AMERICANA CHINESE INTERNATIONAL SCHOOL

Curriculum: Grades 7-12

Chiang Mai Secondary Educational Service

The Ministry of Education

Contents

Introduction

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Introduction

The Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects (hereafter referred to as "the Standards") are the culmination of an extended, broad-based effort to fulfill the charge issued by the states to create the next generation of standards in kindergarten to grade 12 to help ensure that all students are literate and college and career ready no later than the end of high school.

The Standards set requirements not only for English language arts (ELA) but also for literacy in history/social studies, science, and technical subjects. Just as students must learn to read, write, speak, listen, and use language effectively in a variety of content areas, so too must the Standards specify the literacy skills and understandings required for college and career readiness in multiple disciplines. Literacy standards for grade 7 and above are based on the expectation that teachers of ELA, history/social studies, science, and technical subjects use their expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in those content areas. It is important to note that the grades 7–12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

As a natural outgrowth of meeting the charge to define college and career readiness, the Standards also lay out a vision of what it means to be a literate person in the twenty-first century. Indeed, the skills and understandings students are expected to demonstrate have wide application outside the classroom or workplace. Students who meet the Standards readily undertake the close, attentive reading that is at the heart of understanding and enjoying complex works of literature. They habitually perform the critical reading necessary to pick carefully through the staggering amount of information available today in print and digitally. They actively seek wide, deep, and thoughtful engagement with high-quality literary and informational texts that builds knowledge, enlarges experience, and broadens worldviews. They reflexively demonstrate cogent reasoning and use evidence in a way that is essential to both private deliberation and responsible citizenship in a democratic republic. In short, students who meet the Standards develop the skills in reading, writing, speaking, and listening that are the foundation for any creative and purposeful expression in language.
June 2, 2010

Key Design Considerations

Shared responsibility for students' literacy development

The Standards insist that instruction in reading, writing, speaking, listening, and language be a shared responsibility within the school. The grades 7–12 standards are divided into two sections: one for ELA and the other for history/social studies, science, and technical subjects. This division reflects the unique, time-honored place of ELA teachers in developing students' literacy skills while at the same time recognizing that teachers of other subjects must have a role in this development as well.

Part of the motivation behind the interdisciplinary approach to literacy promulgated by the Standards is extensive research establishing the need for college and career ready students to be proficient in reading complex informational text independently in a variety of content areas. Most of the required reading in college and in workforce training programs is informational in structure and challenging in content; postsecondary education programs typically provide students with both a higher volume of such reading than is generally required in K–12 schools and comparatively little scaffolding.

Students Who Are College and Career Ready in Reading, Writing, Speaking and Listening, and Language

They demonstrate independence.

Students can, without significant scaffolding, comprehend and evaluate complex texts across a range of types and disciplines, and they can construct effective arguments and convey intricate or multifaceted information. Likewise, students are independently able to discern a speaker's key points, request clarification, and ask relevant questions. They build on others' ideas, articulate their own ideas, and confirm they have been understood. Without prompting, they demonstrate command of standard English and acquire and use a wide-ranging vocabulary. More broadly, they become self-directed learners, effectively seeking out and using resources to assist them, including teachers, peers, and print and digital reference materials.

They comprehend as well as critique.

Students are engaged and open-minded—but discerning—readers and listeners. They work diligently to understand precisely what an author or speaker is saying, but they also question an author's or speaker's assumptions and premises and assess the veracity of claims and the soundness of reasoning.

They value evidence.

Students cite specific evidence when offering an oral or written interpretation of a text. They use relevant evidence when supporting their own points in writing and speaking, making their reasoning clear to the reader or listener, and they constructively evaluate others' use of evidence.

They use technology and digital media strategically and capably.

Students employ technology thoughtfully to enhance their reading, writing, speaking, listening, and language use. They tailor their searches online to acquire useful information efficiently, and they integrate what they learn through technology with what they learn offline. They are familiar with the strengths and limitations of various technological tools and media and can select and use those best suited to their communication goals.

They come to understand other perspectives and cultures.

Students appreciate that the twenty-first-century classroom and workplace are settings in which people from often widely divergent cultures and who represent diverse experiences and perspectives must learn and work together. Students actively seek to understand other perspectives and cultures through reading and listening, and they are able to communicate effectively with people of varied backgrounds. They evaluate other points of view critically and constructively. Through reading great classic and contemporary works of literature representative of a variety of periods, cultures, and worldviews, students can vicariously inhabit worlds and have experiences much different from their own.

The appendices are available on the Common Core State Standards Initiative Web site at http://www.corestandards.org/ELA-Literacy.

Instructional Design:

CORE CURRICULUM, INSTRUCTIONAL MATERIALS, AND DESIGN

ACIS has adopted a Standards-based, college preparatory curriculum closely following the current CA Common Core State Standards. ACIS uses the Standards as a floor, not a ceiling. ACIS ensures that students develop critical thinking skills, including but not limited to observation and analytical reasoning as well as decision- making skills to help them

access, process, organize, and interpret the information that the Standards present. Students are able to communicate the concepts they have learned through connections between subjects and application of the information to the real world and their own experience. Most importantly, ACIS students draw inspiration from the curriculum to seek further information from other sources.

ACIS analyzes the Standards and has developed clear, useful and assessable guidelines for the Content Standards to be presented to students and their families, so that they may understand the grade-level expectations of ACIS and the State. ACIS outlines all applicable Standards taught in each grade level and subject areas by aligning these in a scope and sequence format. ACIS high school courses range from College prep to Honors courses.

INSTRUCTIONAL MATERIALS

ACIS evaluates the instructional materials used in the School's educational program on a yearly basis. ACIS relies on the professional judgment of its educators to select educational materials that best meet the needs of students at the different grade levels. Educational materials are selected from CA state-adopted lists to ensure that they reflect CA State Standards for the core subjects of reading and language arts, mathematics, science, history/social science and elective subjects.

ACIS includes professional development time for teachers to learn how best to use the selected instructional materials in the curriculum. ACIS plans ahead and budgets sufficient resources to ensure that all students have the needed textbooks, workbooks, technology resources, computer software, and other instructional materials. ACIS prints its own report cards and purchases assessment tools such as testing texts and state and national standardized testing materials as needed.

CORE COURSE BY GRADE LEVEL

Set forth by reference the CA state Standards that correspond to each course title and grade level: All high school courses are A-G approved:

ENGLISH LANGUAGE ARTS

The ACIS English Language Arts program is completely aligned with the Common Core standards. Courses are designed to develop critical thinking skills through literary analysis, rhetorical analysis, and research and to cultivate student literacy and increase reading comprehension through the study of a variety of texts from numerous genres and cultures. At every grade level, students engage in class discussions, group discussions, and seminars to ensure they are proficient in the speaking and listening skills outlined by the Common Core Standards. Likewise, at every grade level, students compose writings within a variety of genres—prose, poetry, analysis, narrative, expository, persuasion, speeches, and multimedia presentations--and for a variety of audiences.

Unlike in other disciplines in which students must master one skill before moving on to another, in language arts classes, the skills remain largely the same from grade to grade as the texts to which students are exposed become more and more complex and their vocabulary more challenging. This is reflected in the scope and sequence of the Common Core Standards themselves. The Common Core Standards for reading, writing, listening, speaking, and language are addressed at all levels with the nuances outlined by the standards. The scope and sequence of skills taught in the Language Arts program of ACIS reflect this concept of grade-appropriate growth and challenge.

ACIS Language Arts program ascribes to the Common Core philosophy that all students need to tackle complex texts and be taught how to determine the meaning of words from context, to discern levels of meaning, to identify the central ideas, to draw inferences, support those inferences through textual evidence, and evaluate methods authors use to convey meaning—ethos, logos, pathos, use of literary devices and

textual elements. One can enter a sixth grade ELA class at ACIS and witness activities, instruction and class discussions that are very similar to those occurring in an eleventh grade course but on a level and using language appropriate for younger students. Likewise, the College and Career Readiness Anchor Standards are addressed in every classroom with particular emphasis on developing a command of the conventions of Standard English grammar, usage, capitalization, and punctuation as well as use of college- and career-level vocabulary and an understanding that words carry with them distinct connotations.

ENGLISH LANGUAGE ARTS MIDDLE SCHOOL: SCOPE AND SEQUENCE

ENGLISH 7

In this course students explore many writing genres such as expository, persuasive, collaborative writing and analytical essays in order to strengthen and enhance their reading and writing skills. They analyze the connections between the texts they read and the real world. Throughout this course, students read a variety of short stories, novels, essays, and poems. The literature in this course is used to sharpen reading skills, develop vocabulary, and improve comprehension and identification of literary elements such as theme, plot, characterization, and figurative language.

MIDDLE SCHOOL CREATIVE WRITING

In this course, students explore a variety of fiction and nonfiction writing genres, and create authentic publications. Students write poetry, short stories, and personal narratives. In addition, students enhance their writing skills while gaining a deeper understanding of the writing process.

ENGLISH 8

Students develop their analytical minds as they read a variety of texts that span several genres and come in many forms. They learn about extrapolating a text through annotation and understanding each author's purpose within varying genres. With the texts students read and discussions, they begin to foster the skills they need to tackle the level of reading they encounter in high school and beyond.

ENGLISH LANGUAGE ARTS HIGH SCHOOL: SCOPE AND SEQUENCE

ENGLISH 9 (College Prep)

Four years of ELA courses in the ACIS High School are required for graduation.

In this course, students analyze short stories, novels, plays, speeches, poetry, and nonfiction to discover how authors utilize literary devices to enhance the power of the written word. Evaluating a text's grammar, imagery, syntax, word choice, and literary devices fosters an understanding of how authors create literature that exemplifies their personal cultural experience, while simultaneously sparking a cross-cultural dialogue regarding the human experience.
Students will be assessed on writing, speaking, reading, and listening. To develop writing mastery, students complete formal writing assignments reflecting selected literature. Critical components of the class involve generating a strong thesis, collecting supporting evidence, and advocating for an original position. Graded writing assignments include formal essays, timed pieces, reading quizzes, and journal writings. In addition, students practice confident, articulate public speaking. Reading and listening skills be assessed using a variety of in-class methods, including but not limited to class notes, vocabulary quizzes, reading quizzes, individual and group projects, pictorial renditions of text, Socratic Seminars, writing portfolios, and professional presentations.

Freshman English students explore the tensions and contradictions espoused in great literature. Practicing civic discourse, students develop their own claims about the text and learn to identify supporting evidence and counterclaims. All the while, learning the values of respect, tolerance, and self-expression. Freshman English aims to create an academic space where students are free to explore academic connections and their pragmatic implications.

HONORS ENGLISH 9

In this course students will evaluate the deeper implications of literature. In this course, students analyze short stories, novels, plays, speeches, poetry, and nonfiction to discover how authors utilize literary devices to enhance the power of the written word. Evaluating a text's grammar, imagery, syntax, word choice, and literary devices foster an understanding of how authors create literature that exemplifies their personal cultural experience, while simultaneously sparking a cross-cultural dialogue regarding the human experience.

Students writing, speaking, reading, and listening assessments include conceptual and grammatical rigor. Reading classic works independently, students enhance their reading ability. To develop writing mastery, students complete formal writing assignments reflecting selected literature. Critical components of the class involve generating a strong thesis, collecting supporting evidence, and advocating for an original position. Graded writing assignments include formal essays, timed pieces, reading quizzes, and journal writings. In addition, students practice confident, articulate public speaking. Reading and listening skills be assessed using a variety of in-class methods, including but not limited to class notes, vocabulary quizzes, reading quizzes, individual and group projects, pictorial renditions of text, Socratic Seminars, writing portfolios, and professional presentations.

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ENGLISH 10: WORLD LITERATURE/AMERICAN LITERATURE (College Prep)

World Literature is designed to expose students to perspectives that differ from their own, ultimately leading them to a deeper understanding of other cultures and the works that represent them. The course is a study of representative works of world literature from Antiquity, the Middle Ages, and the Renaissance. The course emphasizes the study and consideration of the literary, cultural, and human significance of selected great works of the Western and non-Western literary traditions. An emphasis be placed on writing, speaking, and research elements corresponding to California Standards. Therefore, students thematically study, analyze, interpret, & critique various genres of literature and other media based on the historical and cultural context of the author and his/her culture.

An important goal of the class is to promote an understanding of the works in their cultural/historical contexts and of the enduring human values, which unite the different literary traditions. The course's pedagogy gives special attention to critical thinking and writing within a framework of cultural diversity as well as comparative and interdisciplinary analysis.

In this course, the focus will be on developing one skill in particular: asking questions. In this course, an expectation is for all students to be actively engaged in the reading and writing process by formulating and sharpening key questions about literary texts. Learning how to become a discriminating reader by posing interesting questions be a central task per semester. Students are to think of each text as an "open" text. An "open" text is one that presents the reader with a multiplicity of

contradictory meanings, and the pleasure of reading and rereading such a text is precisely to explore those contradictions. Indeed, as students discover, each person brings different ideas to a literary text and draws different conclusions from it.

Such texts that may be read within the course are Antigone by Sophocles, All Quiet on the Western Front by Erich Marie Remarque, Don Quixote of La Mancha by Miguel de Cervantes, Lord of the Flies by William Golding and others.

HONORS ENGLISH 10: WORLD LITERATURE

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ENGLISH 11 (College Prep)

English 11 is a language arts course that focuses on reading, interpreting, and analyzing literature of the various periods and genres of the American literary tradition through thematic units. Students examine the significant connections between American literature and American culture, with emphasis on the American experience. Students also examine how the use of literary and/or rhetorical devices and literary elements illuminate the meaning of a text. Students compose a number of writings for a variety of audiences, occasions and purposes and in doing so, come to understand the roles each of these play in the shaping of a piece of writing. Through the completion of a research essay, students evaluate sources, examine and employ use of ethos and logos, and learn to structure an argument that takes its place in an ongoing conversation about an important topic of the day.

In English 11, emphasis remains on the development of reading strategies, on vocabulary acquisition, and on grammar and writing skills. While literary and rhetorical analysis play central roles in American literature and honors American literature, it is the development of skills of reading and writing across the disciplines that takes center stage in English 11.

American Literature is a chronological study of the American literary tradition and its role in the emerging, developing and changing American experience and ethos. Students read works of national founders such as Jefferson and Franklin, the seminal works of masters of American literature such as Whitman, Emerson, Thoreau, Twain, Poe, and Dickinson, as well as modern and contemporary works by authors such as Miller, Hemingway, Salinger and Morrison. The course focuses on historical as well as literary themes and on the use of literary devices and techniques. Students also continue to develop writing skills, most specifically skills of literary analysis and research.

HONORS ENGLISH 11: AMERICAN LITERATURE

Honors American Literature differs from college preparatory American Literature primarily in level of expectation. Honors students read more

texts, read more challenging texts, and are expected to support their analyses of those texts thoroughly. In their analyses, honors students are expected to utilize more fluid and effective explanations and transitions and to make clear links between the details and quotes being used and the points the details are illustrating or supporting. Other writings completed by honors students require more in-depth research and more convincing arguments.

In short, work completed by honors students must be more polished, more in-depth, and more thorough than work submitted by American Literature students. It should also exhibit a willingness to take risks and think independently.

The expectation of students in the honors courses is that they come to the course possessing strong comprehension skills and wide vocabularies (the hallmarks of avid readers) and that they come to class having understood the assigned reading and already having thought about it analytically before class discussion begins. In American literature, we develop and foster skills of analysis; in honors American literature classes, we hone them.

ENGLISH 12: BRITISH LITERATURE (College Prep)

Students read a wide variety of British literature from the Anglo-Saxon invasion through the first half of 20th century. In addition to the assigned text, students also be responsible for outside independent reading. Emphasis is placed on historical background, cultural context, and literary analysis of selected prose, poetry, and drama. Readings in the first semester of the course range from Beowulf and The Canterbury Tales through works by Sir Thomas Malory, Edmund Spencer, Christopher Marlowe, Sir Walter Scott, John Donne and Andrew Marvell to discuss works from the Anglo-Saxon invasion to the Middle Ages and the 18th Century. Readings in the second semester of the course consist of major works of British Literature from 1789 to the present, including such texts by Blake, Byron, Wordsworth, Keats, Shelly, Tennyson, Browning, Arnold, Carlyle, Hardy, Conrad, Yeats, Woolfe, Joyce and Eliot. Upon completion, students should be able to interpret, analyze, and respond to literary works in their historical and cultural contexts.

Students are responsible for learning through tests, quizzes, group and individual presentations, and a variety of writing assignments. The writing stem directly from the reading and provide students the opportunity to improve expository and persuasive skills. Class writing activities also include some informal, personal narrative, and creative writing to help clarify ideas and stimulate discussion about the readings. The course focuses on the specific history and development of British literature. Therefore, one main objective is for students to learn information about writers, their works, and literary movements.

Throughout the course, the focus is on developing one skill in particular: asking questions. In this course, an expectation is for all students to be actively engaged in the reading and writing process by formulating and sharpening key questions about literary texts. Learning how to become a discriminating reader by posing interesting questions is a central task per semester. Students are to think of each text as an “open” text. It is their work to each have an opinion, an idea that matters, and to figure out where we stand in relation to the thoughts and opinions of others.

HONORS ENGLISH 12: BRITISH LITERATURE

The purpose of this course is to introduce students to a wide range of British literature. It is a survey course and cover all major literary time periods from the Early Middle Ages to Postmodern and Contemporary British voices. Students read poetry, novels, plays, speeches, satires, and essays throughout the year, and be expected to respond thoroughly to the texts using a breadth of both written and oral assessments. Students are encouraged to read closely and to value textual evidence at all times. Thorough annotations of novels and texts are expected.

CREATIVE WRITING

Creative Writing is an extensive introduction to the writing of poetry and prose. Through close reading of the works of published authors and poets, students examine the elements of writing, and through a variety

of writing exercises and prompts, students create writings of their own. Students complete prose writings, essays, short stories, narratives, etc., and a number of poems in a variety of formats and styles. Specifically, students examine and practice elements and techniques such as setting, tone, style, structure, plot, theme, diction, figurative language, symbolism and poetic forms. Students share their work with other students in a workshop format and often with the class as a whole. A command of grammar and mechanics as well as literary terms and devices is essential for success in this class.

Grade Level Instructional Materials

7TH GRADE

Novels and Plays: Among the Hidden by Margaret Haddix, Iqbal A Novel by Francesco D'Adamo The Lightning Dreamer: Cuba's Greatest Abolitionist by Margarita Engle A Long Walk to Water by Linda Sue Park
Endangered by Eliot Schrefer The Outsiders by S.E Hinton A Long Way Gone by Ishmael Beah The Monsters are Due on Maple Street Short Stories: "The Lottery" by Shirley Jackson "Harrison Bergeron" by Kurt Vonnegut

8TH GRADE

Novels and Plays: The Pearl by John Steinbeck Of Mice and Men by John Steinbeck A Midsummer Night's Dream by William Shakespeare (any edition?) A Raisin in the Sun by Lorraine Hansberry Flowers for Algernon by Daniel Keyes, Night by Elie Wiesel Tuesdays with Morrie by Mitch Albom The Human Comedy by William Saroyan

Essays/Nonfiction: News Articles Personal Experience Essays 30 Human Rights by The United Nations God Grew Tired of Us directed by Christopher Quinn Dark Girls directed by Bill Duke and D. Channsin Berry
Poetry: "O Captain! My Captain!" by Walt Whitman (elegy) "Ode to Stephen Dowling Bots" by Mark Twain (ode) "Sonnet 18" by William Shakespeare (sonnet - "Shall I compare thee to a summer's day?") "Sonnet 130" by William Shakespeare (sonnet - "My mistress' eyes are nothing like the sun")

Various Songs/Lyrics "Everything is Everything" by Lauryn Hill "Express Yourself" by O'Shea Jackson (Ice Cube)

Short Stories: "The Landlady" by Roald Dahl "Lamb to the Slaughter" by Roald Dahl "The Monsters Are Due on Maple Street" by Rod Serling (teleplay) "The Monkey's Paw" by W. W. Jacobs ...and others

9TH GRADE

Novels and Plays: Oedipus Rex--Sophocles Antigone--Sophocles Republic by Plato Animal Farm by George Orwell , Romeo and Juliet by William Shakespeare To Kill a Mockingbird by Harper Lee The Absolutely True Diary of a Part-Time Indian by Sherman Alexie House on Mango Street by Sandra Ciseros Frankenstein by Mary Shelley

Essays/Nonfiction: Chief Joseph Surrender Last Stand at Litte Big Horn by James Welch (documentary) "Superman and Me" by Sherman Alexie (L.A. Times, April 19, 1998) "Shooting an Elephant" by George Orwell Selections from Vindication of Women's Rights by Mary Wollstonecraft "Once More to the Lake" by E.B. White "Notes of a Native Son" by James Baldwin, "Driving While Black" by Gary Webb (Esquire, January 2007)

Poetry: "Ozymandias" Selections from Edgar Allen Poe Selections from Joy Harjo "The Shepherd" by William Blake "Rime of the Ancient Mariner" by Samuel Coleridge "Ulysses" by Alfred Lord Tennyson "O Distinct" by EE Cummings "To You" by Walt Whitman "On My First Sonne" by Ben Jonson "Sonnet 2" by William Shakespeare

Short Stories: The Cask of Amontillado by Edgar Allen Poe A Tell-Tale Heart by Edgar Allen Poe The Colomber by Dino Buzzatti Men on the Moon by Simon J Ortiz

10TH GRADE

Novels and Plays: The Odyssey--Fitzgerald translation A Thousand Splendid Suns 1984 Macbeth

Short Stories: Selections from The Bible Rashomon by Ryunosuke Akutagawa West African Folktales W.H. Barker
Short Fiction/Non Fiction: Adventures of Huckleberry Finn - Mark Twain, Autobiography - Benjamin Franklin, Catch 22 - Joseph Heller, The Catcher in the Rye - JD Salinger, The Crucible - Arthur Miller, Death of a Salesman - Arthur Miller, Fahrenheit 451 - Ray Bradbury, For Whom The Bell Tolls - Ernest Hemingway
Grapes of Wrath - John Steinbeck, The Great Gatsby - F. Scott Fitzgerald, Moby Dick - Herman Melville, My Antonia - Willa Cather, Narrative of the Life of Frederick Douglass - Frederick Douglass, Of Mice and Men - John Steinbeck, Our Town - Thornton Wilder, The Red Badge of Courage - Stephen Crane, The Scarlet Letter - Nathaniel Hawthorne, The Sun Also Rises - Ernest Hemingway, To Kill a Mockingbird - Harper Lee, Uncle Tom's Cabin -- Harriet Beecher Stowe, Walden - Henry David Thoreau

11TH GRADE

Novels and Plays: The Crucible (Penguin edition) The Scarlet Letter (honors) The Great Gatsby, The Adventures of Huckleberry Finn, The Things They Carried
Fahrenheit 451, The Catcher in the Rye Prologue and first chapter of Invisible Man--Ralph Ellison, The Red Badge of Courage, chapter one

Essays/Nonfiction: The Federalist Papers--No. 10--James Madison Selection from Autobiography--Benjamin Franklin Selections from Poor Richard's Almanac--Benjamin Franklin Selection from Autobiography--Thomas Jefferson Selection from The Crisis, No. 1--Thomas Paine Common Sense--Thomas Paine "Speech to the Virginia Convention"--Patrick Henry Selection from Walden by Thoreau Selection from Resistance to Civil Government--Thoreau Selection from Nature by Emerson Selection from Self-Reliance by Emerson Selection from The Narrative of the Life of Frederick Douglass Selection from Incidents in the Life of a Slave Girl Selection from Interesting Narrative of the Life of Olaudah Equiano "Indian Education"--Sherman Alexie "Mother Tongue"--Amy Tan "Sinners in the Hands of an Angry God"--Jonathan Edwards Preface to Leaves of Grass "How It Feels to be Colored Me"--Hurston

Poetry: Puritan Era "Huswifery"--Edward Taylor "Sinners in the Hands of an Angry God" Anne Bradstreet "Ain't I a Woman"--Sojourner Truth "War is Kind"--Stephen Crane "The Garden"--Pound "Nothing Gold Can Stay"--Frost "The Death of the Ball Turret Gunner"--jarrell Selection from "The Waste Land"--Eliot "The Lovesong of J. Alfred Prufrock"--Eliot "Richard Cory"--Robinson "In a Station of the Metro"--Pound "The Red Wheelbarrow"--Williams "The Great Figure"--Williams "In Just--"--cummings "Fog"--Sandburg "Thirteen Ways of Looking at a Blackbird"--Stevens "Poetry"--Moore "The Death of the Hired Man"--Frost "Mending Wall"--Frost The works of the Fireside Poets "The First Snowfall" "Snow-Bound: A Winter Idyl"--John Greenleaf Whittier
"Old Ironsides"--Oliver Wendell Holmens "The Tide Rises, The Tide Falls"--Longfellow "A Psalm of Life"--Longfellow "Thanatopsis"—T.S. Eliot Works by Dickinson "Success is counted sweetest" "I heard a Fly buzz--when I died" "Because I could not stop for Death" Works by Whitman "I Hear America Singing" "Song of Myself," 10, 33, 52 "A Noiseless Patient Spider" "O Captain, My Captain!" Works of the Harlem Renaissance "The Negro Speaks of Rivers"--Hughes "Harlem"--Hughes "I, Too"--Hughes "Theme for English B"--Hughes "Any Human to Another"--Cullen "Incident"--Cullen "If We Must Die"—McKay

Short Stories/Short Fiction: "The Fall of the House of Usher"--Poe "The Minister's Black Veil"--Nathaniel Hawthorne "The Devil and Tom Walker"--Washington Irving "The World on Turtle's Back"-- "When Grizzlies Walked Upright" "The Way to Rainy Mountain"--N. Scott Momaday "The Luck of Roaring Camp"--Bret Harte "An Occurrence at Owl Creek Bridge"--Ambrose Bierce "A Mystery of Heroism"--Stephen Crane "The Yellow Wallpaper"--Charlotte Perkins Gilman "A Wagner Matinee"--Willa Cather "The Story of an Hour"--Kate Chopin "To Build a Fire"--Jack London

12TH GRADE

Novels and Plays: College Preparatory Sections: The Canterbury Tales, Hamlet (Folger edition) Brave New World Contemporary Text (possibly The Passion)

Honors Sections: Beowulf (Seamus Heaney translation) The Canterbury Tales King Lear (Folger edition) Pride and Prejudice (Penguin edition only?) The

Importance of Being Earnest Brave New World Postcolonial Text (Things Fall Apart, Oranges Are Not the Only Fruit, Wide Sargasso Sea, Grendel) Personal selection of British text.

Essays/Nonfiction: The Writer's Journey, The Power of Myth "A Modest Proposal" "On Speaking Well" "The Fallacy of Success" Several news articles concerning unit Essential Questions

Poetry: Selections from T.S. Eliot Selections from W.B. Yeats Alexander Pope's "The Rape of the Lock" (satire)

Short Stories: Selections from Dubliners (particularly "The Sisters," "An Encounter," and "The Dead") Excerpts from Gulliver's Travels Charles Dickens satirical short story (to be selected later), "The Very Old Man With the Enormous Wings"

Standards for

English Language Arts

7–12

RL Reading Standards for Literature 7–8

	Grade 7 Students	Grade 8 Students
Key Ideas and Details	1. Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	1. Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
	2. Determine a theme or central idea of a text and analyze its development over the course of the text; provide an objective summary of the text.	2. Determine a theme or central idea of a text and analyze its development over the course of the text, including its relationship to the characters, setting, and plot; provide an objective summary of the text.
	3. Analyze how particular elements of a story or drama interact (e.g., how setting shapes the characters or plot).	3. Analyze how particular lines of dialogue or incidents in a story or drama propel the action, reveal aspects of a character, or provoke a decision.
Craft and Structure	4. Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of rhymes and other repetitions of sounds (e.g., alliteration) on a specific verse or stanza of a poem or section of a story or drama. **(See grade 7 Language standards 4–6 for additional expectations.) CA**	4. Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts. **(See grade 8 Language standards 4–6 for additional expectations.) CA**
	5. Analyze how a drama's or poem's form or structure (e.g., soliloquy, sonnet) contributes to its meaning.	5. Compare and contrast the structure of two or more texts and analyze how the differing structure of each text contributes to its meaning and style.
	6. Analyze how an author develops and contrasts the points of view of different characters or narrators in a text.	6. Analyze how differences in the points of view of the characters and the audience or reader (e.g., created through the use of dramatic irony) create such effects as suspense or humor.

Reading Standards for Literature 7-8

	Grade 7 Students	Grade 8 Students
Integration of Knowledge and Ideas	7. Compare and contrast a written story, drama, or poem to its audio, filmed, staged, or multimedia version, analyzing the effects of techniques unique to each medium (e.g., lighting, sound, color, or camera focus and angles in a film).	7. Analyze the extent to which a filmed or live production of a story or drama stays faithful to or departs from the text or script, evaluating the choices made by the director or actors.
	8. (Not applicable to literature)	8. (Not applicable to literature)
	9. Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history.	9. Analyze how a modern work of fiction draws on themes, patterns of events, or character types from myths, traditional stories, or religious works such as the Bible, including describing how the material is rendered new.
Range of Reading and Level of Text Complexi	10. By the end of the year, read and comprehend literature, including stories, dramas, and poems, in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.	10. By the end of the year, read and comprehend literature, including stories, dramas, and poems, at the high end of grades 6–8 text complexity band independently and proficiently.

RL Reading Standards for Literature 9–12

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

	Grades 9–10 Students	Grades 11–12 Students
Key Ideas and Details	1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
	2. Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.	2. Determine two or more themes or central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to produce a complex account; provide an objective summary of the text.
	3. Analyze how complex characters (e.g., those with multiple or conflicting motivations) develop over the course of a text, interact with other characters, and advance the plot or develop the theme.	3. Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters**/archetypes** are introduced and developed). **CA**
Craft and Structure	4. Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone). **(See grade 9–10 Language standards 4–6 for additional expectations.) CA**	4. Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (Include Shakespeare as well as other authors.) **(See grade 11–12 Language standards 4–6 for additional expectations.) CA**
	5. Analyze how an author's choices concerning how to structure a text, order events within it (e.g., parallel plots), and manipulate time (e.g., pacing, flashbacks) create such effects as mystery, tension, or surprise.	5. Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact.
	6. Analyze a particular point of view or cultural experience reflected in a work of literature from outside the United States, drawing on a wide reading of world literature.	6. Analyze a case in which grasping point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement).

RL Reading Standards for Literature 9–12

	Grades 9–10 Students	Grades 11–12 Students
Integration of Knowledge and Ideas	7. Analyze the representation of a subject or a key scene in two different artistic mediums, including what is emphasized or absent in each treatment (e.g., Auden's "Musée des Beaux Arts" and Breughel's *Landscape with the Fall of Icarus*).	7. Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.)
	8. (Not applicable to literature)	8. (Not applicable to literature)
	9. Analyze how an author draws on and transforms source material in a specific work (e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare).	9. Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.
Range of Reading and Level of Text Complexity	10. By the end of grade 9, read and comprehend literature, including stories, dramas, and poems, in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 9–10 text complexity band independently and proficiently.	10. By the end of grade 11, read and comprehend literature, including stories, dramas, and poems, in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 11–CCR text complexity band independently and proficiently.

RI Reading Standards for Informational Text 7-8

	Grade 7 Students	Grade 8 Students
Key Ideas and Details	1. Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	1. Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
	2. Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.	2. Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
	3. Analyze the interactions between individuals, events, and ideas in a text (e.g., how ideas influence individuals or events, or how individuals influence ideas or events).	3. Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).
Craft and Structure	4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone. **(See grade 7 Language standards 4–6 for additional expectations.) CA**	4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.
	5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to the development of the ideas. **a. Analyze the use of text features (e.g., graphics, headers, captions) in public documents. CA**	5. Analyze in detail the structure of a specific paragraph in a text, including the role of particular sentences in developing and refining a key concept. **a. Analyze the use of text features (e.g., graphics, headers, captions) in consumer materials. CA**
	6. Determine an author's point of view or purpose in a text and analyze how the author distinguishes his or her position from that of others.	6. Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints.

RI Reading Standards for Informational Text 7-8

	Grade 7 Students	Grade 8 Students
Integration of Knowledge and Ideas	7. Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the delivery of a speech affects the impact of the words).	7. Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.
	8. Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.	8. Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.
	9. Analyze how two or more authors writing about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.	9. Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.
Range of Reading and Level of Text Complexity	10. By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.	10. By the end of the year, read and comprehend literary nonfiction at the high end of the grades 6–8 text complexity band independently and proficiently.

RI Reading Standards for Informational Text 9–12

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

	Grades 9–10 Students	Grades 11–12 Students
Key Ideas and Details	1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
	2. Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.	2. Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.
	3. Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.	3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.
Craft and Structure	4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper). **(See grade 9–10 Language standards 4–6 for additional expectations.) CA**	4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10). **(See grade 11–12 Language standards 4–6 for additional expectations.) CA**
	5. Analyze in detail how an author's ideas or claims are developed and refined by particular sentences, paragraphs, or larger portions of a text (e.g., a section or chapter). **a. Analyze the use of text features (e.g., graphics, headers, captions) in functional workplace documents. CA**	5. Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging. **a. Analyze the use of text features (e.g., graphics, headers, captions) in public documents. CA**
	6. Determine an author's point of view or purpose in a text and analyze how an author uses rhetoric to advance that point of view or purpose.	6. Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text.

RI Reading Standards for Informational Text 9–12

	Grades 9–10 Students	Grades 11–12 Students
Integration of Knowledge and Ideas	7. Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.	7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
	8. Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.	8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., *The Federalist,* presidential addresses).
	9. Analyze seminal U.S. documents of historical and literary significance (e.g., Washington's Farewell Address, the Gettysburg Address, Roosevelt's Four Freedoms speech, King's "Letter from Birmingham Jail"), including how they address related themes and concepts.	9. Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of Independence, the Preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) for their themes, purposes, and rhetorical features.
Range of Reading and Level of Text Complexity	10. By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9–10 text complexity band independently and proficiently.	10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently.

College and Career Readiness Anchor Standards for Writing

The grades 7–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Text Types and Purposes[1*]

1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
9. Draw evidence from literary and/or informational texts to support analysis, reflection, and research.

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

[*] These broad types of writing include many subgenres.

Note on range and content of student writing

For students, writing is a key means of asserting and defending claims, showing what they know about a subject, and conveying what they have experienced, imagined, thought, and felt. To be college- and career-ready writers, students must take task, purpose, and audience into careful consideration, choosing words, information, structures, and formats deliberately. They need to know how to combine elements of different kinds of writing—for example, to use narrative strategies within argument and explanation within narrative—to produce complex and nuanced writing. They need to be able to use technology strategically when creating, refining, and collaborating on writing. They have to become adept at gathering information, evaluating sources, and citing material accurately, reporting findings from their research and analysis of sources in a clear and cogent manner. They must have the flexibility, concentration, and fluency to produce high-quality first-draft text under a tight deadline as well as the capacity to revisit and make improvements to a piece of writing over multiple drafts when circumstances encourage or require it.

W Writing Standards 7-8

Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

	Grade 7 Students	Grade 8 Students
Text Types and Purposes	1. Write arguments to support claims with clear reasons and relevant evidence. a. Introduce claim(s), acknowledge **and address** alternate or opposing claims, and organize the reasons and evidence logically. **CA** b. Support claim(s) **or counterarguments** with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text. **CA** c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from and supports the argument presented.	1. Write arguments to support claims with clear reasons and relevant evidence. a. Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from and supports the argument presented.

W Writing Standards 7-8

	Grade 7 Students	Grade 8 Students
Text Types and Purposes (*continued*)	2. Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. a. Introduce a topic **or thesis statement** clearly, previewing what is to follow; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/ effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. **CA** b. Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate transitions to create cohesion and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Establish and maintain a formal style. f. Provide a concluding statement or section that follows from and supports the information or explanation presented.	2. Write informative/explanatory texts, **including career development documents (e.g., simple business letters and job applications),** to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. **CA** a. Introduce a topic **or thesis statement** clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. **CA** b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Establish and maintain a formal style. f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

W Writing Standards 7-8

	Grade 7 Students	Grade 8 Students
Text Types and Purposes (*continued*)	3. Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences. a. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically. b. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters. c. Use a variety of transition words, phrases, and clauses to convey sequence and signal shifts from one time frame or setting to another. d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events. e. Provide a conclusion that follows from and reflects on the narrated experiences or events.	3. Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences. a. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically. b. Use narrative techniques, such as dialogue, pacing, description, and reflection, to develop experiences, events, and/or characters. c. Use a variety of transition words, phrases, and clauses to convey sequence, signal shifts from one time frame or setting to another, and show the relationships among experiences and events. d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events. e. Provide a conclusion that follows from and reflects on the narrated experiences or events.

W Writing Standards 7-8

	Grade 7 Students	Grade 8 Students
Production and Distribution of Writing	4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)	4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
	5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 7.)	5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 8.)
	6. Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.	6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
Research to Build and Present Knowledge	7. Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.	7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

W Writing Standards 7-8

	Grade 7 Students	Grade 8 Students
Research to Build and Present Knowledge (*continued*)	8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.	8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
	9. Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grade 7 Reading standards* to literature (e.g., "Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history"). b. Apply *grade 7 Reading standards* to literary nonfiction (e.g. "Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims").	9. Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grade 8 Reading standards* to literature (e.g., "Analyze how a modern work of fiction draws on themes, patterns of events, or character types from myths, traditional stories, or religious works such as the Bible, including describing how the material is rendered new"). b. Apply *grade 8 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced").
Range of Writing	10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

W Writing Standards 9-12

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

	Grades 9–10 Students	Grades 11–12 Students
Text Types and Purposes	1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from and supports the argument presented.	1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from and supports the argument presented. **f. Use specific rhetorical devices to support assertions (e.g., appeal to logic through reasoning; appeal to emotion or ethical belief; relate a personal anecdote, case study, or analogy). CA**

W Writing Standards 9–12

	Grades 9–10 Students	Grades 11–12 Students
Text Types and Purposes (*continued*)	2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. a. Introduce a topic **or thesis statement**; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. **CA** b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use appropriate and varied transitions to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).	2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. a. Introduce a topic **or thesis statement**; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. **CA** b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

W Writing Standards 9–12

	Grades 9–10 Students	Grades 11–12 Students
Text Types and Purposes (*continued*)	3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. a. Engage and orient the reader by setting out a problem, situation, or observation, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events. b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters. c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole. d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters. e. Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.	3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. a. Engage and orient the reader by setting out a problem, situation, or observation and its significance, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events. b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters. c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole and build toward a particular tone and outcome (e.g., a sense of mystery, suspense, growth, or resolution). d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters. e. Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.
Production and Distribution of Writing	4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)	4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
	5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 9–10.)	5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 11–12.)
	6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

W Writing Standards 9–12

	Grades 9–10 Students	Grades 11–12 Students
Research to Build and Present Knowledge	7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
	8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation **including footnotes and endnotes. CA**	8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation **including footnotes and endnotes. CA**
	9. Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grades 9–10 Reading standards* to literature (e.g., "Analyze how an author draws on and transforms source material in a specific work [e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare]"). b. Apply *grades 9–10 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning").	9. Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grades 11–12 Reading standards* to literature (e.g., "Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics"). b. Apply *grades 11–12 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning [e.g., in U.S. Supreme Court Case majority opinions and dissents] and the premises, purposes, and arguments in works of public advocacy (e.g., *The Federalist*, presidential addresses]").
Range of Writing	10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.	10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

College and Career Readiness Anchor Standards for Speaking and Listening

The grades 7–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Comprehension and Collaboration

1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge and Ideas

4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

6. Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Note on range and content of student speaking and listening

To be college and career ready, students must have ample opportunities to take part in a variety of rich, structured conversations—as part of a whole class, in small groups, and with a partner—built around important content in various domains. They must be able to contribute appropriately to these conversations, make comparisons and contrasts, and analyze and synthesize a multitude of ideas according to the standards of evidence appropriate to a particular discipline. Whatever their intended major or profession, high school graduates will depend heavily on their ability to listen attentively to others so that they are able to build on others' meritorious ideas while expressing their own clearly and persuasively.

New technologies have broadened and expanded the role that speaking and listening play in acquiring and sharing knowledge and have tightened the link to other forms of communication. The Internet has accelerated the speed at which connections between speaking, listening, reading, and writing can be made, requiring that students be ready to use these modalities nearly simultaneously. Technology itself is changing quickly, creating a new urgency for students to be adaptable in response to change.

SL Speaking and Listening Standards 7-8

The following standards for grades 6–12 offer a focus for instruction in each year to help ensure that students gain adequate mastery of a range of skills and applications. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.*

	Grade 7 Students	Grade 8 Students
Comprehension and Collaboration	1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 7 topics, texts, and issues,* building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed. c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed. d. Acknowledge new information expressed by others and, when warranted, modify their own views.	1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 8 topics, texts, and issues,* building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed. c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas. d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
	2. Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.	2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

SL

Speaking and Listening Standards 7-8

	Grade 7 Students	Grade 8 Students
Comprehension and Collaboration (continued)	3. Delineate a speaker's argument and specific claims, **and attitude toward the subject,** evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence. **CA**	3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.
Presentation of Knowledge and Ideas	4. Present claims and findings **(e.g., argument, narrative, summary presentations),** emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation. **CA** **a. Plan and present an argument that: supports a claim, acknowledges counterarguments, organizes evidence logically, uses words and phrases to create cohesion, and provides a concluding statement that supports the argument presented. CA**	4. Present claims and findings **(e.g., argument, narrative, response to literature presentations)**, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. **CA** **a. Plan and present a narrative that: establishes a context and point of view, presents a logical sequence, uses narrative techniques (e.g., dialogue, pacing, description, sensory language), uses a variety of transitions, and provides a conclusion that reflects the experience. CA**
	5. Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
	6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 7 Language standards 1 and 3 for specific expectations.)	6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 8 Language standards 1 and 3 for specific expectations.)

SL Speaking and Listening Standards 9–12

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

	Grades 9–10 Students	Grades 11–12 Students
Comprehension and Collaboration	1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.	1. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.
	2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.	2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
	3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.	3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

SL

Speaking and Listening Standards 7–12

	Grades 9–10 Students	Grades 11–12 Students
Presentation of Knowledge and Ideas	4. Present information, findings, and supporting evidence clearly, concisely, and logically **(using appropriate eye contact, adequate volume, and clear pronunciation)** such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose **(e.g., argument, narrative, informative, response to literature presentations),** audience, and task. **CA** **a. Plan and deliver an informative/explanatory presentation that: presents evidence in support of a thesis, conveys information from primary and secondary sources coherently, uses domain specific vocabulary, and provides a conclusion that summarizes the main points. (9th or 10th grade) CA** **b. Plan, memorize, and present a recitation (e.g., poem, selection from a speech or dramatic soliloquy) that: conveys the meaning of the selection and includes appropriate performance techniques (e.g., tone, rate, voice modulation) to achieve the desired aesthetic effect. (9th or 10th grade) CA**	4. Present information, findings, and supporting evidence **(e.g., reflective, historical investigation, response to literature presentations)**, conveying a clear and distinct perspective **and a logical argument**, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. **Use appropriate eye contact, adequate volume, and clear pronunciation. CA** **a. Plan and deliver a reflective narrative that: explores the significance of a personal experience, event, or concern; uses sensory language to convey a vivid picture; includes appropriate narrative techniques (e.g., dialogue, pacing, description); and draws comparisons between the specific incident and broader themes. (11th or 12th grade) CA** **b. Plan and present an argument that: supports a precise claim; provides a logical sequence for claims, counterclaims, and evidence; uses rhetorical devices to support assertions (e.g., analogy, appeal to logic through reasoning, appeal to emotion or ethical belief); uses varied syntax to link major sections of the presentation to create cohesion and clarity; and provides a concluding statement that supports the argument presented. (11th or 12th grade) CA**
	5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
	6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9–10 Language standards 1 and 3 for specific expectations.)	6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 for specific expectations.)

College and Career Readiness Anchor Standards for Language

The grades 7–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Conventions of Standard English

1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Vocabulary Acquisition and Use

4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

Note on range and content of student language use

To be college and career ready in language, students must have firm control over the conventions of standard English. At the same time, they must come to appreciate that language is as at least as much a matter of craft as of rules and be able to choose words, syntax, and punctuation to express themselves and achieve particular functions and rhetorical effects. They must also have extensive vocabularies, built through reading and study, enabling them to comprehend complex texts and engage in purposeful writing about and conversations around content. They need to become skilled in determining or clarifying the meaning of words and phrases they encounter, choosing flexibly from an array of strategies to aid them. They must learn to see an individual word as part of a network of other words—words, for example, that have similar denotations but different connotations. The inclusion of Language standards in its own strand should not be taken as an indication that skills related to conventions, effective language use, and vocabulary are unimportant to reading, writing, speaking, and listening; indeed, they are inseparable from such contexts.

L Language Standards 7-8

The following standards for grades 7–12 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.* Beginning in grade 3, skills and understandings that are particularly likely to require continued attention in higher grades as they are applied to increasingly sophisticated writing and speaking are marked with an asterisk (*).

	Grade 7 Students	Grade 8 Students
Conventions of Standards English	1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Explain the function of phrases and clauses in general and their function in specific sentences. b. Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas. c. Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers.*	1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Explain the function of verbals (gerunds, participles, infinitives) in general and their function in particular sentences. b. Form and use verbs in the active and passive voice. c. Form and use verbs in the indicative, imperative, interrogative, conditional, and subjunctive mood. d. Recognize and correct inappropriate shifts in verb voice and mood.*
	2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use a comma to separate coordinate adjectives (e.g., *It was a fascinating, enjoyable movie* but not *He wore an old[,] green shirt*). b. Spell correctly.	2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use punctuation (comma, ellipsis, dash) to indicate a pause or break. b. Use an ellipsis to indicate an omission. c. Spell correctly.

L Language Standards 7–8

	Grade 7 Students	Grade 8 Students
Knowledge of Language	3. Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.*	3. Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Use verbs in the active and passive voice and in the conditional and subjunctive mood to achieve particular effects (e.g., emphasizing the actor or the action; expressing uncertainty or describing a state contrary to fact).
Vocabulary Acquisition and Use	4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 7 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., *belligerent, bellicose, rebel*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech **or trace the etymology of words**. **CA** d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	4. Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on *grade 8 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., *precede, recede, secede*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech **or trace the etymology of words**. **CA** d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

L Language Standards 7-8

	Grade 7 Students	Grade 8 Students
Vocabulary Acquisition and Use (*continued*)	5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., literary, biblical, and mythological allusions) in context. b. Use the relationship between particular words (e.g., synonym/antonym, analogy) to better understand each of the words. c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *refined, respectful, polite, diplomatic, condescending*).	5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g. verbal irony, puns) in context. b. Use the relationship between particular words to better understand each of the words. c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *bullheaded, willful, firm, persistent, resolute*).
	6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

L Language Standards 9–12

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

	Grades 9–10 Students	Grades 11–12 Students
Conventions of Standard English	1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Use parallel structure.* b. Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations.	1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested. b. Resolve issues of complex or contested usage, consulting references (e.g., *Merriam-Webster's Dictionary of English Usage, Garner's Modern American Usage*) as needed.
	2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use a semicolon (and perhaps a conjunctive adverb) to link two or more closely related independent clauses. b. Use a colon to introduce a list or quotation. c. Spell correctly.	2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Observe hyphenation conventions. b. Spell correctly.
Knowledge of Language	3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. a. Write and edit work so that it conforms to the guidelines in a style manual (e.g., *MLA Handbook*, Turabian's *Manual for Writers*) appropriate for the discipline and writing type.	3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. a. Vary syntax for effect, consulting references (e.g., Tufte's *Artful Sentences*) for guidance as needed; apply an understanding of syntax to the study of complex texts when reading.

L Language Standards 9–12

	Grades 9–10 Students	Grades 11–12 Students
Vocabulary Acquisition and Use	4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 9–10 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *analyze, analysis, analytical; advocate, advocacy*) **and continue to apply knowledge of Greek and Latin roots and affixes. CA** c. Consult general and specialized reference materials (e.g., **college-level** dictionaries, **rhyming dictionaries, bilingual dictionaries,** glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology. **CA** d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 11–12 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *conceive, conception, conceivable*). **Apply knowledge of Greek, Latin, and Anglo-Saxon roots and affixes to draw inferences concerning the meaning of scientific and mathematical terminology. CA** c. Consult general and specialized reference materials (e.g., **college-level** dictionaries, **rhyming dictionaries, bilingual dictionaries,** glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage. **CA** d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).
	5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., euphemism, oxymoron) in context and analyze their role in the text. b. Analyze nuances in the meaning of words with similar denotations.	5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., hyperbole, paradox) in context and analyze their role in the text. b. Analyze nuances in the meaning of words with similar denotations.
	6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Language Progressive Skills, by Grade

The following skills, marked with an asterisk (*) in Language standards 1–3, are particularly likely to require continued attention in higher grades as they are applied to increasingly sophisticated writing and speaking.

Standard	Grade(s)											
L.3.1.f. Ensure subject-verb and pronoun-antecedent agreement.												
L.3.3.a. Choose words and phrases for effect.												
L.4.1.f. Produce complete sentences, recognizing and correcting inappropriate fragments and run-ons.	No											
L.4.1.g. Correctly use frequently confused words (e.g., *to/too/two; there/their*).	No											
L.4.3.a. Choose words and phrases to convey ideas precisely.*	No				No	No	No		No			
L.4.3.b. Choose punctuation for effect.	No											
L.5.1.d. Recognize and correct inappropriate shifts in verb tense.	No	No										
L.5.2.a. Use punctuation to separate items in a series.**	No	No					No		No			
L.6.1.c. Recognize and correct inappropriate shifts in pronoun number and person.	No	No	No									
L.6.1.d. Recognize and correct vague pronouns (i.e., ones with unclear or ambiguous antecedents).	No	No	No									
L.6.1.e. Recognize variations from standard English in their own and others' writing and speaking, and identify and use strategies to improve expression in conventional language.	No	No	No									
L.6.2.a. Use punctuation (commas, parentheses, dashes) to set off nonrestrictive/parenthetical elements.	No	No	No									
L.6.3.a. Vary sentence patterns for meaning, reader/listener interest, and style.***	No	No	No						No			
L.6.3.b. Maintain consistency in style and tone.	No	No	No									
L.7.1.c. Place phrases and clauses within a sentence, recognizing and correcting misplaced modifiers.	No	No	No	No								
L.7.3.a. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.	No	No	No	No								
L.8.1.d. Recognize and correct inappropriate shifts in verb voice and mood.	No	No	No	No	No							
L.9–10.1.a. Use parallel structure.	No	No	No	No	No	No						

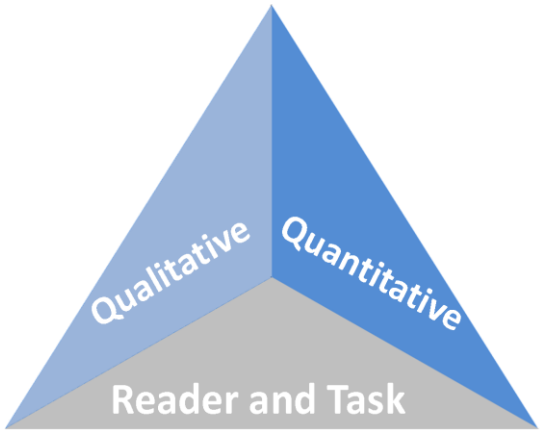
*Subsumed by L.7.3.a

**Subsumed by L.9–10.1.a

***Subsumed by L.11–12.3.a

Standard 10: Range, Quality, and Complexity of Student Reading 7–12

Measuring Text Complexity: Three Factors



Qualitative evaluation of the text:	Levels of meaning, structure, language conventionality and clarity, and knowledge demands
Quantitative evaluation of the text:	Readability measures and other scores of text complexity
Matching reader to text and task:	Reader variables (such as motivation, knowledge, and experiences) and task variables (such as purpose and the complexity generated by the task assigned and the questions posed)

Note: More detailed information on text complexity and how it is measured is provided in Appendix A.

Range of Text Types for 7–12

Students in grades 7–12 apply the Reading standards to the following range of text types, with texts selected from a broad range of cultures and periods.

Literature			Informational Text
Stories	**Drama**	**Poetry**	**Literary Nonfiction**
Includes the subgenres of adventure stories, historical fiction, mysteries, myths, science fiction, realistic fiction, allegories, parodies, satire, and graphic novels.	Includes **classical through contemporary** one-act and multi-act plays, both in written form and on film, **and works by writers representing a broad range of literary periods and cultures. CA**	Includes **classical through contemporary works and** the subgenres of narrative poems, lyrical poems, free verse poems, sonnets, odes, ballads, and epics **by writers representing a broad range of literary periods and cultures. CA**	Includes the subgenres of exposition, argument, and functional text in the form of personal essays, speeches, opinion pieces, essays about art or literature, biographies, memoirs, journalism, and historical, scientific, technical, or economic accounts (including digital sources) written for a broad audience.

Texts Illustrating the Complexity, Quality, and Range of Student Reading 7–12

	Literature: Stories, Dramas, Poetry	Informational Texts: Literary Nonfiction
6–8	• *Little Women* by Louisa May Alcott (1869) • *The Adventures of Tom Sawyer* by Mark Twain (1876) • "The Road Not Taken" by Robert Frost (1915) • *The Dark Is Rising* by Susan Cooper (1973) • *Dragonwings* by Laurence Yep (1975) • *Roll of Thunder, Hear My Cry* by Mildred Taylor (1976)	• "Letter on Thomas Jefferson" by John Adams (1776) • *Narrative of the Life of Frederick Douglass, an American Slave* by Frederick Douglass (1845) • "Blood, Toil, Tears and Sweat: Address to Parliament on May 13th, 1940" by Winston Churchill (1940) • *Harriet Tubman: Conductor on the Underground Railroad* by Ann Petry (1955) • *Travels with Charley: In Search of America* by John Steinbeck (1962)
9–10	• *The Tragedy of Macbeth* by William Shakespeare (1592) • "Ozymandias" by Percy Bysshe Shelley (1817) • "The Raven" by Edgar Allen Poe (1845) • "The Gift of the Magi" by O. Henry (1906) • *The Grapes of Wrath* by John Steinbeck (1939) • *Fahrenheit 451* by Ray Bradbury (1953) • *The Killer Angels* by Michael Shaara (1975)	• "Speech to the Second Virginia Convention" by Patrick Henry (1775) • "Farewell Address" by George Washington (1796) • "Gettysburg Address" by Abraham Lincoln (1863) • "State of the Union Address" by Franklin Delano Roosevelt (1941) • "Letter from Birmingham Jail" by Martin Luther King, Jr. (1964) • "Hope, Despair and Memory" by Elie Wiesel (1997)
11–CCR	• "Ode on a Grecian Urn" by John Keats (1820) • *Jane Eyre* by Charlotte Brontë (1848) • "Because I Could Not Stop for Death" by Emily Dickinson (1890) • *The Great Gatsby* by F. Scott Fitzgerald (1925) • *Their Eyes Were Watching God* by Zora Neale Hurston (1937) • *A Raisin in the Sun* by Lorraine Hansberry (1959) • *The Namesake* by Jhumpa Lahiri (2003)	• *Common Sense* by Thomas Paine (1776) • *Walden* by Henry David Thoreau (1854) • "Society and Solitude" by Ralph Waldo Emerson (1857) • "The Fallacy of Success" by G. K. Chesterton (1909) • *Black Boy* by Richard Wright (1945) • "Politics and the English Language" by George Orwell (1946) • "Take the Tortillas Out of Your Poetry" by Rudolfo Anaya (1995)

Note: Given space limitations, the illustrative texts listed above are meant only to show individual titles that are representative of a range of topics and genres. (See Appendix B for excerpts of these and other texts illustrative of grades 6–12 text complexity, quality, and range.) At a curricular or instructional level, within and across grade levels, texts need to be selected around topics or themes that generate knowledge and allow students to study those topics or themes in de

Standards for

Literacy in History/Social Studies, Science, and Technical Subjects

7–12

College and Career Readiness Anchor Standards for Reading

The grades 7–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
3. Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Craft and Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.
6. Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.[2*]
8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

10. Read and comprehend complex literary and informational texts independently and proficiently.

Note on range and content of student reading

Reading is critical to building knowledge in history/social studies as well as in science and technical subjects. College and career ready reading in these fields requires an appreciation of the norms and conventions of each discipline, such as the kinds of evidence used in history and science; an understanding of domain-specific words and phrases; an attention to precise details; and the capacity to evaluate intricate arguments, synthesize complex information, and follow detailed descriptions of events and concepts. In history/social studies, for example, students need to be able to analyze, evaluate, and differentiate primary and secondary sources. When reading scientific and technical texts, students need to be able to gain knowledge from challenging texts that often make extensive use of elaborate diagrams and data to convey information and illustrate concepts. Students must be able to read complex informational texts in these fields with independence and confidence because the vast majority of reading in college and workforce training programs will be sophisticated nonfiction. It is important to note that these Reading standards are meant to complement the specific content demands of the disciplines, not replace them.

[*] Please see "Research to Build and Present Knowledge" in Writing and "Comprehension and Collaboration" in Speaking and Listening for additional standards relevant to gathering, assessing, and applying information from print and digital sources.

RH Reading Standards for Literacy in History/Social Studies 7–12

The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

	Grades 7–8 Students	Grades 9–10 Students	Grades 11–12 Students
Key Ideas and Details	1. Cite specific textual evidence to support analysis of primary and secondary sources.	1. Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.	1. Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.
	2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.	2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.	2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.
	3. Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).	3. Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.	3. Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.
Craft and Structure	4. Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.	4. Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science.	4. Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).
	5. Describe how a text presents information (e.g., sequentially, comparatively, causally).	5. Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.	5. Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole.
	6. Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).	6. Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.	6. Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.

RH Reading Standards for Literacy in History/Social Studies 7–12

	Grades 7–8 Students	Grades 9–10 Students	Grades 11–12 Students
Integration of Knowledge and Ideas	7. Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.	7. Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.	7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.
	8. Distinguish among fact, opinion, and reasoned judgment in a text.	8. Assess the extent to which the reasoning and evidence in a text support the author's claims.	8. Evaluate an author's premises, claims, and evidence by corroborating or challenging them with other information.
	9. Analyze the relationship between a primary and secondary source on the same topic.	9. Compare and contrast treatments of the same topic in several primary and secondary sources.	9. Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.
Range of Reading and Level of Text Complexity	10. By the end of grade 8, read and comprehend history/social studies texts in the grades 6–8 text complexity band independently and proficiently.	10. By the end of grade 10, read and comprehend history/social studies texts in the grades 9–10 text complexity band independently and proficiently.	10. By the end of grade 12, read and comprehend history/social studies texts in the grades 11–12 text complexity band independently and proficiently.

RST Reading Standards for Literacy in Science and Technical Subjects 7–12

	Grades 7–8 Students	Grades 9–10 Students	Grades 11–12 Students
Key Ideas and Details	1. Cite specific textual evidence to support analysis of science and technical texts.	1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.	1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
	2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.	2. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.	2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
	3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.	3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.	3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
Craft and Structure	4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6–8 texts and topics.*	4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.	4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.
	5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.	5. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).	5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
	6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.	6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.	6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

RST Reading Standards for Literacy in Science and Technical Subjects 7–12

	Grades 7–8 Students	Grades 9–10 Students	Grades 11–12 Students
Integration of Knowledge and Ideas	7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
	8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.	8 .Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.	8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
	9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.	9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.	9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Range of Reading and Level of Text Complexity	10. By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.	10. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.	10. By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

College and Career Readiness Anchor Standards for Writing

The grades 7–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Text Types and Purposes*

1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.
2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
9. Draw evidence from literary and/or informational texts to support analysis, reflection, and research.

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Note on range and content of student writing

For students, writing is a key means of asserting and defending claims, showing what they know about a subject, and conveying what they have experienced, imagined, thought, and felt. To be college and career ready writers, students must take task, purpose, and audience into careful consideration, choosing words, information, structures, and formats deliberately. They need to be able to use technology strategically when creating, refining, and collaborating on writing. They have to become adept at gathering information, evaluating sources, and citing material accurately, reporting findings from their research and analysis of sources in a clear and cogent manner. They must have the flexibility, concentration, and fluency to produce high-quality first-draft text under a tight deadline as well as the capacity to revisit and make improvements to a piece of writing over multiple drafts when circumstances encourage or require it. To meet these goals, students must devote significant time and effort to writing, producing numerous pieces over short and long time frames throughout the year.

WHST

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 7–12

The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

	Grades 7–8 Students	Grades 9–10 Students	Grades 11–12 Students
Text Types and Purposes	1. Write arguments focused on *discipline-specific content*. a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from and supports the argument presented.	1. Write arguments focused on *discipline-specific content.* a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.	1. Write arguments focused on *discipline-specific content.* a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.

WHST

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 7–12

	Grades 7–8 Students	Grades 9–10 Students	Grades 11–12 Students
Text Types and Purposes (*continued*)	2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented.	2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance	2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance

	of the topic).	of the topic).

WHST

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 7–12

	Grades 7–8 Students	Grades 9–10 Students	Grades 11–12 Students
Text Types and Purposes *(continued)*	3. (See note; not applicable as a separate requirement)	3. (See note; not applicable as a separate requirement)	3. (See note; not applicable as a separate requirement)
Production and Distribution of Writing	4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
	5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed	5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
	6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.	6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Research to Build and Present Knowledge	7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.	7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.

WHST Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 7–12

	Grades 7–8 Students	Grades 9–10 Students	Grades 11–12 Students
Research to Build and Present Knowledge (*continued*)	8. Gather relevant information from multiple print and digital sources **(primary and secondary),** using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. **CA**	8. Gather relevant information from multiple authoritative print and digital sources **(primary and secondary),** using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. **CA**	8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
	9. Draw evidence from informational texts to support analysis reflection, and research.	9. Draw evidence from informational texts to support analysis, reflection, and research.	9. Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing	10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Instructional Design for:

Mathematics

7–12

Introduction:

The Common Core State Standards: Mathematics (CCSSM) reflect the importance of focus, coherence, and rigor as the guiding principles for mathematics instruction and learning. The implementation of the CCSSM demonstrates a commitment to providing a world-class education for all students that supports college and career readiness and the knowledge and skills necessary to fully participate in the twenty-first-century global economy.

The CCSSM build on the standards-based educational system in which curriculum, instruction, professional learning, assessment, and accountability are aligned to support student attainment of the standards. The CCSSM incorporate current research and input from education stakeholders—including other state departments of education, scholars, professional organizations, teachers and other educators, parents, and students. California additions to the standards (identified in boldface text and followed by the abbreviation "CA") were incorporated in an effort to retain the consistency and precision of our past standards. The CCSSM are internationally benchmarked, research-based, and unequivocally rigorous.

The standards call for learning mathematical content in the context of real-world situations, using mathematics to solve problems, and developing "habits of mind" that foster mastery of mathematics content as well as mathematical understanding. The standards for kindergarten through grade 8 prepare students for higher mathematics. The standards for higher mathematics reflect the knowledge and skills that are necessary to prepare students for college and careers and productive citizenship.

CCSSM require not only rigorous curriculum and instruction but also conceptual understanding, procedural skill and fluency, and the ability to apply mathematics. In short, the standards call for meeting the challenges of the twenty-first century through innovation.

INSTRUCTIONAL DESIGN:

ACIS International School has chosen the traditional pathway for mathematics. The model courses consist of three courses in the traditional pathway (Algebra I, Geometry, and Algebra II) and two advanced courses (Advanced Placement Probability and Statistics and Calculus). The model courses provide guidance for developing curriculum and instruction.

The higher mathematics standards specify the mathematics that all students should study in order to be college and career ready. Additional mathematics that students should learn in preparation for advanced courses, such as calculus and advanced statistics.

Discipline	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
Algebra I	Possible	Possible	Possible	Possible	Possible	Possible
Geometry		Possible	Possible	Possible	Possible	Possible
Algebra II			Possible	Possible	Possible	Possible
Probability & Statistics (AP)				Possible	Possible	Possible
Pre-Calculus				Possible	Possible	Possible

MATHEMATICS: SCOPE AND SEQUENCE

Grade 7

In grade 7, instructional time should focus on four critical areas:
(1) developing understanding of and applying proportional relationships;
(2) developing understanding of operations with rational numbers and working with expressions and linear equations;
(3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

(1) Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.

(2) Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percent's as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

(3) Students continue their work with area from grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

(4) Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

OVERVIEW:

Ratios and Proportional Relationships
Analyze proportional relationships and use them to solve real-world and mathematical problems.

The Number System
Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Expressions and Equations
Use properties of operations to generate equivalent expressions.
Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Geometry
Draw, construct and describe geometrical figures and describe the relationships between them.
Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Statistics and Probability
Use random sampling to draw inferences about a population.
Draw informal comparative inferences about two populations.
Investigate chance processes and develop, use, and evaluate probability models.

Grade 8

In grade 8, instructional time should focus on three critical areas:
(1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations;
(2) grasping the concept of a function and using functions to describe quantitative relationships;
(3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

(1) Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions (y/x = m or y = mx) as special linear equations (y = mx + b), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount m. A. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span versus height for students in a classroom). At this grade, fitting the model and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation.
Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

(2) Students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.

(3) Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

OVERVIEW:

The Number System
Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations
Work with radicals and integer exponents.
Understand the connection between proportional relationships, lines, and linear equations.
Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions `
Define, evaluate, and compare functions.
Use functions to model relationships between quantities.

Geometry
Understand congruence and similarity using physical models, transparencies, or geometry software.
Understand and apply the Pythagorean Theorem.
Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

Statistics and Probability
Investigate patterns of association in bivariate data.

Grades 9-12

The model courses consist of three courses in the traditional pathway (Algebra I, Geometry, and Algebra II); and two advanced courses (Advanced Placement Probability and Statistics and Pre-Calculus). The model courses provide guidance for developing curriculum and instruction.

The forthcoming Mathematics Framework for California Public Schools, Kindergarten Through Grade Twelve, will offer expanded explanations of the model courses and suggestions for additional courses, including Pre-Calculus and Statistics and Probability.

The six conceptual categories are as follows:
Number and Quantity
Algebra
Functions
Modeling
Geometry
Statistics and Probability

The higher mathematics standards specify the mathematics that all students should study in order to be college and career ready. Additional mathematics that students should learn in preparation for advanced courses, such as calculus, advanced statistics, or discrete mathematics, is indicated by a plus symbol (+). All standards without a (+) symbol should be in the common mathematics curriculum for all college and career ready students. Standards with a (+) symbol may also appear in courses intended for all students.

Algebra I

The fundamental purpose of the Algebra I course is to formalize and extend the mathematics that students learned in the middle grades. This course includes standards from the conceptual categories of Number and Quantity, Algebra, Functions, and Statistics and Probability. Some standards are repeated in multiple higher mathematics courses; therefore, instructional notes, which appear in brackets, indicate what is appropriate for study in this particular course. For example, the scope of Algebra I is limited to linear, quadratic, and exponential expressions and functions as well as some work with absolute value, step, and functions that are piecewise-defined. Therefore, although a standard may include references to logarithms or trigonometry, those functions are not to be included in course work for Algebra I; they will be addressed later in Algebra II.

For the Algebra I course, instructional time should focus on four critical areas: (1) deepen and extend understanding of linear and exponential relationships; (2) contrast linear and exponential relationships with each other and engage in methods for analyzing, solving, and using quadratic functions; (3) extend the laws of exponents to square and cube roots; and (4) apply linear models to data that exhibit a linear trend.

(1) In previous grades, students learned to solve linear equations in one variable and applied graphical and algebraic methods to analyze and solve systems of linear equations in two variables. In Algebra I, students analyze and explain the process of solving an equation and justify the

process used in solving a system of equations. Students develop fluency in writing, interpreting, and translating among various forms of linear equations and inequalities and use them to solve problems. They master the solution of linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations.

(2) In earlier grades, students define, evaluate, and compare functions and use them to model relationships between quantities. In Algebra I, students learn function notation and develop the concepts of domain and range. They focus on linear, quadratic, and exponential functions, including sequences, and also explore absolute value, step, and piecewise-defined functions; they interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations. Students build on and extend their understanding of integer exponents to consider exponential functions. They compare and contrast linear and exponential functions, distinguishing between additive and multiplicative change. Students explore systems of equations and inequalities, and they find and interpret their solutions. They interpret arithmetic sequences as linear functions and geometric sequences as exponential functions.

(3) Students extend the laws of exponents to rational exponents involving square and cube roots and apply this new understanding of number; they strengthen their ability to see structure in and create quadratic and exponential expressions. They create and solve equations, inequalities, and systems of equations involving quadratic expressions. Students become facile with algebraic manipulation, including rearranging and collecting terms, and factoring, identifying, and canceling common factors in rational expressions. Students consider quadratic functions, comparing the key characteristics of quadratic functions to those of linear and exponential functions. They select from these functions to model phenomena. Students learn to anticipate the graph of a quadratic function by interpreting various forms of quadratic expressions. In particular, they identify the real solutions of a quadratic equation as the zeros of a related quadratic function. Students expand their experience with functions to include more specialized functions—absolute value, step, and those that are piecewise-defined.

4) Building upon their prior experiences with data, students explore a more formal means of assessing how a model fits data. Students use regression techniques to describe approximately linear relationships between quantities. They use graphical representations and knowledge of context to make judgments about the appropriateness of linear models. With linear models, they look at residuals to analyze the goodness of fit.

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle, and high school years.

OVERVIEW:

Number and Quantity

The Real Number System
Extend the properties of exponents to rational exponents.
Use properties of rational and irrational numbers.

Quantities
Reason quantitatively and use units to solve problems.

Algebra

Seeing Structure in Expressions
Interpret the structure of expressions.
Write expressions in equivalent forms to solve problems.
Arithmetic with Polynomials and Rational Expressions
Perform arithmetic operations on polynomials.

Creating Equations
Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities
Understand solving equations as a process of reasoning and explain the reasoning.
Solve equations and inequalities in one variable.
Solve systems of equations.
Represent and solve equations and inequalities graphically.

Functions

Interpreting Functions
Understand the concept of a function and use function notation. Interpret functions that arise in applications in terms of the context. Analyze functions using different representations.

Building Functions
Build a function that models a relationship between two quantities. Build new functions from existing functions.

Linear, Quadratic, and Exponential Models
Construct and compare linear, quadratic, and exponential models and solve problems.
Interpret expressions for functions in terms of the situation they model.

Statistics and Probability

Interpreting Categorical and Quantitative Data
Summarize, represent, and interpret data on a single count or measurement variable.
Summarize, represent, and interpret data on two categorical and quantitative variables.
Interpret linear models.

Geometry

The fundamental purpose of the Geometry course is to formalize and extend students' geometric experiences from the middle grades. This course includes standards from the conceptual categories of Geometry and Statistics and Probability. Some standards are repeated in multiple higher mathematics courses; therefore, instructional notes, which appear in brackets, indicate what is appropriate for study in this particular course.

In this Geometry course, students explore more complex geometric situations and deepen their explanations of geometric relationships, presenting and hearing formal mathematical arguments. Important differences exist between this course and the historical approach taken in geometry classes. For example, transformations are emphasized in this course.

For the Geometry course, instructional time should focus on six critical areas: (1) establish criteria for congruence of triangles based on rigid motions; (2) establish criteria for similarity of triangles based on dilations and proportional reasoning; (3) informally develop explanations of circumference, area, and volume formulas; (4) apply the Pythagorean Theorem to the coordinate plane; (5) prove basic geometric theorems; and (6) extend work with probability.

(1) Students have prior experience with drawing triangles based on given measurements and performing rigid motions including translations, reflections, and rotations. They have used these to develop notions about what it means for two objects to be congruent. In this course, students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. They use triangle congruence as a familiar foundation for the development of formal proof. Students prove theorems—using a variety of formats including deductive and inductive reasoning and proof by contradiction—and solve problems about triangles, quadrilaterals, and other polygons.

They apply reasoning to complete geometric constructions and explain why they work.

(2) Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean Theorem. Students derive the Laws of Sines and Cosines in order to find missing measures of general (not necessarily right) triangles, building on their work with quadratic equations done in Algebra I. They are able to distinguish whether three given measures (angles or sides) define 0, 1, 2, or infinitely many triangles.

(3) Students' experience with three-dimensional objects is extended to include informal explanations of circumference, area, and volume formulas. Additionally, students apply their knowledge of two-dimensional shapes to consider the shapes of cross-sections and the result of rotating a two-dimensional object about a line.

(4) Building on their work with the Pythagorean Theorem to find distances, students use the rectangular coordinate system to verify geometric relationships, including properties of special triangles and quadrilaterals, and slopes of parallel and perpendicular lines, which relates back to work done in the Algebra I course. Students continue their study of quadratics by connecting the geometric and algebraic definitions of the parabola.

(5) Students prove basic theorems about circles, with particular attention to perpendicularity and inscribed angles, in order to see symmetry in circles and as an application of triangle congruence criteria. They study relationships among segments on chords, secants, and tangents as an application of similarity. In the Cartesian coordinate system, students use the distance formula to write the equation of a circle when given the radius and the coordinates of its center. Given an equation of a circle, they draw the graph in the coordinate plane, and apply techniques for solving quadratic equations—which relates back to work done in the Algebra I course—to determine intersections between lines and circles or parabolas and between two circles.

(6) Building on probability concepts that began in the middle grades, students use the language of set theory to expand their ability to compute and interpret theoretical and experimental probabilities for compound events, attending to mutually exclusive events, independent events, and conditional probability. Students should make use of geometric probability models wherever possible. They use probability to make informed decisions.

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle, and high school years.

OVERVIEW:

Geometry

Congruence
Experiment with transformations in the plane.
Understand congruence in terms of rigid motions.
Prove geometric theorems.
Make geometric constructions.

Similarity, Right Triangles, and Trigonometry
Understand similarity in terms of similarity transformations.
Prove theorems involving similarity.
Define trigonometric ratios and solve problems involving right triangles.
Apply trigonometry to general triangles.

Circles
Understand and apply theorems about circles.
Find arc lengths and area of sectors of circles.

Expressing Geometric Properties with Equations
Translate between the geometric description and the equation for a conic section.
Use coordinates to prove simple geometric theorems algebraically.

Geometric Measurement and Dimension
Explain volume formulas and use them to solve problems.
Visualize relationships between two-dimensional and three-dimensional objects.

Modeling with Geometry
Apply geometric concepts in modeling situations.

Statistics and Probability

Conditional Probability and the Rules of Probability
Understand independence and conditional probability and use them to interpret data.
Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Using Probability to Make Decisions
Use probability to evaluate outcomes of decisions.

Algebra II

Building on their work with linear, quadratic, and exponential functions, students extend their repertoire of functions to include logarithmic, polynomial, rational, and radical functions in the Algebra II course. This course includes standards from the conceptual categories of Number and Quantity, Algebra, Functions, Geometry, and Statistics and Probability. Some standards are repeated in multiple higher mathematics courses; therefore, instructional notes, which appear in brackets, indicate what is appropriate for study in this particular course. Standards that were limited in Algebra I no longer have those restrictions in Algebra II. Students work closely with the expressions that define the functions, competently manipulate algebraic expressions, and continue to expand and hone their abilities to model situations and to solve equations, including solving quadratic equations over the set of complex numbers and solving exponential equations using the properties of logarithms.

For the Algebra II course, instructional time should focus on four critical areas: (1) relate arithmetic of rational expressions to arithmetic of rational numbers; (2) expand understandings of functions and graphing to include trigonometric functions; (3) synthesize and generalize functions and extend understanding of exponential functions to logarithmic functions; and (4) relate data display and summary statistics to probability and explore a variety of data collection methods.

(1) A central theme of this Algebra II course is that the arithmetic of rational expressions is governed by the same rules as the arithmetic of rational numbers. Students explore the structural similarities between the system of polynomials and the system of integers. They draw on analogies between polynomial arithmetic and base-ten computation, focusing on properties of operations, particularly the distributive property. Connections are made between multiplication of polynomials with multiplication of multi-digit integers, and division of polynomials with long division of integers. Students identify zeros of polynomials, including complex zeros of quadratic polynomials, and make connections between zeros of polynomials and solutions of polynomial equations. The Fundamental Theorem of Algebra is examined.

(2) Building on their previous work with functions and on their work with trigonometric ratios and circles in the Geometry course, students now use the coordinate plane to extend trigonometry to model periodic phenomena.

(3) Students synthesize and generalize what they have learned about a variety of function families. They extend their work with exponential functions to include solving exponential equations with logarithms.

They explore the effects of transformations on graphs of diverse functions, including functions arising in an application, in order to abstract the general principle that transformations on a graph always have the same effect regardless of the type of the underlying function. They identify appropriate types of functions to model a situation, they adjust parameters to improve the model, and they compare models by analyzing appropriateness of fit and making judgments about the domain over which a model is a good fit. The description of modeling as "the process of choosing and using mathematics and statistics to analyze empirical situations, to understand them better, and to make decisions" is at the heart of this Algebra II course. The narrative discussion and diagram of the modeling cycle should be considered when knowledge of functions, statistics, and geometry is applied in a modeling context.

(4) Students see how the visual displays and summary statistics they learned in earlier grades relate to different types of data and to probability distributions. They identify different ways of collecting data—including sample surveys, experiments, and simulations—and consider how randomness and careful design affect the conclusions that can be drawn.

The Standards for Mathematical Practice complement the content standards so that students increasingly engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle, and high school years.

OVERVIEW:

Number and Quantity

The Complex Number System
Perform arithmetic operations with complex numbers.
Use complex numbers in polynomial identities and equations.

Algebra

Seeing Structure in Expressions
Interpret the structure of expressions.
Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions
Perform arithmetic operations on polynomials.
Understand the relationship between zeros and factors of polynomials.
Use polynomial identities to solve problems.
Rewrite rational expressions.

Creating Equations
Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities
Understand solving equations as a process of reasoning and explain the reasoning.
Solve equations and inequalities in one variable.
Represent and solve equations and inequalities graphically.

Functions

Interpreting Functions
Interpret functions that arise in applications in terms of the context.
Analyze functions using different representations.
Building Functions
Build a function that models a relationship between two quantities.
Build new functions from existing functions.

Linear, Quadratic, and Exponential Models
Construct and compare linear, quadratic, and exponential models and solve problems.

Trigonometric Functions
Extend the domain of trigonometric functions using the unit circle.
Model periodic phenomena with trigonometric functions.
Prove and apply trigonometric identities.

Geometry

Expressing Geometric Properties with Equations
Translate between the geometric description and the equation for a conic section.

Statistics and Probability

Interpreting Categorical and Quantitative Data
Summarize, represent, and interpret data on a single count or measurement variable.

Making Inferences and Justifying Conclusions
Understand and evaluate random processes underlying statistical experiments.
Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Using Probability to Make Decisions
Use probability to evaluate outcomes of decisions.

Probability and Statistics

Statistics and Probability offers students an alternative to Pre-calculus as a fourth high school mathematics course. In the Statistics and Probability course, students continue to develop a more formal and precise understanding of statistical inference, which requires a deeper understanding of probability. Students learn that formal inference procedures are designed for studies in which the sampling or assignment of treatments was random, and these procedures may be less applicable to non-randomized observational studies. Probability is still viewed as long-run relative frequency, but the emphasis now shifts to conditional probability and independence, and basic rules for calculating probabilities of compound events. In the plus (+) standards are the Multiplication Rule, probability distributions, and their expected values. Probability is presented as an essential tool for decision making in a world of uncertainty.

Students extend their work in statistics and probability by applying statistics ideas to real-world situations. They link classroom mathematics and statistics to everyday life, work, and decision making by applying these standards in modeling situations. Students select and use appropriate mathematics and statistics to analyze and understand empirical situations and to improve decisions. Students in Statistics and Probability take their understanding of probability further by studying expected values, interpreting them as long-term relative means of a random variable. They use this understanding to make decisions about both probability games and real-life examples using empirical probabilities. The fact that numerous standards are repeated from previous courses does not imply that those standards should be omitted from those courses. In keeping with the Common Core State Standards for Mathematics (CSSM) theme that mathematics instruction should strive for depth rather than breadth, teachers should view this course as an opportunity to delve deeper into those repeated Statistics and Probability standards while addressing new ones.

Overview

Interpreting Categorical and Quantitative Data
Summarize, represent, and interpret data on a single count or measurement variable.
Summarize, represent, and interpret data on two categorical and quantitative variables.
Interpret linear models.

Making Inferences and Justifying Conclusions
Understand and evaluate random processes underlying statistical experiments.
Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Conditional Probability and the Rules of Probability
Understand independence and conditional probability and use them to interpret data.
Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Using Probability to Make Decisions
Calculate expected values and use them to solve problems.
Use probability to evaluate outcomes of decisions.

Pre-Calculus

When taught in high school, pre-calculus should be presented with the same level of depth and rigor as are entry-level college and university pre-calculus courses. Pre-calculus is a widely applied area of mathematics and involves a beautiful intrinsic theory.

Students in Pre-calculus extend their work with complex numbers, which started in Algebra II, to see that complex numbers can be represented in the Cartesian plane and that operations with complex numbers have a geometric interpretation. They connect their understanding of trigonometry and the geometry of the plane to express complex numbers in polar form. Students begin working with vectors, representing them geometrically and performing operations with them. They connect the notion of vectors to complex numbers. Students also work with matrices and their operations, experiencing for the first time an algebraic system in which multiplication is not commutative. Additionally, they see the connection between matrices and transformations of the plane— namely, that a vector in the plane can be multiplied by a 2 X 2 matrix to produce another vector—and they work with matrices from the perspective of transformations. They also find inverse matrices and use matrices to represent and solve linear systems. Students extend their work with trigonometric functions, investigating the reciprocal functions secant, cosecant, and cotangent and the graphs and properties associated with those functions. Students find inverse trigonometric functions by appropriately restricting the domains of the standard trigonometric functions and use them to solve problems that arise in modeling contexts. Although students in Pre-calculus have worked previously with parabolas and circles, they now work with ellipses and hyperbolas. They also work with polar coordinates and curves defined parametrically and connect these to their other work with trigonometry and complex numbers.

Finally, students work with rational functions that are more complicated, graphing them and determining zeros, -intercepts, symmetry, asymptotes, intervals for which the function is increasing or decreasing, and maximum or minimum points.

Throughout the Common Core State Standards for Mathematics (CCSSM), specific standards for higher mathematics are marked with a ↔ symbol to indicate they are modeling standards. Modeling at the higher mathematics level goes beyond the simple application of previously constructed mathematics and includes real-world problems. True modeling begins with students asking a question about the world around them, and the mathematics is then constructed in the process of attempting to answer the question. When students are presented with a real-world situation and challenged to ask a question, all sorts of new issues arise (e.g., Which of the quantities present in this situation are known and which are unknown?). Students need to decide on a solution path that may need to be revised. They make use of tools such as calculators, dynamic geometry software, or spreadsheets. They try to use previously derived models (e.g., linear functions), but may find that a new equation or function will apply. Additionally, students may see when trying to answer their question that solving an equation arises as a necessity and that the equation often involves the specific

instance of knowing the output value of a function at an unknown input value. Modeling problems have an element of being genuine problems, in the sense that students care about answering the question under consideration. In modeling, mathematics is used as a tool to answer questions that students really want answered. Students examine a problem and formulate a mathematical model (an equation, table, graph, and the like), compute an answer or rewrite their expression to reveal new information, interpret and validate the results, and report out; see figure P-1. This is a new approach for many teachers and may be challenging to implement, but the effort should show students that mathematics is relevant to their lives. From a pedagogical perspective, modeling gives a concrete basis from which to abstract the mathematics and often serves to motivate students to become independent learners.

Number and Quantity

The Complex Number System
Perform arithmetic operations with complex numbers.
Represent complex numbers and their operations on the complex plane.

Vector and Matrix Quantities
Represent and model with vector quantities.
Perform operations on vectors.
Perform operations on matrices and use matrices in applications.

Algebra Seeing Structure in Expressions
Interpret the structure of expressions.

Arithmetic with Polynomials and Rational Expressions
Rewrite rational expressions.

Creating Equations
Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities
Solve systems of equations.

Functions

Interpreting Functions

Interpret functions that arise in applications in terms of the context.
Analyze functions using different representations.

Building Functions
Build new functions from existing functions.

Trigonometric Functions
Extend the domain of trigonometric functions using the unit circle.
Model periodic phenomena with trigonometric functions.
Prove and apply trigonometric identities.

Geometry

Similarity, Right Triangles, and Trigonometry
Apply trigonometry to general triangles.
Expressing Geometric Properties with Equations
Translate between the geometric description and the equation for a conic section.

Standards for:

Mathematics

7–12

Grade 7:

Ratios and Proportional Relationships 7.RP

Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction ½/¼ miles per hour, equivalently 2 miles per hour.

2. Recognize and represent proportional relationships between quantities.

a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

c. Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.

d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.

3. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

The Number System 7.NS

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

a. Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.

b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

c. Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

d. Apply properties of operations as strategies to add and subtract rational numbers.

2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers.

Interpret products of rational numbers by describing real-world contexts.

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real-world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. 3. Solve real-world and mathematical problems involving the four operations with rational numbers.

Expressions and Equations 7.EE

Use properties of operations to generate equivalent expressions.

1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.

4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

a. Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?

b. Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.

Geometry 7.G

Draw, construct, and describe geometrical figures and describe the relationships between them.

1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

2. Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Statistics and Probability 7.SP
Use random sampling to draw inferences about a population.

1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be. Draw informal comparative inferences about two populations.

3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.

4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.
Investigate chance processes and develop, use, and evaluate probability models.

5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.

7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.

b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?

8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.

c. Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?

Grade 8:

The Number System 8.NS

Know that there are numbers that are not rational, and approximate them by rational numbers.

1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π 2). For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

Expressions and Equations 8.EE

Work with radicals and integer exponents.

1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 32 × 3–5 = 3–3 = 1/33 = 1/27.

2. Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.

3. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example,

estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109, and determine that the world population is more than 20 times larger.

4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Understand the connections between proportional relationships, lines, and linear equations.

5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.

Analyze and solve linear equations and pairs of simultaneous linear equations.

7. Solve linear equations in one variable.

a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).

b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8. Analyze and solve pairs of simultaneous linear equations.

a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.

c. Solve real-world and mathematical problems leading to linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

Functions 8.F
Define, evaluate, and compare functions.

1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.

3. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function A = s2 giving the area of a square as a

function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.

Use functions to model relationships between quantities.

4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Geometry 8.G

Understand congruence and similarity using physical models, transparencies, or geometry software.

1. Verify experimentally the properties of rotations, reflections, and translations:

a. Lines are taken to lines, and line segments to line segments of the same length.

b. Angles are taken to angles of the same measure.

c. Parallel lines are taken to parallel lines.

2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them

5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

Understand and apply the Pythagorean Theorem.

6. Explain a proof of the Pythagorean Theorem and its converse.

7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Statistics and Probability 8.SP
Investigate patterns of association in bivariate data.

1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.

4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

Algebra I :

Number and Quantity
The Real Number System N-RN

Extend the properties of exponents to rational exponents.

1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define 51/3 to be the cube root of 5 because we want (51/3)3 = 5(1/3)3 to hold, so (51/3)3 must equal 5.

2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Use properties of rational and irrational numbers.

3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Quantities N-Q

Reason quantitatively and use units to solve problems. [Foundation for work with expressions, equations and functions].

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

2. Define appropriate quantities for the purpose of descriptive modeling.

3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Algebra

Seeing Structure in Expressions A-SSE

Interpret the structure of expressions. [Linear, exponential, and quadratic]

1. Interpret expressions that represent a quantity in terms of its context.

a. Interpret parts of an expression, such as terms, factors, and coefficients.

b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P (1 + r) n as the product of P and a factor not depending on P.

2. Use the structure of an expression to identify ways to rewrite it.

Write expressions in equivalent forms to solve problems. [Quadratic and exponential]

3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

a. Factor a quadratic expression to reveal the zeros of the function it defines.

b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

c. Use the properties of exponents to transform expressions for exponential functions. For example, the expression 1.15t can be rewritten as (1.151/12)12t ≈ 1.01212t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.

Arithmetic with Polynomials and Rational Expressions A-APR

Perform arithmetic operations on polynomials. [Linear and quadratic]

1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

Creating Equations A-CED

Create equations that describe numbers or relationships. [Linear, quadratic, and exponential (integer inputs only); for A.CED.3 linear only]

1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. 4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

Reasoning with Equations and Inequalities A-REI

Understand solving equations as a process of reasoning and explain the reasoning. [Master linear; learn as general principle.]

1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Solve equations and inequalities in one variable. [Linear inequalities; literal equations that are linear in the variables being solved for; quadratics with real solutions]

2. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

2.1 Solve one-variable equations and inequalities involving absolute value, graphing the solutions and interpreting them in context.

3. Solve quadratic equations in one variable.

a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – p)2 = q that has the same solutions. Derive the quadratic formula from this form.

b. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.

Solve systems of equations. [Linear-linear and linear-quadratic]

4. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

5. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

6. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

Represent and solve equations and inequalities graphically. [Linear and exponential; learn as general principle.]

7. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

8. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

9. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Functions

Interpreting Functions F-IF

Understand the concept of a function and use function notation. [Learn as general principle; focus on linear and exponential and on arithmetic and geometric sequences.]

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element

of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).

2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n + 1) = f(n) + f(n − 1) for n ≥ 1.

Interpret functions that arise in applications in terms of the context. [Linear, exponential, and quadratic]

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Analyze functions using different representations. [Linear, exponential, quadratic, absolute value, step, piecewise-defined]

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

c. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, and y = (1.2)t/10, and classify them as representing exponential growth or decay.

9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

Building Functions F-BF

Build a function that models a relationship between two quantities. [For F.BF.1, 2, linear, exponential, and quadratic]

1. Write a function that describes a relationship between two quantities.

a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.

2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

Build new functions from existing functions. [Linear, exponential, quadratic, and absolute value; for F.BF.4a, linear only]

3. Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

4. Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse.

Linear, Quadratic, and Exponential Models F-LE

Construct and compare linear, quadratic, and exponential models and solve problems.

1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

Interpret expressions for functions in terms of the situation they model.

5. Interpret the parameters in a linear or exponential function in terms of a context. [Linear and exponential of form f(x) = bx + k]

6. Apply quadratic functions to physical problems, such as the motion of an object under the force of gravity.

Statistics and Probability

Interpreting Categorical and Quantitative Data S-ID

Summarize, represent, and interpret data on a single count or measurement variable.

1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Summarize, represent, and interpret data on two categorical and quantitative variables. [Linear focus; discuss general principle.]

4. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

5. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.

Interpret linear models.

6. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

7. Compute (using technology) and interpret the correlation coefficient of a linear fit.

8. Distinguish between correlation and causation.

Geometry:

Congruence G-CO
Experiment with transformations in the plane.

1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Understand congruence in terms of rigid motions. [Build on rigid motions as a familiar starting point for development of concept of geometric proof.]

6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Prove geometric theorems. [Focus on validity of underlying reasoning while using variety of ways of writing proofs.]

9. Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

10. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.

11. Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

Make geometric constructions. [Formalize and explain processes.]

12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Similarity, Right Triangles, and Trigonometry G-SRT
Understand similarity in terms of similarity transformations.

1. Verify experimentally the properties of dilations given by a center and a scale factor:

a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.

b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

2. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

3. Use the properties of similarity transformations to establish the Angle-Angle (AA) criterion for two triangles to be similar.
Prove theorems involving similarity.

4. Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.

5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Define trigonometric ratios and solve problems involving right triangles.

6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

7. Explain and use the relationship between the sine and cosine of complementary angles.

8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

8.1 Derive and use the trigonometric ratios for special right triangles (30°, 60°, 90°and 45°, 45°, 90°).

Apply trigonometry to general triangles.

9. (+) Derive the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.

11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Circles G-C
Understand and apply theorems about circles.

1. Prove that all circles are similar.

2. Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.

3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

4. (+) Construct a tangent line from a point outside a given circle to the circle.

Find arc lengths and areas of sectors of circles.
[Radian introduced only as unit of measure]

5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. Convert between degrees and radians.

Expressing Geometric Properties with Equations G-GPE
Translate between the geometric description and the equation for a conic section.

1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

2. Derive the equation of a parabola given a focus and directrix.

Use coordinates to prove simple geometric theorems algebraically. [Include distance formula; relate to Pythagorean Theorem.]

3. Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the

point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).

4. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

5. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

6. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Geometric Measurement and Dimension G-GMD
Explain volume formulas and use them to solve problems.

1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.

2. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Visualize relationships between two-dimensional and three-dimensional objects.

3. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

4. Know that the effect of a scale factor k greater than zero on length, area, and volume is to multiply each by k, k2, and k3, respectively; determine length, area and volume measures using scale factors.

5. Verify experimentally that in a triangle, angles opposite longer sides are larger, sides opposite larger angles are longer, and the sum of any two side lengths is greater than the remaining side length; apply these relationships to solve real world and mathematical problems.

Modeling with Geometry G-MG
Apply geometric concepts in modeling situations.

1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

Statistics and Probability
Conditional Probability and the Rules of Probability S-CP

Understand independence and conditional probability and use them to interpret data. [Link to data from simulations or experiments.]

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").

2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

3. Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the

conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.

4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.

5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.

Use the rules of probability to compute probabilities of compound events in a uniform probability model.

6. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.

7. Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.

8. (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.

9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.

Using Probability to Make Decisions S-MD

Use probability to evaluate outcomes of decisions. [Introductory; apply counting rules.]

1. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

2. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

Algebra II:

Number and Quantity
The Complex Number System N-CN

Perform arithmetic operations with complex numbers.

1. Know there is a complex number i such that i2 = −1, and every complex number has the form a + bi with a and b real.

2. Use the relation i2 = −1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. Use complex numbers in polynomial identities and equations. [Polynomials with real coefficients]

3. Solve quadratic equations with real coefficients that have complex solutions.

4. (+) Extend polynomial identities to the complex numbers. For example, rewrite x2 + 4 as (x + 2i)(x – 2i).

5. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Algebra

Seeing Structure in Expressions A-SSE
Interpret the structure of expressions. [Polynomial and rational]

1. Interpret expressions that represent a quantity in terms of its context.

a. Interpret parts of an expression, such as terms, factors, and coefficients.

b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1 + r)n as the product of P and a factor not depending on P.

2. Use the structure of an expression to identify ways to rewrite it.

Write expressions in equivalent forms to solve problems.

3. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.

Arithmetic with Polynomials and Rational Expressions A-APR
Perform arithmetic operations on polynomials. [Beyond quadratic]

1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
Understand the relationship between zeros and factors of polynomials.

2. Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).

3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Use polynomial identities to solve problems.

4. Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity (x2 + y2)2= (x2 – y2)2 + (2xy)2 can be used to generate Pythagorean triples.

5. (+) Know and apply the Binomial Theorem for the expansion of (x + y)n in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.

Rewrite rational expressions. [Linear and quadratic denominators]

6. Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.

7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Creating Equations A-CED
Create equations that describe numbers or relationships. [Equations using all available types of expressions, including simple root functions]

1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems. Include equations

arising from linear and quadratic functions, and simple rational and exponential functions.

2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.

4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Reasoning with Equations and Inequalities A-REI

Understand solving equations as a process of reasoning and explain the reasoning. [Simple radical and rational]

1. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Solve equations and inequalities in one variable.

2. Solve one-variable equations and inequalities involving absolute value, graphing the solutions and interpreting them in context.

Represent and solve equations and inequalities graphically. [Combine polynomial, rational, radical, absolute value, and exponential functions.]

3. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

Functions

Interpreting Functions F-IF

Interpret functions that arise in applications in terms of the context. [Emphasize selection of appropriate models.]

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Analyze functions using different representations.

[Focus on using key features to guide selection of appropriate type of model function.]

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

a. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

b. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

c. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

Building Functions F-BF

Build a function that models a relationship between two quantities. [Include all types of functions studied.]

1. Write a function that describes a relationship between two quantities.

a. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.

Build new functions from existing functions. [Include simple radical, rational, and exponential functions; emphasize common effect of each transformation across function types.]

2. Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

3. Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2x3 or f(x) = (x + 1)/(x − 1) for x ≠ 1.

Linear, Quadratic, and Exponential Models F-LE

Construct and compare linear, quadratic, and exponential models and solve problems.

4. For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

[Logarithms as solutions for exponentials]

4.1 Prove simple laws of logarithms.

4.2 Use the definition of logarithms to translate between logarithms in any base.

4.3 Understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.

Trigonometric Functions F-TF

Extend the domain of trigonometric functions using the unit circle.

1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

2.1 Graph all 6 basic trigonometric functions.

Model periodic phenomena with trigonometric functions.

3. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

Prove and apply trigonometric identities.

4. Prove the Pythagorean identity sin2(θ) + cos2(θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle.

Geometry

Expressing Geometric Properties with Equations G-GPE

Translate between the geometric description and the equation for a conic section.

1. Given a quadratic equation of the form ax2 + by2 + cx + dy + e = 0, use the method for completing the square to put the equation into standard form; identify whether the graph of the equation is a circle, ellipse, parabola, or hyperbola and graph the equation. [In Algebra II, this standard addresses only circles and parabolas.] CA

Statistics and Probability

Interpreting Categorical and Quantitative Data S-ID

Summarize, represent, and interpret data on a single count or measurement variable.

1. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Making Inferences and Justifying Conclusions S-IC

Understand and evaluate random processes underlying statistical experiments.

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?

Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

6. Evaluate reports based on data.

Using Probability to Make Decisions S-MD

Use probability to evaluate outcomes of decisions. [Include more complex situations.]

7. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

8. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

Advanced Placement Probability and Statistics:

Interpreting Categorical and Quantitative Data S-ID

Summarize, represent, and interpret data on a single count or measurement variable.

1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Summarize, represent, and interpret data on two categorical and quantitative variables.

5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.

Interpret linear models.

7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

8. Compute (using technology) and interpret the correlation coefficient of a linear fit.

9. Distinguish between correlation and causation.

Making Inferences and Justifying Conclusions S-IC

Understand and evaluate random processes underlying statistical experiments.

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?

Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

Statistics and Probability

5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

6. Evaluate reports based on data.

Conditional Probability and the Rules of Probability S-CP

Understand independence and conditional probability and use them to interpret data.

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," **"not").**

2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

3. Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.

4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.

5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.

Use the rules of probability to compute probabilities of compound events in a uniform probability model.

6. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.

7. Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.

8. (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.

9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.

Using Probability to Make Decisions S-MD
Calculate expected values and use them to solve problems.

1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.

2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.

Statistics and Probability

3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.

4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?

Use probability to evaluate outcomes of decisions.

5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.

a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.

b. Evaluate and compare strategies on the basis of expected values. For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.

6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

7. (+) Analyze decisions and strategies using probability concepts (e.g. product testing, medical testing, pulling a hockey goalie at the end of a game).

Pre-Calculus:

1.0 Students demonstrate knowledge of both the formal definition and the graphical interpretation of limit of values of functions. This knowledge includes one-sided limits, infinite limits, and limits at infinity. Students know the definition of convergence and divergence of a function as the domain variable approaches either a number or infinity:

1.1 Students prove and use theorems evaluating the limits of sums, products, quotients, and composition of functions.

1.2 Students use graphical calculators to verify and estimate limits.

1.3 Students prove and use special limits, such as the limits of (sin(x))/x and (1−cos(x))/x as x tends to 0.

2.0 Students demonstrate knowledge of both the formal definition and the graphical interpretation of continuity of a function.

3.0 Students demonstrate an understanding and the application of the intermediate value theorem and the extreme value theorem.

4.0 Students demonstrate an understanding of the formal definition of the derivative of a function at a point and the notion of differentiability:

4.1 Students demonstrate an understanding of the derivative of a function as the slope of the tangent line to the graph of the function.

4.2 Students demonstrate an understanding of the interpretation of the derivative as an instantaneous rate of change. Students can use derivatives to solve a variety of problems from physics, chemistry, economics, and so forth that involve the rate of change of a function.

4.3 Students understand the relation between differentiability and continuity.

4.4 Students derive derivative formulas and use them to find the derivatives of algebraic, trigonometric, inverse trigonometric, exponential, and logarithmic functions.

5.0 Students know the chain rule and its proof and applications to the calculation of the derivative of a variety of composite functions.

6.0 Students find the derivatives of parametrically defined functions and use implicit differentiation in a wide variety of problems in physics, chemistry, economics, and so forth.

7.0 Students compute derivatives of higher orders.

8.0 Students know and can apply Rolle's Theorem, the mean value theorem, and L'Hôpital's rule.

9.0 Students use differentiation to sketch, by hand, graphs of functions. They can identify maxima, minima, inflection points, and intervals in which the function is increasing and decreasing.

10.0 Students know Newton's method for approximating the zeros of a function.

11.0 Students use differentiation to solve optimization (maximum-minimum problems) in a variety of pure and applied contexts.

12.0 Students use differentiation to solve related rate problems in a variety of pure and applied contexts.

13.0 Students know the definition of the definite integral by using Riemann sums. They use this definition to approximate integrals.

14.0 Students apply the definition of the integral to model problems in physics, economics, and so forth, obtaining results in terms of integrals.

15.0 Students demonstrate knowledge and proof of the fundamental theorem of calculus and use it to interpret integrals as antiderivatives.

16.0 Students use definite integrals in problems involving area, velocity, acceleration, volume of a solid, area of a surface of revolution, length of a curve, and work.

17.0 Students compute, by hand, the integrals of a wide variety of functions by using techniques of integration, such as substitution, integration by parts, and trigonometric substitution. They can also combine these techniques when appropriate.

18.0 Students know the definitions and properties of inverse trigonometric functions and the expression of these functions as indefinite integrals.

19.0 Students compute, by hand, the integrals of rational functions by combining the techniques in standard 17.0 with the algebraic techniques of partial fractions and completing the square.

20.0 Students compute the integrals of trigonometric functions by using the techniques noted above.

21.0 Students understand the algorithms involved in Simpson's rule and Newton's method. They use calculators or computers or both to approximate integrals numerically.

22.0 Students understand improper integrals as limits of definite integrals.

23.0 Students demonstrate an understanding of the definitions of convergence and divergence of sequences and series of real numbers. By using such tests as the comparison test, ratio test, and alternate series test, they can determine whether a series converges.

24.0 Students understand and can compute the radius (interval) of the convergence of power series.

25.0 Students differentiate and integrate the terms of a power series in order to form new series from known ones.

26.0 Students calculate Taylor polynomials and Taylor series of basic functions, including the remainder term.

27.0 Students know the techniques of solution of selected elementary differential equations and their applications to a wide variety of situations, including growth-and-decay problems.

Standards for:

Science

7–12

Next Generation Science Standards

Grade Seven – Life Sciences

The section entitled "Disciplinary Core Ideas" is reproduced verbatim from *A Framework for K–12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas*. Revised March 2015.

MS-LS1 From Molecules to Organisms: Structures and Processes

MS-LS1 From Molecules to Organisms: Structures and Processes
Students who demonstrate understanding can: **MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things (**including Bacteria, Archaea, and Eukarya) are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells. **Viruses, while not cells, have features that are both common with, and distinct from, cellular life.]** **MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]** **MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]**
MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds; and, creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.] **MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large**

breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] [Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]

MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. [Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models **Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** ▪ **Develop and use a model to describe phenomena. (MS-LS1-2)** **Planning and Carrying Out Investigations** **Planning and carrying out investigations in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.** ▪ **Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1)** **Constructing Explanations and Designing Solutions** **Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.**	**LS1.A: Structure and Function** ▪ All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) ▪ Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2) ▪ In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3) **LS1.B: Growth and Development of Organisms** ▪ Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4) ▪ Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4) ▪ Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5) **LS1.D: Information Processing**	**Cause and Effect** ▪ Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8) ▪ Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4),(MS-LS1-5) **Scale, Proportion, and Quantity** ▪ Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1) **Systems and System Models** ▪ Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3) **Structure and Function** ▪ Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural and designed structures/systems can be analyzed to determine how they function. (MS-LS1-2) ----------

▪ **Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5)** **Engaging in Argument from Evidence** **Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).** ▪ **Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3)** ▪ **Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS1-4)** **Obtaining, Evaluating, and Communicating Information** **Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.** ▪ **Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe**	▪ Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1-8)	***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** ▪ Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1-1) --- ***Connections to Nature of Science*** **Science is a Human Endeavor** ▪ Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3)

how they are supported or not supported by evidence. (MS-LS1-8)	
Connections to other DCIs in this grade-band: **MS.LS2.A (MS-LS1-4),(MS-LS1-5); MS.LS3.A (MS-LS1-2)**	
Articulation to DCIs across grade-bands: **3.LS1.B (MS-LS1-4),(MS-LS1-5); 3.LS3.A (MS-LS1-5); 4.LS1.A (MS-LS1-2); 4.LS1.D (MS-LS1-8); HS.LS1.A (MS-LS1-1),(MS-LS1-2),(MS-LS1-3),(MS-LS1-8); HS.LS2.A (MS-LS1-4),(MS-LS1-5); HS.LS2.D (MS-LS1-4);**	
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.6–8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3),(MS-LS1-4),(MS-LS1-5)** **RST.6–8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5)** **RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3),(MS-LS1-4)** **WHST.6–8.1.a–e Write arguments focused on *discipline-specific content*. (MS-LS1-3),(MS-LS1-4)** **WHST.6–8.2.a–f Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (MS-LS1-5)** **WHST.6–8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-LS1-1)** **WHST.6–8.8 Gather relevant information from multiple print and digital sources (primary and secondary), using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. CA (MS-LS1-8)** **WHST.6–8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5)** **SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2)** ***Mathematics –*** **6.EE.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1),(MS-LS1-2),(MS-LS1-3)** **6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4),(MS-LS1-5)** **6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots. (MS-LS1-4),(MS-LS1-5)**	

MS-LS1 From Molecules to Organisms: Structures and Processes

MS-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. [Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] [Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.]

MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- **Develop a model to describe unobservable mechanisms. (MS-LS1-7)**

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.

- **Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-6)**

Disciplinary Core Ideas

LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)

****Supplemental DCI PS1.A, PS1.B and grade 5 PS3.D*

- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

PS3.D: Energy in Chemical Processes and Everyday Life

- The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and

Crosscutting Concepts

Energy and Matter

- Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7)
- Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6)

Connections to Nature of Science **Scientific Knowledge is Based on Empirical Evidence** ▪ **Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6)**	release oxygen. (secondary to MS-LS1-6) ▪ Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)
Connections to other DCIs in this grade-band: **MS.PS1.B (MS-LS1-6),(MS-LS1-7); MS.ESS2.A (MS-LS1-6)**	
Articulation to DCIs across grade-bands: **5.PS3.D (MS-LS1-6),(MS-LS1-7); 5.LS1.C (MS-LS1-6),(MS-LS1-7); 5.LS2.A (MS-LS1-6); 5.LS2.B (MS-LS1-6),(MS-LS1-7); HS.PS1.B (MS-LS1-6),(MS-LS1-7); HS.LS1.C (MS-LS1-6),(MS-LS1-7); HS.LS2.B (MS-LS1-6),(MS-LS1-7); HS.ESS2.D (MS-LS1-6)**	
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.6–8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-6)** **RST.6–8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-6)** **WHST.6–8.2.a–f Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (MS-LS1-6)** **WHST.6–8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-6)** **SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-7)** ***Mathematics –*** **6.EE.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-6)**	

MS-LS2 Ecosystems: Interactions, Energy, and Dynamics

MS-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- **Develop a model to describe phenomena. (MS-LS2-3)**

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- **Analyze and interpret data to provide evidence for phenomena. (MS-LS2-1)**

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)

******Supplemental DCI PS1.B***

- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1)
- Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)
- Similarly, predatory interactions may reduce the

Crosscutting Concepts

Patterns

- Patterns can be used to identify cause and effect relationships. (MS-LS2-2)

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1)

Energy and Matter

- The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3)

Stability and Change

- Small changes in one part of a system might cause large changes in another part. (MS-LS2-4),(MS-LS2-5)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- **Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2)**

Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- **Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS2-4)**
- **Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2-5)**

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- **Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4)**

number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)

LS2.B: Cycle of Matter and Energy Transfer in Ecosystems

- Food webs are models that demonstrate how matter and energy is transferred between producers~~,~~ consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)

****Supplemental DCI PS1.B, ESS2.A*

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)
- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's

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Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-LS2-5)

---***Connections to Nature of Science***

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3)

Science Addresses Questions About the Natural and Material World

- Science knowledge can describe consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5)

	biodiversity is often used as a measure of its health. (MS-LS2-5) ***Supplemental DCI PS1.B, ESS3.A, ESS3.C **LS4.D: Biodiversity and Humans** ▪ Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5) **ETS1.B: Developing Possible Solutions** ▪ There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary to MS-LS2-5)
***Connections to other DCIs in this grade-band*: MS.PS1.B (MS-LS2-3); MS.LS1.B (MS-LS2-2); MS.LS4.C (MS-LS2-4); MS.LS4.D (MS-LS2-4); MS.ESS2.A (MS-LS2-3),(MS-LS2-4); MS.ESS3.A (MS-LS2-1),(MS-LS2-4); MS.ESS3.C (MS-LS2-1),(MS-LS2-4),(MS-LS2-5)**	
***Articulation across grade-bands:* 1.LS1.B (MS-LS2-2); 3.LS2.C (MS-LS2-1),(MS-LS2-4); 3.LS4.D (MS-LS2-1),(MS-LS2-4); 5.LS2.A (MS-LS2-1),(MS-LS2-3); 5.LS2.B (MS-LS2-3); HS.PS3.B (MS-LS2-3); HS.LS1.C (MS-LS2-3); HS.LS2.A (MS-LS2-1),(MS-LS2-2),(MS-LS2-5); HS.LS2.B (MS-LS2-2),(MS-LS2-3); HS.LS2.C (MS-LS2-4),(MS-LS2-5); HS.LS2.D (MS-LS2-2); HS.LS4.C (MS-LS2-1),(MS-LS2-4); HS.LS4.D (MS-LS2-1),(MS-LS2-4),(MS-LS2-5); HS.ESS2.A (MS-LS2-3); HS.ESS2.E (MS-LS2-4); HS.ESS3.A (MS-LS2-1),(MS-LS2-5); HS.ESS3.B (MS-LS2-4); HS.ESS3.C (MS-LS2-4),(MS-LS2-5); HS.ESS3.D (MS-LS2-5)**	
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.6–8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-1),(MS-LS2-2),(MS-LS2-4)** **RST.6–8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS2-1)** **RST.6–8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5)** **RI.8.8 Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS-4),(MS-LS2-5)** **WHST.6–8.1.a–e Write arguments focused on *discipline-specific content.* (MS-LS2-4)** **WHST.6–8.2.a–f Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (MS-LS2-2)** **WHST.6–8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS-2),(MS-LS2-4)** **SL.8.1.a–d Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 8 topics, texts, and issues,* building on others' ideas and expressing their own clearly. (MS-LS2-2)** **SL.8.4 Present claims and findings (e.g., argument, narrative, response to literature presentations), emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.**	

CA

a. Plan and present a narrative that: establishes a context and point of view, presents a logical sequence, uses narrative techniques (e.g., dialogue, pacing, description, sensory language), uses a variety of transitions, and provides a conclusion that reflects the experience. CA (MS-LS2-2)

SL.8.5 Integrate multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. (MS-LS2-3)

***Mathematics* –**

MP.4 Model with mathematics. (MS-LS2-5)

6.RP.3.a-d Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. (MS-LS2-5)

6.EE.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS2-3)

6.SP.5.a-d Summarize numerical data sets in relation to their context. (MS-LS2-2)

MS-LS3 Heredity: Inheritance and Variation of Traits

MS-LS3 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models **Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** ▪ **Develop and use a model to describe phenomena. (MS-LS3-1)**	**LS3.A: Inheritance of Traits** ▪ Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1) **LS3.B: Variation of Traits** ▪ In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)	**Structure and Function** ▪ Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function. (MS-LS3-1)

***Connections to other DCIs in this grade-band*: MS.LS1.A (MS-LS3-1)**

***Articulation across grade-bands:* 3.LS3.A (MS-LS3-1); 3.LS3.B (MS-LS3-1); HS.LS1.A (MS-LS3-1); HS.LS1.B (MS-LS3-1); HS.LS3.A (MS-LS3-1); HS.LS3-B (MS-LS3-1)**

California Common Core State Standards Connections:

ELA/Literacy –

RST.6–8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS3-1)

RST.6–8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. (MS-LS3-1)

RST.6–8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-1)

SL.8.5 Integrate multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. (MS-LS3-1)

MS-LS3 Heredity: Inheritance and Variation of Traits

MS-LS3 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models **Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.** ▪ **Develop and use a model to describe phenomena. (MS-LS3-2)**	**LS1.B: Growth and Development of Organisms** ▪ Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2) **LS3.A: Inheritance of Traits** ▪ Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2) **LS3.B: Variation of Traits** ▪ In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)	**Cause and Effect** ▪ Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2)

***Articulation across grade-bands:* 3.LS3.A (MS-LS3-2); 3.LS3.B (MS-LS3-2); HS.LS1.B (MS-LS3-2); HS.LS3.A (MS-LS3-2); HS.LS3-B (MS-LS3-2)**

California Common Core State Standards Connections:

ELA/Literacy –

RST.6–8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS3-2)

RST.6–8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. (MS-LS3-2)

RST.6–8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-L

Integrate multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. (MS-LS3-2)

Mathematics –

MP.4 Model with mathematics. (MS-LS3-2)

6.SP.5.a-d Summarize numerical data sets in relation to their context. (MS-LS3-2)

MS-LS4 Biological Evolution: ACIS and Diversity

MS-LS4 Biological Evolution: ACIS and Diversity

Students who demonstrate understanding can:

MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]

MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]

MS-LS4-3. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]

MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]

MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data **Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.** ▪ **Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3)** ▪ **Analyze and interpret data to determine**	**LS4.A: Evidence of Common Ancestry and Diversity** ▪ The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1) ***Supplemental DCI ESS1.C, ESS2.B*	**Patterns** ▪ Patterns can be used to identify cause and effect relationships. (MS-LS4-2) ▪ Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1),(MS-LS4-3) **Cause and Effect** ▪ Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-

similarities and differences in findings. (MS-LS4-1)

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

- **Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)**

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- **Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. (MS-LS4-2)**
- **Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4)**

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

- **Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS4-5)**

Connections to Nature of Science

- Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)

******Supplemental DCI ESS1.C***

- Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)

LS4.B: Natural Selection

- Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)
- In *artificial* selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5)

LS4.C: Adaptation

- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)

4),(MS-LS4-5),(MS-LS4-6)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1),(MS-LS4-2)

Science Addresses Questions About the Natural and Material World

- Science knowledge can describe consequences of actions but does not make the decisions that society takes. (MS-LS4-5)

Scientific Knowledge is Based on Empirical Evidence ▪ **Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1)**	
Connections to other DCIs in this grade-band: **MS.LS2.A (MS-LS4-3),(MS-LS4-6); MS.LS2.C (MS-LS4-6); MS.LS3.A (MS-LS4-2),(MS-LS4-3); MS.LS3.B (MS-LS4-2),(MS-LS4-3),(MS-LS4-6); MS.ESS1.C (MS-LS4-1),(MS-LS4-2),(MS-LS4-6); MS.ESS2.B (MS-LS4-1)**	
Articulation across grade-bands: **3.LS3.B (MS-LS4-4); 3.LS4.A (MS-LS4-1),(MS-LS4-2); 3. LS4.B (MS-LS4-4); 3.LS4.C (MS-LS4-6); HS.LS2.A (MS-LS4-4),(MS-LS4-6); HS.LS2.C (MS-LS4-6); HS.LS3.B (MS-LS4-4),(MS-LS4-5),(MS-LS4-6); HS.LS4.A (MS-LS4-1),(MS-LS4-2),(MS-LS4-3); HS.LS4.B (MS-LS4-4),(MS-LS4-6); HS.LS4.C (MS-LS4-4),(MS-LS4-5),(MS-LS4-6); HS.ESS1.C (MS-LS4-1),(MS-LS4-2)**	
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.6–8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-LS4-1),(MS-LS4-2),(MS-LS4-3),(MS-LS4-4),(MS-LS4-5)** **RST.6–8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS4-1),(MS-LS4-3)** **RST.6–8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3),(MS-LS4-4)** **WHST.6–8.2.a–f Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (MS-LS4-2),(MS-LS4-4)** **WHST.6–8.8 Gather relevant information from multiple print and digital sources (primary and secondary), using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. CA (MS-LS4-5)** **WHST.6–8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2),(MS-LS4-4)** **SL.8.1.a–d Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 8 topics, texts, and issues,* building on others' ideas and expressing their own clearly.MS-LS4-2),(MS-LS4-4)** **SL.8.4 Present claims and findings (e.g., argument, narrative, response to literature presentations), emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. CA** **a. Plan and present a narrative that: establishes a context and point of view, presents a logical sequence, uses narrative techniques (e.g., dialogue, pacing, description, sensory language), uses a variety of transitions, and provides a conclusion that reflects the experience. CA (MS-LS4-2),(MS-LS4-4)** ***Mathematics –*** **MP.4 Model with mathematics. (MS-LS4-6)** **6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4),(MS-LS4-6)** **7.RP.2.a-d Recognize and represent proportional relationships between quantities. (MS-LS4-4),(MS-LS4-6)** **6.SP.5.a-d Summarize numerical data sets in relation to their context. (MS-LS4-4),(MS-LS4-6)** **6.EE.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1),(MS-LS4-2)**	

MS-ETS1 Engineering Design

MS-ETS1 Engineering Design

Students who demonstrate understanding can:

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- **Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)**

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- **Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs (MS-ETS1-4)**

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- **Analyze and interpret data to determine similarities**

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems

- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)

ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)
- Models of all kinds are important for testing solutions. (MS-ETS1-4)

ETS1.C: Optimizing the Design Solution

- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign

Crosscutting Concepts

Influence of Science, Engineering, and Technology on Society and the Natural World

- All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)
- The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)

and differences in findings. (MS-ETS1-3) **Engaging in Argument from Evidence** **Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.** ▪ **Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)**	process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3) ▪ The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)

Connections to MS-ETS1.A: Defining and Delimiting Engineering Problems include:
Physical Science: MS-PS3-3
Connections to MS-ETS1.B: Developing Possible Solutions Problems include:
Physical Science: MS-PS1-6, MS-PS3-3, Life Science: MS-LS2-5
Connections to MS-ETS1.C: Optimizing the Design Solution include:
Physical Science: MS-PS1-6

Articulation of DCIs across grade-bands: **3–5.ETS1.A (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3); 3–5.ETS1.B (MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); 3–5.ETS1.C (MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); HS.ETS1.A (MS-ETS1-1),(MS-ETS1-2); HS.ETS1.B (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); HS.ETS1.C (MS-ETS1-3),(MS-ETS1-4)**

California Common Core State Standards Connections:

ELA/Literacy –

RST.6–8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)

RST.6–8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ETS1-3)

RST.6–8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-2),(MS-ETS1-3)

WHST.6–8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ETS1-2)

WHST.6–8.8 Gather relevant information from multiple print and digital sources (primary and secondary), using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. CA (MS-ETS1-1)

WHST.6–8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2)

SL.8.5 Integrate multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. (MS-ETS1-4)

Mathematics –

MP.2 Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4)

7.EE.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)

7.SP.7.a,b Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is

not good, explain possible sources of the discrepancy. (MS-ETS1-4)

Grade Eight – Physical Sciences

MS-PS1 Matter and its Interactions

MS-PS1 Matter and Its Interactions

Students who demonstrate understanding can:

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete description of all individual atoms in a complex molecule or extended structure is not required.]

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. [Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.] [Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.]

MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. [Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.] [Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]

MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.* [Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving

ammonium chloride or calcium chloride.] [Assessment Boundary: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models **Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.** ▪ **Develop a model to predict and/or describe phenomena. (MS-PS1-1),(MS-PS1-4)** ▪ **Develop a model to describe unobservable mechanisms. (MS-PS1-5)** **Analyzing and Interpreting Data** **Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.** ▪ **Analyze and interpret data to determine similarities and differences in findings. (MS-PS1-2)** **Constructing Explanations and Designing Solutions** **Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.** ▪ **Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)** **Obtaining, Evaluating, and Communicating**	**PS1.A: Structure and Properties of Matter** ▪ Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1) ▪ Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2),(MS-PS1-3) ****Supplemental DCI ESS3.C, LS4.D*</br>▪ Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4) ▪ In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4) ▪ Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1) ▪ The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4) **PS1.B: Chemical Reactions** ▪ Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-3)	**Patterns** ▪ Macroscopic patterns are related to the nature of microscopic and atomic-level structure. (MS-PS1-2) **Cause and Effect** ▪ Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4) **Scale, Proportion, and Quantity** ▪ Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1) **Energy and Matter** ▪ Matter is conserved because atoms are conserved in physical and chemical processes. (MS-PS1-5) ▪ The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS1-6) **Structure and Function** ▪ Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3) --- ***Connections to Engineering, Technology, and Applications of Science***

Information
Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.

- **Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-PS1-3)**

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- **Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS1-2)**

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- **Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5)**

****Supplemental DCI ESS3.C, LS4.D*,(MS-PS1-5)

- The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5)
- Some chemical reactions release energy, others store energy. (MS-PS1-6)

PS3.A: Definitions of Energy

- The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4)
- The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (secondary to MS-PS1-4)

ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (secondary to MS-PS1-6)

ETS1.C: Optimizing the Design Solution

- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can

Interdependence of Science, Engineering, and Technology

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3)

Influence of Science, Engineering and Technology on Society and the Natural World

- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)

	provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design. (secondary to MS-PS1-6) ▪ The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (secondary to MS-PS1-6)

***Connections to other DCIs in this grade-band*: MS.PS3.D (MS-PS1-2),(MS-PS1-6); MS.LS1.C (MS-PS1-2),(MS-PS1-5); MS.LS2.A (MS-PS1-3); MS.LS2.B (MS-PS1-5); MS.LS4.D (MS-PS1-3); MS.ESS2.A (MS-PS1-2),(MS-PS1-5); MS.ESS2.C (MS-PS1-1),(MS-PS1-4); MS.ESS3.A (MS-PS1-3); MS.ESS3.C (MS-PS1-3)**

***Articulation across grade-bands:* 5.PS1.A (MS-PS1-1); 5.PS1.B (MS-PS1-2),(MS-PS1-5); HS.PS1.A (MS-PS1-1),(MS-PS1-3),(MS-PS1-4),(MS-PS1-6); HS.PS1.B (MS-PS1-2),(MS-PS1-4),(MS-PS1-5),(MS-PS1-6); HS.PS3.A (MS-PS1-4),(MS-PS1-6); HS.PS3.B (MS-PS1-6); HS.PS3.D (MS-PS1-6); HS.LS2.A (MS-PS1-3); HS.LS4.D (MS-PS1-3); HS.ESS1.A (MS-PS1-1); HS.ESS3.A (MS-PS1-3)**

California Common Core State Standards Connections:

ELA/Literacy –

RST.6–8.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS1-2),(MS-PS1-3)**
RST.6–8.3	**Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)**
RST.6–8.7	**Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-1),(MS-PS1-2),(MS-PS1-4),(MS-PS1-5)**
WHST.6–8.7	**Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS1-6)**
WHST.6–8.8	**Gather relevant information from multiple print and digital sources (primary and secondary), using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. CA (MS-PS1-3)**

Mathematics –

MP.2	**Reason abstractly and quantitatively. (MS-PS1-1),(MS-PS1-2), (MS-PS1-5)**
MP.4	**Model with mathematics. (MS-PS1-1), (MS-PS1-5)**
6.RP.3	**Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. (MS-PS1-1),(MS-PS1-2),(MS-PS1-5)**
6.NS.5	**Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS1-4)**
6.SP.4	**Display numerical data in plots on a number line, including dot plots, histograms, and box plots. (MS-PS1-2)**

6.SP.5.a-d	Summarize numerical data sets in relation to their context (MS-PS1-2)

MS-PS2 Motion and Stability: Forces and Interactions

MS-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.]

MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]

MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. [Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.] [Assessment Boundary: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.]

MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.] [Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.]

MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.] [Assessment Boundary: Assessment is limited to electric and magnetic fields, and is limited to qualitative evidence for the existence of fields.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems **Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.** ▪ **Ask questions that can be investigated within the scope of the classroom, outdoor**	**PS2.A: Forces and Motion** ▪ For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1) ▪ The motion of an object is determined by the	**Cause and Effect** ▪ Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS2-3),(MS-PS2-5) **Systems and System Models** ▪ Models can be used to represent systems and their interactions—such as inputs, processes

environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. (MS-PS2-3)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

- **Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS2-2)**
- **Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation. (MS-PS2-5)**

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- **Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1)**

Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds

sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2)

- All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MS-PS2-2)

PS2.B: Types of Interactions

- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3)
- Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4)
  ****Supplemental ESS1.A, ESS1.B*
- Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (MS-PS2-5)

and outputs—and energy and matter flows within systems. (MS-PS2-1),(MS-PS2-4),

Stability and Change

- Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. (MS-PS2-2)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-PS2-1)

from K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.

- **Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-PS2-4)**

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- **Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS2-2),(MS-PS2-4)**

***Connections to other DCIs in this grade-band*: MS.PS3.A (MS-PS2-2); MS.PS3.B (MS-PS2-2); MS.PS3.C (MS-PS2-1); MS.ESS1.A (MS-PS2-4); MS.ESS1.B (MS-PS2-4); MS.ESS2.C (MS-PS2-2),(MS-PS2-4)**

***Articulation across grade-bands:* 3.PS2.A (MS-PS2-1),(MS-PS2-2); 3.PS2.B (MS-PS2-3),(MS-PS2-5); 5.PS2.B (MS-PS2-4); HS.PS2.A (MS-PS2-1),(MS-PS2-2); HS.PS2.B (MS-PS2-3),(MS-PS2-4),(MS-PS2-5); HS.PS3.A (MS-PS2-5); HS.PS3.B (MS-PS2-2),(MS-PS2-5); HS.PS3.C (MS-PS2-5); HS.ESS1.B (MS-PS2-4)**

California Common Core State Standards Connections:

ELA/Literacy –

RST.6–8.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS2-1),(MS-PS2-3)**
RST.6–8.3	**Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS2-1),(MS-PS2-2),(MS-PS2-5)**
WHST.6–8.1.a–e	**Write arguments focused on *discipline-specific content*. (MS-PS2-4)**
WHST.6–8.7	**Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS2-1),(MS-PS2-2),(MS-PS2-5)**

Mathematics –

MP.2	**Reason abstractly and quantitatively. (MS-PS2-1),(MS-PS2-2),(MS-PS2-3)**
6.NS.5	**Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS2-1)**
6.EE.2.a-c	**Write, read, and evaluate expressions in which letters stand for numbers. (MS-PS2-1),(MS-PS2-2)**

7.EE.3-4	Solve real-life and mathematical problems using numerical and algebraic expressions and equations. (MS-PS2-1), (MS-PS2-2)

MS-PS3 Energy

MS-PS3 Energy

Students who demonstrate understanding can:

MS-PS3-1. **Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. [Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.]**

MS-PS3-2. **Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.

- **Develop a model to describe unobservable mechanisms. (MS-PS3-2)**

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- **Construct and interpret graphical displays of data to identify linear and nonlinear relationships. (MS-PS3-1)**

Disciplinary Core Ideas

PS3.A: Definitions of Energy

- Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)
- A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2)

PS3.C: Relationship Between Energy and Forces

- When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)

Crosscutting Concepts

Scale, Proportion, and Quantity

- Proportional relationships (e.g., speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. (MS-PS3-1)

Systems and System Models

- Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems. (MS-PS3-2)

***Connections to other DCIs in this grade-band*: MS.PS2.A (MS-PS3-1);**

***Articulation across grade-bands:* 4.PS3.B (MS-PS3-1); HS.PS2.B (MS-PS3-2); HS.PS3.A (MS-PS3-1); HS.PS3.B (MS-PS3-1),(MS-PS3-2) HS.PS3.C (MS-PS3-2)**

California Common Core State Standards Connections:	
ELA/Literacy –	
RST.6–8.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS3-1)**
RST.6–8.7	**Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1)**
SL.8.5	**Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS3-2)**
Mathematics –	
MP.2	**Reason abstractly and quantitatively. (MS-PS3-1)**
6.RP.1	**Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1)**
6.RP.2	**Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio r relationship. (MS-PS3-1)**
7.RP.2.a-d	**Recognize and represent proportional relationships between quantities. (MS-PS3-1)**
8.EE.1	**Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1)**
8.EE.2	**Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. (MS-PS3-1)**
8.F.3	**Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1)**

MS-PS3 Energy

Students who demonstrate understanding can:

MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]

MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]

MS-PS3–5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary: Assessment does not include calculations of energy.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

- **Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS3-4)**

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions

Disciplinary Core Ideas

PS3.A: Definitions of Energy

- Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3),(MS-PS3-4)

PS3.B: Conservation of Energy and Energy Transfer

- When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3–5)
- The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the

Crosscutting Concepts

Scale, Proportion, and Quantity

- Proportional relationships (e.g., speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. (MS-PS3-4)

Energy and Matter

- Energy may take different forms (e.g., energy in fields, thermal energy, energy of motion). (MS-PS3–5)
- The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS3-3)

in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. ▪ **Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system. (MS-PS3-3)** **Engaging in Argument from Evidence** **Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed worlds.** ▪ **Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. (MS-PS3–5)** **----------** ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ▪ **Science knowledge is based upon logical and conceptual connections between evidence and explanations (MS-PS3-4),(MS-PS3–5)**	environment. (MS-PS3-4) ▪ Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3) **ETS1.A: Defining and Delimiting an Engineering Problem** ▪ The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (secondary to MS-PS3-3) **ETS1.B: Developing Possible Solutions** ▪ A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (secondary to MS-PS3-3)
***Connections to other DCIs in this grade-band*: MS.PS1.A (MS-PS3-4); MS.PS1.B (MS-PS3-3); MS.PS2.A (MS-PS3-4),(MS-PS3–5); MS.ESS2.A (MS-PS3-3); MS.ESS2.C (MS-PS3-3),(MS-PS3-4); MS.ESS2.D (MS-PS3-3),(MS-PS3-4); MS.ESS3.D (MS-PS3-4)**	
***Articulation across grade-bands:* 4.PS3.B (MS-PS3-3); 4.PS3.C (MS-PS3-4),(MS-PS3–5); HS.PS1.B (MS-PS3-4); HS.PS3.A (MS-PS3-4),(MS-PS3–5); HS.PS3.B,(MS-PS3-3),(MS-PS3-4),(MS-PS3–5)**	
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.6–8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or**	

	descriptions (MS-PS3–5)
RST.6–8.3	**Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3),(MS-PS3-4)**
WHST.6–8.1.a–e	**Write arguments focused on *discipline-specific content*. (MS-PS3–5)**
WHST.6–8.7	**Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS3-3),(MS-PS3-4)**
Mathematics –	
MP.2	**Reason abstractly and quantitatively. (MS-PS3-4),(MS-PS3–5)**
6.RP.1	**Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3–5)**
6.SP.5.a-d	**Summarize numerical data sets in relation to their context. (MS-PS3-4)**

MS-PS4 Waves and Their Applications in Technologies for Information Transfer

MS-PS4 Waves and Their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

MS-PS4-1. **Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.]**

MS-PS4-2. **Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]**

MS-PS4-3. **Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. [Clarification Statement: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.] [Assessment Boundary: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.]**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- **Develop and use a model to describe phenomena. (MS-PS4-2)**

Using Mathematics and Computational Thinking

Mathematical and computational thinking at the 6–8 level builds on K–5 and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

- **Use mathematical representations to describe and/or support scientific conclusions and design solutions. (MS-PS4-1)**

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating

Disciplinary Core Ideas

PS4.A: Wave Properties

- A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1)
- A sound wave needs a medium through which it is transmitted. (MS-PS4-2)

PS4.B: Electromagnetic Radiation

- When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2)
- The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (MS-PS4-2)
- A wave model of light is useful for explaining brightness, color, and the frequency-dependent

Crosscutting Concepts

Patterns

- Graphs and charts can be used to identify patterns in data. (MS-PS4-1)

Structure and Function

- Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS4-2)
- Structures can be designed to serve particular functions. (MS-PS4-3)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- Technologies extend the measurement,

information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods. ▪ **Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. (MS-PS4-3)** --- ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ▪ **Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS4-1)**	bending of light at a surface between media. (MS-PS4-2) ▪ However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2) **PS4.C: Information Technologies and Instrumentation** ▪ Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3)	exploration, modeling, and computational capacity of scientific investigations. (MS-PS4-3) --- ***Connections to Nature of Science*** **Science is a Human Endeavor** ▪ Advances in technology influence the progress of science and science has influenced advances in technology. (MS-PS4-3)

Connections to other DCIs in this grade-band: **MS.LS1.D (MS-PS4-2)**

Articulation across grade-bands: **4.PS3.A (MS-PS4-1); 4.PS3.B (MS-PS4-1); 4.PS4.A (MS-PS4-1); 4.PS4.B (MS-PS4-2); 4.PS4.C (MS-PS4-3); HS.PS4.A (MS-PS4-1),(MS-PS4-2),(MS-PS4-3); HS.PS4.B (MS-PS4-1),(MS-PS4-2); HS.PS4.C (MS-PS4-3); HS.ESS1.A (MS-PS4-2)**

California Common Core State Standards Connections:

ELA/Literacy –

RST.6–8.1	**Cite specific textual evidence to support analysis of science and technical texts. (MS-PS4-3)**
RST.6–8.2	**Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-PS4-3)**
RST.6–8.9	**Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3)**
WHST.6–8.9	**Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3)**
SL.8.5	**Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS4-1),(MS-PS4-2)**

Mathematics –

MP.2	**Reason abstractly and quantitatively. (MS-PS4-1)**
MP.4	**Model with mathematics. (MS-PS4-1)**
6.RP.1	**Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS4-1)**
6.RP.3.a-d	**Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. (MS-PS4-1)**
7.RP.2.a-d	**Recognize and represent proportional relationships between quantities. (MS-PS4-1)**
8.F.3	**Interpret the equation *y* = *mx* + *b* as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS4-1)**

MS-ETS1 Engineering Design

MS-ETS1 Engineering Design

Students who demonstrate understanding can:

MS-ETS1-1. **Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.**

MS-ETS1-2. **Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.**

MS-ETS1-3. **Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**

MS-ETS1-4. **Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- **Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)**

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- **Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs (MS-ETS1-4)**

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems

- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)

ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)
- Models of all kinds are important for testing solutions. (MS-ETS1-4)

Crosscutting Concepts

Influence of Science, Engineering, and Technology on Society and the Natural World

- All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)
- The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)

to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. ▪ **Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)** **Engaging in Argument from Evidence** **Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.** ▪ **Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)**	**ETS1.C: Optimizing the Design Solution** ▪ Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3) ▪ The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)
Connections to MS-ETS1.A: Defining and Delimiting Engineering Problems include: **Physical Science: MS-PS3-3** ***Connections to MS-ETS1.B: Developing Possible Solutions Problems include:*** **Physical Science: MS-PS1-6, MS-PS3-3, Life Science: MS-LS2-5** ***Connections to MS-ETS1.C: Optimizing the Design Solution include:*** **Physical Science: MS-PS1-6**	
Articulation of DCIs across grade-bands: **3–5.ETS1.A (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3); 3–5.ETS1.B (MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); 3–5.ETS1.C (MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); HS.ETS1.A (MS-ETS1-1),(MS-ETS1-2); HS.ETS1.B (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); HS.ETS1.C (MS-ETS1-3),(MS-ETS1-4)**	
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.6–8.1** **Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)** **RST.6–8.7** **Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ETS1-3)** **RST.6–8.9** **Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-2),(MS-ETS1-3)** **WHST.6–8.7** **Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ETS1-2)** **WHST.6–8.8** **Gather relevant information from multiple print and digital sources (primary and secondary), using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. CA (MS-ETS1-1)**	

WHST.6–8.9	**Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2)**
SL.8.5	**Integrate multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. (MS-ETS1-4)**
Mathematics –	
MP.2	**Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4)**
7.EE.3	**Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)**
7.SP.7.a,b	**Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. (MS-ETS1-4)**

Next Generation Science Standards for California Public Schools

Grades Nine through Twelve

The star symbol (★) following the standard indicates that it is also a Modeling standard. Modeling is best interpreted not as a collection of isolated topics but in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and modeling standards appear throughout the higher mathematics standards indicated by a ★ symbol.
The section entitled "Disciplinary Core Ideas" is reproduced verbatim from *A Framework for K–12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas*. Revised March 2015.

HS Structure and Function

HS Structure and Function		
Students who demonstrate understanding can:		
HS-LS1-1.	**Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]**	
HS-LS1-2.	**Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]**	
HS-LS1-3.	**Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]**	
The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models **Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and**	**LS1.A: Structure and Function** ▪ Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) ▪ All cells contain genetic information in the form	**Systems and System Models** ▪ Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and

designed world.

- **Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)**

Planning and Carrying Out Investigations

Planning and carrying out in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- **Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)**

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- **Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)**

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

- **Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.**

of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.)

- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

between systems at different scales. (HS-LS1-2)

Structure and Function

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

Stability and Change

- Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

(HS-LS1-3)	
Connections to other DCIs in this grade-band: **HS.LS3.A (HS-LS1-1)**	
Articulation across grade-bands: **MS.LS1.A (HS-LS1-1),(HS-LS1-2),(HS-LS1-3); MS.LS3.A (HS-LS1-1); MS.LS3.B (HS-LS1-1)**	
California Common Core State Standards Connections:	
ELA/Literacy –	
RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS1-1)**
WHST.9–12.2.a–e	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (HS-LS1-1)**
WHST.9–12.7	**Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-LS1-3)**
WHST.11-12.8	**Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)**
WHST.9–12.9	**Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1)**
SL.11-12.5	**Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-2)**

HS Matter and Energy in Organisms and Ecosystems

HS Matter and Energy in Organisms and Ecosystems

Students who demonstrate understanding can:

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.] [Assessment Boundary: Assessment does not include specific biochemical steps.]

HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]

HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. [Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.] [Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.]

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.]

HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.]

HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. [Clarification Statement: Examples of models could include simulations and mathematical models.] [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]'

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models **Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components**	**LS1.C: Organization for Matter and Energy Flow in Organisms** ▪ The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen.	**Systems and System Models** ▪ Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and

in the natural and designed worlds. ▪ **Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-5),(HS-LS1-7)** ▪ **Develop a model based on evidence to illustrate the relationships between systems or components of a system. (HS-LS2-5)** **Using Mathematics and Computational Thinking** **Mathematical and computational thinking in 9–12 builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** ▪ **Use mathematical representations of phenomena or design solutions to support claims. (HS-LS2-4)** **Constructing Explanations and Designing Solutions** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.** ▪ **Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will**	(HS-LS1-5) ▪ The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6) ▪ As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-6),(HS-LS1-7) ▪ As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.(HS-LS1-7) **LS2.B: Cycles of Matter and Energy Transfer in Ecosystems** ▪ Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3) ▪ Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical	between systems at different scales. (HS-LS2-5) **Energy and Matter** ▪ Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6) ▪ Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems.(HS-LS1-7),(HS-LS2-4) ▪ Energy drives the cycling of matter within and between systems. (HS-LS2-3)

continue to do so in the future. (HS-LS1-6),(HS-LS2-3) --- ***Connections to Nature of Science*** **Scientific Knowledge is Open to Revision in Light of New Evidence** ▪ **Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence. (HS-LS2-3)**	elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4) ▪ Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5) **PS3.D: Energy in Chemical Processes** ▪ The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis. (secondary to HS-LS2-5)

Connections to other DCIs in this grade-band: **HS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7),(HS-LS2-3),(HS-LS2-5); HS.PS2.B (HS-LS1-7); HS.PS3.B (HS-LS1-5),(HS-LS1-7),(HS-LS2-3),(HS-LS2-4); HS.PS3.D (HS-LS2-3),(HS-LS2-4); HS.ESS2.A (HS-LS2-3); HS.ESS2.D (HS-LS2-5)**

Articulation across grade-bands: **MS.PS1.A (HS-LS1-6); MS.PS1.B (HS-LS1-5),(HS-LS1-6),(HS-LS1-7),(HS-LS2-3); MS.PS3.D (HS-LS1-5),(HS-LS1-6),(HS-LS1-7),(HS-LS2-3),(HS-LS2-4),(HS-LS2-5); MS.LS1.C (HS-LS1-5),(HS-LS1-6),(HS-LS1-7),(HS-LS2-3),(HS-LS2-4),(HS-LS2-5); MS.LS2.B (HS-LS1-5),(HS-LS1-7),(HS-LS2-3),(HS-LS2-4),(HS-LS2-5); MS.ESS2.A (HS-LS2-5); MS.ESS2.E (HS-LS1-6)**

California Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS1-6),(HS-LS2-3)**
WHST.9–12.2.a–e	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (HS-LS1-6),(HS-LS2-3)**
WHST.9–12.5	**Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS1-6),(HS-LS2-3)**
WHST.9–12.9	**Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-6)**
SL.11-12.5	**Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-5),(HS-LS1-7)**

Mathematics –

MP.2	**Reason abstractly and quantitatively. (HS-LS2-4)**
MP.4	**Model with mathematics. (HS-LS2-4)**

N-Q.A.1-3	**Reason quantitatively and use units to solve problems.★ (HS-LS2-4)**

HS Inheritance and Variation of Traits

Students who demonstrate understanding can:

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. [Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.]

HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]

HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.] [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. [Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.] [Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- **Ask questions that arise from examining models or a theory to clarify relationships. (HS-LS3-1)**

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- **Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4)**

Disciplinary Core Ideas

LS1.A: Structure and Function

- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. (secondary to HS-LS3-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS1-1.)

LS1.B: Growth and Development of Organisms

- In multicellular organism's individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1),(HS-LS3-2)

Scale, Proportion, and Quantity

- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-LS3-3)

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-4)

Analyzing and Interpreting Data
Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- **Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS3-3)**

Engaging in Argument from Evidence
Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- **Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2)**

work together to meet the needs of the whole organism. (HS-LS1-4)

LS3.A: Inheritance of Traits

- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (HS-LS3-1)

LS3.B: Variation of Traits

- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2)
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2),(HS-LS3-3)

Connections to Nature of Science

Science is a Human Endeavor

- Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)
- Science and engineering are influenced by society and society is influenced by science and engineering. (HS-LS3-3)

Connections to other DCIs in this grave-band: **HS.LS2.A (HS-LS3-3); HS.LS2.C (HS-LS3-3); HS.LS4.B (HS-LS3-3); HS.LS4.C (HS-LS3-3)**

Articulation across grade-bands: **MS.LS1.A (HS-LS1-4); MS.LS1.B (HS-LS1-4); MS.LS2.A (HS-LS3-3); MS.LS3.A (HS-LS1-4),(HS-LS3-1),(HS-LS3-2); MS.LS3.B (HS-LS3-1),(HS-LS3-2),(HS-LS3-3); MS.LS4.C (HS-LS3-3)**

California Common Core State Standards Connections:
ELA/Literacy –

RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS3-1),(HS-LS3-2)**
RST.11-12.9	**Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (HS-LS3-1)**
WHST.9–12.1.a–e	**Write arguments focused on *discipline-specific content*. (HS-LS3-2)**
SL.11-12.5	**Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-4)**
***Mathematics* –**	
MP.2	**Reason abstractly and quantitatively. (HS-LS3-2),(HS-LS3-3)**
MP.4	**Model with mathematics. (HS-LS1-4)**
F-IF.7.a-e	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ (HS-LS1-4)**
F-BF.1.a-c	**Write a function that describes a relationship between two quantities. (HS-LS1-4)**

HS Interdependent Relationships in Ecosystems

HS Interdependent Relationships in Ecosystems

Students who demonstrate understanding can:

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.]

HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.] [Assessment Boundary: Assessment is limited to provided data.]

HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]

HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. [Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]

HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* [Clarification Statement: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking **Mathematical and computational thinking in 9–12 builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple**	**LS2.A: Interdependent Relationships in Ecosystems** ▪ Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the	**Cause and Effect** ▪ Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8),(HS-LS4-6) **Scale, Proportion, and Quantity** ▪ The significance of a phenomenon is

computational simulations are created and used based on mathematical models of basic assumptions.

- **Use mathematical and/or computational representations of phenomena or design solutions to support explanations. (HS-LS2-1)**
- **Use mathematical representations of phenomena or design solutions to support and revise explanations. (HS-LS2-2)**
- **Create or revise a simulation of a phenomenon, designed device, process, or system. (HS-LS4-6)**

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- **Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7)**

Engaging in Argument from Evidence

Engaging in argument from evidence in 9–12 builds from K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- **Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6)**
- **Evaluate the evidence behind currently accepted**

fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1),(HS-LS2-2)

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)
- Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7)

LS2.D: Social Interactions and Group Behavior

- Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8)

LS4.C: Adaptation

- Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (HS-LS4-6)

LS4.D: Biodiversity and Humans

- Biodiversity is increased by the formation of new

dependent on the scale, proportion, and quantity at which it occurs. (HS-LS2-1)

- Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale. (HS-LS2-2)

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-LS2-6),(HS-LS2-7)

explanations or solutions to determine the merits of arguments. (HS-LS2-8) **----------*Connections to Nature of Science*** **Scientific Knowledge is Open to Revision in Light of New Evidence** ▪ **Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence. (HS-LS2-2)** ▪ **Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation. (HS-LS2-6),(HS-LS2-8)**	species (speciation) and decreased by the loss of species (extinction). (secondary to HS-LS2-7) ▪ Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (secondary to HS-LS2-7), (HS-LS4-6) **ETS1.B: Developing Possible Solutions** ▪ When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (secondary to HS-LS2-7),(secondary to HS-LS4-6) ▪ Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (secondary to HS-LS4-6)
Connections to other DCIs in this grade-band: **HS.ESS2.D (HS-LS2-7),(HS-LS4-6); HS.ESS2.E (HS-LS2-2),(HS-LS2-6),(HS-LS2-7),(HS-LS4-6); HS.ESS3.A (HS-LS2-2),(HS-LS2-7), (HS-LS4-6); HS.ESS3.C (HS-LS2-2),(HS-LS2-7),(HS-LS4-6); HS.ESS3.D (HS-LS2-2),(HS-LS4-6)**	
Articulation across grade-bands: **MS.LS1.B (HS-LS2-8); MS.LS2.A (HS-LS2-1),(HS-LS2-2),(HS-LS2-6); MS.LS2.C (HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-7),(HS-LS4-6); MS.ESS2.E (HS-LS2-6); MS.ESS3.A (HS-LS2-1); MS.ESS3.C (HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-7),(HS-LS4-6); MS.ESS3.D (HS-LS2-7)**	
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.9-10.8** **Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. (HS-LS2-6*),*(HS-LS2-7),(HS-LS2-8)**	

RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-8)**
RST.11-12.7	**Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-LS2-6),(HS-LS2-7),(HS-LS2-8)**
RST.11-12.8	**Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-LS2-6),(HS-LS2-7),(HS-LS2-8)**
WHST.9–12.2.a–e	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (HS-LS2-1),(HS-LS2-2)**
WHST.9–12.5	**Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS4-6)**
WHST.9–12.7	**Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-LS2-7),(HS-LS4-6)**
Mathematics –	
MP.2	**Reason abstractly and quantitatively. (HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-7)**
MP.4	**Model with mathematics. (HS-LS2-1),(HS-LS2-2)**
N-Q.1-3	**Reason quantitatively and use units to solve problems.★ (HS-LS2-1),(HS-LS2-2),(HS-LS2-7)**
S-ID.1	**Represent data with plots on the real number line (dot plots, histograms, and box plots).★ (HS-LS2-6)**
S-IC.1	**Understand statistics as a process for making inferences about population parameters based on a random sample from that population.★ (HS-LS2-6)**
S-IC.6	**Evaluate reports based on data.★ (HS-LS2-6)**

HS Natural Selection and Evolution

Students who demonstrate understanding can:

HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]

HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. [Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.] [Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.]

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]

HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data **Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.**	**LS4.A: Evidence of Common Ancestry and Diversity** ▪ Genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of	**Patterns** ▪ Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-LS4-1),(HS-LS4-3)

- **Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS4-3)**

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- **Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS4-2),(HS-LS4-4)**

Engaging in Argument from Evidence

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current or historical episodes in science.

- **Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS4-5)**

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and

descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS4-1)

LS4.B: Natural Selection

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2),(HS-LS4-3)
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3)

LS4.C: Adaptation

- Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS4-2)
- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS4-2),(HS-LS4-4),(HS-LS4-5)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-LS4-1),(HS-LS4-4)

progresses to evaluating the validity and reliability of the claims, methods, and designs. ▪ **Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-LS4-1)** --- ***Connections to Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** ▪ **A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-LS4-1)**	generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4) ▪ Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3) ▪ Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (HS-LS4-5) ▪ Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5)
Connections to other DCIs in this grade-band: **HS.LS2.A (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); HS.LS2.D (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); HS.LS3.A (HS-LS4-1); HS.LS3.B (HS-LS4-1),(HS-LS4-2) (HS-LS4-3),(HS-LS4-5); HS.ESS1.C (HS-LS4-1); HS.ESS2.E (HS-LS4-2),(HS-LS4-5); HS.ESS3.A (HS-LS4-2),(HS-LS4-5)**	
Articulation across grade-bands: **MS.LS2.A (HS-LS4-2),(HS-LS4-3),(HS-LS4-5); MS.LS2.C (HS-LS4-5); MS.LS3.A (HS-LS4-1); MS.LS3.B (HS-LS4-1),(HS-LS4-2),(HS-LS4-3); MS.LS4.A (HS-LS4-1); MS.LS4.B (HS-LS4-2),(HS-LS4-3),(HS-LS4-4); MS.LS4.C (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); MS.ESS1.C (HS-LS4-1); MS.ESS3.C (HS-LS4-5)**	
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.11-12.1** **Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4)** **RST.11-12.8** **Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-LS4-5)** **WHST.9–12.2** **Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical**	

	processes. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4)
WHST.9–12.9.a–e	**Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5)**
SL.11-12.4	**Present information, findings, and supporting evidence (e.g., reflective, historical investigation, response to literature presentations), conveying a clear and distinct perspective and a logical argument, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. Use appropriate eye contact, adequate volume, and clear pronunciation. CA (HS-LS4-1),(HS-LS4-2)** **a. Plan and deliver a reflective narrative that: explores the significance of a personal experience, event, or concern; uses sensory language to convey a vivid picture; includes appropriate narrative techniques (e.g., dialogue, pacing, description); and draws comparisons between the specific incident and broader themes. (11th or 12th grade) CA** **b. Plan and present an argument that: supports a precise claim; provides a logical sequence for claims, counterclaims, and evidence; uses rhetorical devices to support assertions (e.g., analogy, appeal to logic through reasoning, appeal to emotion or ethical belief); uses varied syntax to link major sections of the presentation to create cohesion and clarity; and provides a concluding statement that supports the argument presented. (11th or 12th grade) CA (HS-ESS1-3)**
***Mathematics* –**	
MP.2	**Reason abstractly and quantitatively. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5)**
MP.4	**Model with mathematics. (HS-LS4-2)**

HS Space Systems

Students who demonstrate understanding can:

HS-ESS1-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. [Clarification Statement: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries.] [Assessment Boundary: Assessment does not include details of the atomic and sub-atomic processes involved with the sun's nuclear fusion.]

HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. [Clarification Statement: Emphasis is on the astronomical evidence of the red shift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the Big Bang theory (3/4 hydrogen and 1/4 helium).]

HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements. [Clarification Statement: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.] [Assessment Boundary: Details of the many different nucleosynthesis pathways for stars of differing masses are not assessed.]

HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. [Clarification Statement: Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons.] [Assessment Boundary: Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

- **Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS1-1)**

Using Mathematical and Computational Thinking

Mathematical and computational thinking in 9–12

Disciplinary Core Ideas

ESS1.A: The Universe and Its Stars

- The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (HS-ESS1-1)
- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS1-2),(HS-ESS1-3)
- The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars

Crosscutting Concepts

Scale, Proportion, and Quantity

- The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-ESS1-1)
- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-ESS1-4)

Energy and Matter

- Energy cannot be created or destroyed–

builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- **Use mathematical or computational representations of phenomena to describe explanations. (HS-ESS1-4)**

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- **Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS1-2)**

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- **Communicate scientific ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including**

and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. (HS-ESS1-2)

- Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (HS-ESS1-2),(HS-ESS1-3)

ESS1.B: Earth and the Solar System

- Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. (HS-ESS1-4)

PS3.D: Energy in Chemical Processes and Everyday Life

- Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. (secondary to HS-ESS1-1)

PS4.B Electromagnetic Radiation

- Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. (secondary to HS-ESS1-2)

only moved between one place and another place, between objects and/or fields, or between systems. (HS-ESS1-2)

- In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-ESS1-3)

Connection to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (HS-ESS1-2),(HS-ESS1-4)

Connection to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-ESS1-2)
- Science assumes the universe is a vast single system in which basic laws are consistent. (HS-ESS1-2)

orally, graphically, textually, and mathematically). (HS-ESS1-3)

Connections to Nature of Science

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- **A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science commACIS validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-ESS1-2)**

Connections to other DCIs in this grade-band: **HS.PS1.A (HS-ESS1-2),(HS-ESS1-3); HS.PS1.C (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3); HS.PS2.B (HS-ESS1-4); HS.PS3.A (HS-ESS1-1),(HS-ESS1-2); HS.PS3.B (HS-ESS1-2); HS.PS4.A (HS-ESS1-2)**

Articulation of DCIs across grade-bands: **MS.PS1.A (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3); MS.PS2.A (HS-ESS1-4); MS.PS2.B (HS-ESS1-4); MS.PS4.B (HS-ESS1-1),(HS-ESS1-2); MS.ESS1.A (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3),(HS-ESS1-4); MS.ESS1.B (HS-ESS1-4); MS.ESS2.A (HS-ESS1-1); MS.ESS2.D (HS-ESS1-1)**

California Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-ESS1-1),(HS-ESS1-2)**
WHST.9–12.2.a–e	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (HS-ESS1-2),(HS-ESS1-3)**
SL.11-12.4	**Present information, findings, and supporting evidence (e.g., reflective, historical investigation, response to literature presentations), conveying a clear and distinct perspective and a logical argument, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. Use appropriate eye contact, adequate volume, and clear pronunciation. CA (HS-LS4-1),(HS-LS4-2)** **a. Plan and deliver a reflective narrative that: explores the significance of a personal experience, event, or concern; uses sensory language to convey a vivid picture; includes appropriate narrative techniques (e.g., dialogue, pacing, description); and draws comparisons between the specific incident and broader themes. (11th or 12th grade) CA** **b. Plan and present an argument that: supports a precise claim; provides a logical sequence for claims, counterclaims, and**

	evidence; uses rhetorical devices to support assertions (e.g., analogy, appeal to logic through reasoning, appeal to emotion or ethical belief); uses varied syntax to link major sections of the presentation to create cohesion and clarity; and provides a concluding statement that supports the argument presented. (11th or 12th grade) CA (HS-ESS1-3)
Mathematics –	
MP.2	**Reason abstractly and quantitatively. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3),(HS-ESS1-4)**
MP.4	**Model with mathematics. (HS-ESS1-1),(HS-ESS1-4)**
N-Q.1-3	**Reason quantitatively and use units to solve problems.★ (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)**
A-SSE.1.a,b	**Interpret expressions that represent a quantity in terms of its context.★ (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)**
A-CED.2	**Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.★ (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)**
A-CED.4	**Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.★ (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)**

HS History of Earth

Students who demonstrate understanding can:

HS-ESS1-5. **Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. [Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust increasing with distance away from a central ancient core (a result of past plate interactions).]**

HS-ESS1-6. **Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. [Clarification Statement: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system 4.6 billion years ago. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.]**

HS-ESS2-1. **Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. [Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).] [Assessment Boundary: Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.]**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

- **Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS2-1)**

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- **Apply scientific reasoning to link evidence to the**

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth

- Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old. (HS-ESS1-5)
- Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. (HS-ESS1-6)

ESS2.A: Earth Materials and Systems

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or

Crosscutting Concepts

Patterns

- Empirical evidence is needed to identify patterns. (HS-ESS1-5)

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS1-6)
- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS2-1)

claims to assess the extent to which the reasoning and data support the explanation or conclusion. (HS-ESS1-6)

Engaging in Argument from Evidence

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- **Evaluate evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-ESS1-5)**

Connections to Nature of Science

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- **A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science commACIS validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-ESS1-6)**
- **Models, mechanisms, and explanations collectively serve as tools in the development of a scientific theory. (HS-ESS1-6)**

decrease the original changes. (HS-ESS2-1) (Note: This Disciplinary Core Idea is also addressed by HS-ESS2-2.)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. (ESS2.B Grade 8 GBE) (secondary to HS-ESS1-5),(HS-ESS2-1)
- Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. (ESS2.B Grade 8 GBE) (HS-ESS2-1)

PS1.C: Nuclear Processes

- Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. (secondary to HS-ESS1-5),(secondary to HS-ESS1-6)

Connections to other DCIs in this grade-band: **HS.PS2.A (HS-ESS1-6); HS.PS2.B (HS-ESS1-6),(HS-ESS2-1); HS.PS3.B (HS-ESS1-5); HS.ESS2.A (HS-ESS1-5)**

Articulation of DCIs across grade-bands: **MS.PS2.B (HS-ESS1-6),(HS-ESS2-1); MS.LS2.B (HS-ESS2-1); MS.ESS1.B (HS-ESS1-6); MS.ESS1.C (HS-ESS1-5),(HS-ESS1-6),(HS-ESS2-1); MS.ESS2.A (HS-ESS1-5),(HS-ESS1-6),(HS-ESS2-1); MS.ESS2.B (HS-ESS1-5),(HS-ESS1-6),(HS-ESS2-1); MS.ESS2.C (HS-ESS2-1); MS.ESS2.D (HS-ESS2-1)**

California Common Core State Standards Connections:	
ELA/Literacy –	
RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-ESS1-5),(HS-ESS1-6)**
RST.11-12.8	**Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-ESS1-5),(HS-ESS1-6)**
WHST.9–12.1	**Write arguments focused on *discipline-specific content*. (HS-ESS1-6)**
WHST.9–12.2.a–e	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (HS-ESS1-5)**
SL.11-12.5	**Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-ESS2-1)**
Mathematics –	
MP.2	**Reason abstractly and quantitatively. (HS-ESS1-5),(HS-ESS1-6),(HS-ESS2-1)**
MP.4	**Model with mathematics. (HS-ESS2-1)**
N-Q.1-3	**Reason quantitatively and use units to solve problems.★ (HS-ESS1-5),(HS-ESS1-6),(HS-ESS2-1)**
F-IF.5	**Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.★ (HS-ESS1-6)**
S-ID.6	**Represent data on two quantitative variables on a scatter plot, and describe how those variables are related.★ (HS-ESS1-6)**

HS Earth's Systems	
Students who demonstrate understanding can:	
HS-ESS2-2.	**Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. [Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.]**
HS-ESS2-3.	**Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. [Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.]**
HS-ESS2-5.	**Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. [Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).]**
HS-ESS2-6.	**Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. [Clarification Statement: **The carbon cycle is a property of the Earth system that arises from interactions among the hydrosphere, atmosphere, geosphere, and biosphere. Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.]**
HS-ESS2-7.	**Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. [Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.] [Assessment Boundary: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.]**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

- **Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS2-3),(HS-ESS2-6)**

Planning and Carrying Out Investigations

Planning and carrying out investigations in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- **Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-ESS2-5)**

Analyzing and Interpreting Data

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- **Analyze data using tools, technologies, and/or**

Disciplinary Core Ideas

ESS2.A: Earth Materials and Systems

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (HS-ESS2-2)
- Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (HS-ESS2-3)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (HS-ESS2-3)

ESS2.C: The Roles of Water in Earth's Surface Processes

- The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and

Crosscutting Concepts

Energy and Matter

- The total amount of energy and matter in closed systems is conserved. (HS-ESS2-6)
- Energy drives the cycling of matter within and between systems. (HS-ESS2-3)

Structure and Function

- The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. (HS-ESS2-5)

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS2-7)
- Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS2-2)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (HS-ESS2-3)

Influence of Engineering, Technology, and Science on Society and the Natural World

- New technologies can have deep impacts on

models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (HS-ESS2-2) **Engaging in Argument from Evidence** **Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.** ▪ **Construct an oral and written argument or counter-arguments based on data and evidence. (HS-ESS2-7)** --- ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ▪ **Science knowledge is based on empirical evidence. (HS-ESS2-3)** ▪ **Science disciplines share common rules of evidence used to evaluate explanations about natural systems. (HS-ESS2-3)** ▪ **Science includes the process of coordinating patterns of evidence with current theory. (HS-ESS2-3)**	transport materials, and lower the viscosities and melting points of rocks. (HS-ESS2-5) **ESS2.D: Weather and Climate** ▪ The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (HS-ESS2-2) ▪ Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6),(HS-ESS2-7) ▪ Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-6) **ESS2.E: Biogeology** ▪ The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (HS-ESS2-7) **PS4.A: Wave Properties** Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. (secondary to HS-ESS2-3)	society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS2-2)
Connections to other DCIs in this grade-band: **HS.PS1.A (HS-ESS2-5),(HS-ESS2-6); HS.PS1.B (HS-ESS2-5),(HS-ESS2-6); HS.PS2.B (HS-ESS2-3); HS.PS3.B (HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-5); HS.PS3.D (HS-ESS2-3),(HS-ESS2-6); HS.PS4.B (HS-ESS2-2); HS.LS1.C (HS-ESS2-6); HS.LS2.A (HS-ESS2-7); HS.LS2.B (HS-ESS2-2),(HS-ESS2-6); HS.LS2.C (HS-ESS2-2),(HS-ESS2-7); HS.LS4.A (HS-ESS2-7); HS.LS4.B (HS-ESS2-7); HS.LS4.C (HS-ESS2-7); HS.LS4.D (HS-ESS2-2),(HS-ESS2-7); HS.ESS3.C (HS-ESS2-2),(HS-ESS2-5),(HS-ESS2-6); HS.ESS3.D (HS-ESS2-2),(HS-ESS2-6)**		
Articulation of DCIs across grade-bands: **MS.PS1.A (HS-ESS2-3),(HS-ESS2-5),(HS-ESS2-6); MS.PS1.B (HS-ESS2-3); MS.PS2.B (HS-ESS2-3); MS.PS3.A (HS-ESS2-3); MS.PS3.B (HS-ESS2-3); MS.PS3.D (HS-ESS2-2),(HS-ESS2-6); MS.PS4.B (HS-ESS2-2),(HS-ESS2-5),(HS-ESS2-6); MS.LS2.A (HS-ESS2-7); MS.LS2.B (HS-ESS2-2),(HS-ESS2-6); MS.LS2.C (HS-ESS2-2),(HS-ESS2-7); MS.LS4.A (HS-ESS2-7); MS.LS4.B (HS-ESS2-7); MS.LS4.C (HS-ESS2-2),(HS-ESS2-7); MS.ESS1.C (HS-ESS2-7);**		

MS.ESS2.A (HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-5),(HS-ESS2-6),(HS-ESS2-7); MS.ESS2.B (HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-6); MS.ESS2.C (HS-ESS2-2),(HS-ESS2-5),(HS-ESS2-6),(HS-ESS2-7); MS.ESS2.D (HS-ESS2-2),(HS-ESS2-5); MS.ESS3.C (HS-ESS2-2),(HS-ESS2-6); MS.ESS3.D (HS-ESS2-2),(HS-ESS2-6)	
California Common Core State Standards Connections:	
ELA/Literacy –	
RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-ESS2-2),(HS-ESS2-3)**
RST.11-12.2.a–e	**Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. (HS-ESS2-2)**
WHST.9–12.1.a–e	**Write arguments focused on *discipline-specific content*. (HS-ESS2-7)**
WHST.9–12.7	**Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-ESS2-5)**
SL.11-12.5	**Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-ESS2-3)**
Mathematics –	
MP.2	**Reason abstractly and quantitatively. (HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-6)**
MP.4	**Model with mathematics. (HS-ESS2-3),(HS-ESS2-6)**
N-Q.1-3	**Reason quantitatively and use units to solve problems.★ (HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-6)**

HS Weather and Climate

Students who demonstrate understanding can:

HS-ESS2-4. **Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. [Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.] [Assessment Boundary: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.]**

HS-ESS3–5. **Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

- **Use a model to provide mechanistic accounts of phenomena. (HS-ESS2-4)**

Analyzing and Interpreting Data

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- **Analyze data using computational models in order to make valid and reliable scientific claims. (HS-ESS3–5)**

Connections to Nature of Science

Disciplinary Core Ideas

ESS1.B: Earth and the Solar System

- Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. (secondary to HS-ESS2-4)

ESS2.A: Earth Materials and Systems

- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4)

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS2-4)

Stability and Change

- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS3–5)

Scientific Investigations Use a Variety of Methods ▪ **Science investigations use diverse methods and do not always use the same set of procedures to obtain data. (HS-ESS3–5)** ▪ **New technologies advance scientific knowledge. (HS-ESS3–5)** **Scientific Knowledge is Based on Empirical Evidence** ▪ **Science knowledge is based on empirical evidence. (HS-ESS3–5)** ▪ **Science arguments are strengthened by multiple lines of evidence supporting a single explanation. (HS-ESS2-4), (HS-ESS3–5)**	**ESS2.D: Weather and Climate** ▪ The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (HS-ESS2-4),(secondary to HS-ESS2-2) ▪ Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-4) **ESS3.D: Global Climate Change** ▪ Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (HS-ESS3–5)

Connections to other DCIs in this grade-band: **HS.PS3.A (HS-ESS2-4); HS.PS3.B (HS-ESS2-4),(HS-ESS3–5); HS.PS3.D (HS-ESS3–5); HS.LS1.C (HS-ESS3–5); HS.LS2.C (HS-ESS2-4); HS.ESS1.C (HS-ESS2-4); HS.ESS2.D (HS-ESS3–5); HS.ESS3.C (HS-ESS2-4); HS.ESS3.D (HS-ESS2-4)**

Articulation of DCIs across grade-bands: **MS.PS3.A (HS-ESS2-4); MS.PS3.B (HS-ESS2-4),(HS-ESS3–5); MS.PS3.D (HS-ESS2-4),(HS-ESS3–5); MS.PS4.B (HS-ESS2-4); MS.LS1.C (HS-ESS2-4); MS.LS2.B (HS-ESS2-4); MS.LS2.C (HS-ESS2-4); MS.ESS2.A (HS-ESS2-4),(HS-ESS3–5); MS.ESS2.B (HS-ESS2-4); MS.ESS2.C (HS-ESS2-4); MS.ESS2.D (HS-ESS2-4),(HS-ESS3–5); MS.ESS3.B (HS-ESS3–5); MS.ESS3.C (HS-ESS2-4),(HS-ESS3–5); MS.ESS3.D (HS-ESS2-4),(HS-ESS3–5)**

California Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-ESS3–5)**
RST.11-12.2	**Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. (HS-ESS3–5)**
RST.11-12.7	**Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-ESS3–5)**
SL.11-12.5	**Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-ESS2-4)**

Mathematics –

MP.2	**Reason abstractly and quantitatively.(HS-ESS2-4),(HS-ESS3–5)**
MP.4	**Model with mathematics. (HS-ESS2-4)**
N-Q.1-3	**Reason quantitatively and use units to solve problems.★ (HS-ESS2-4),(HS-ESS3–5)**

HS Human Sustainability

Students who demonstrate understanding can:

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.]

HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.* [Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.]

HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. [Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.] [Assessment Boundary: Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.]

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* [Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).]

HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.* [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking	ESS2.D: Weather and Climate	Cause and Effect

Mathematical and computational thinking in 9–12 builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- **Create a computational model or simulation of a phenomenon, designed device, process, or system. (HS-ESS3-3)**
- **Use a computational representation of phenomena or design solutions to describe and/or support claims and/or explanations. (HS-ESS3-6)**

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories.

- **Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS3-1)**
- **Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence,**

- Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. (secondary to HS-ESS3-6)

ESS3.A: Natural Resources

- Resource availability has guided the development of human society. (HS-ESS3-1)
- All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2)

ESS3.B: Natural Hazards

- Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1)

ESS3.C: Human Impacts on Earth Systems

- The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3)
- Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-
- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS3-1)

Systems and System Models

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-ESS3-6)

Stability and Change

- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS3-3)
- Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS3-4)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Modern civilization depends on major technological systems. (HS-ESS3-1),(HS-ESS3-3)
- Engineers continuously modify these systems to increase benefits while decreasing costs and risks. (HS-ESS3-2),(HS-ESS3-4)
- New technologies can have deep impacts on society and the environment, including some that were not anticipated. (HS-ESS3-3)
- Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS3-2)

Connections to Nature of Science

prioritized criteria, and tradeoff considerations. (HS-ESS3-4) **Engaging in Argument from Evidence** **Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.** ▪ **Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g., economic, societal, environmental, or ethical considerations). (HS-ESS3-2)**	ESS3-4) **ESS3.D: Global Climate Change** ▪ Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (HS-ESS3-6) **ETS1.B: Developing Possible Solutions** ▪ When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (secondary to HS-ESS3-2),(secondary to HS-ESS3-4)	**Science is a Human Endeavor** ▪ Scientific knowledge is a result of human endeavors, imagination, and creativity. (HS-ESS3-3) **Science Addresses Questions About the Natural and Material World** ▪ Science and technology may raise ethical issues for which science, by itself, does not provide answers and solutions. (HS-ESS3-2) ▪ Science knowledge indicates what can happen in natural systems—not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge. (HS-ESS3-2) ▪ Many decisions are not made using science alone, but rely on social and cultural contexts to resolve issues. (HS-ESS3-2)

Connections to other DCIs in this grade-band: **HS.PS1.B (HS-ESS3-3); HS.PS3.B (HS-ESS3-2); HS.PS3.D (HS-ESS3-2); HS.LS2.A (HS-ESS3-2),(HS-ESS3-3); HS.LS2.B (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-6); HS.LS2.C (HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); HS.LS4.D (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); HS.ESS2.A (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-6); HS.ESS2.E (HS-ESS3-3)**

Articulation of DCIs across grade-bands: **MS.PS1.B (HS-ESS3-3); MS.PS3.D (HS-ESS3-2); MS.LS2.A (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); MS.LS2.B (HS-ESS3-2),(HS-ESS3-3); MS.LS2.C (HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); MS.LS4.C (HS-ESS3-3); MS.LS4.D (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); MS.ESS2.A (HS-ESS3-1),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); MS.ESS2.C (HS-ESS3-6); MS.ESS3.A (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); MS.ESS3.B (HS-ESS3-1),(HS-ESS3-4); MS.ESS3.C (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); MS.ESS3.D (HS-ESS3-4),(HS-ESS3-6)**

California Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-4)**
RST.11-12.8	**Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-ESS3-2),(HS-ESS3-4)**
WHST.9–12.2.a–e	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (HS-ESS3-1)**

Mathematics –

MP.2	**Reason abstractly and quantitatively. (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6)**
MP.4	**Model with mathematics. (HS-ESS3-3),(HS-ESS3-6)**
N-Q.1-3	**Reason quantitatively and use units to solve problems.★ Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs**

and data displays. (HS-ESS3-1),(HS-ESS3-4),(HS-ESS3-6)

HS Structure and Properties of Matter

HS Structure and Properties of Matter

Students who demonstrate understanding can:

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.] [Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.]

HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. [Clarification Statement: Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.] [Assessment Boundary: Assessment does not include Raoult's law calculations of vapor pressure.]

HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. [Clarification Statement: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.] [Assessment Boundary: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.]

HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.* [Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models **Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.** ▪ **Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS1-8)** ▪ **Use a model to predict the relationships between**	**PS1.A: Structure and Properties of Matter** ▪ Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (HS-PS1-1) ▪ The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HS-PS1-1)	**Patterns** ▪ Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS1-1),(HS-PS1-3) **Energy and Matter** ▪ In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-PS1-8)

systems or between components of a system. (HS-PS1-1) **Planning and Carrying Out Investigations** **Planning and carrying out investigations in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.** ▪ **Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, or time), and refine the design accordingly. (HS-PS1-3)** **Obtaining, Evaluating, and Communicating Information** **Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.** ▪ **Communicate scientific and technical information (e.g., about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-PS2-6)**	▪ The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (HS-PS1-3),(secondary to HS-PS2-6) **PS1.C: Nuclear Processes** ▪ Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (HS-PS1-8) **PS2.B: Types of Interactions** ▪ Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (secondary to HS-PS1-1),(secondary to HS-PS1-3),(HS-PS2-6)	**Structure and Function** ▪ Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-PS2-6)
Connections to other DCIs in this grade-band: **HS.PS3.A (HS-PS1-8); HS.PS3.B (HS-PS1-8); HS.PS3.C (HS-PS1-8); HS.PS3.D (HS-PS1-8); HS.LS1.C (HS-PS1-1); HS.ESS1.A (HS-PS1-8); HS.ESS1.C (HS-PS1-8); HS.ESS2.C (HS-PS1-3)**		
Articulation to DCIs across grade-bands: **MS.PS1.A (HS-PS1-1),(HS-PS1-3),(HS-PS1-8),(HS-PS2-6); MS.PS1.B (HS-PS1-1),(HS-PS1-8); MS.PS1.C (HS-PS1-8); MS.PS2.B (HS-PS1-3),(HS-PS2-6); MS.ESS2.A (HS-PS1-8)**		
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.9-10.7** **Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. (HS-PS1-1)**		

RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS1-3),(HS-PS2-6)**
WHST.9–12.2.a–e	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (HS-PS2-6)**
WHST.9–12.7	**Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-PS1-3)**
WHST.11-12.8	**Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-PS1-3)**
WHST.9–12.9	**Draw evidence from informational texts to support analysis, reflection, and research. (HS-PS1-3)**
***Mathematics* –**	
MP.4	**Model with mathematics. (HS-PS1-8)**
N-Q.A.1-3	**Reason quantitatively and use units to solve problems.★ (HS-PS1-3),(HS-PS1-8),(HS-PS2-6)**

HS Chemical Reactions

Students who demonstrate understanding can:

HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. [Clarification Statement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.] [Assessment Boundary: Assessment is limited to chemical reactions involving main group elements and combustion reactions.]

HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. [Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.] [Assessment Boundary: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.]

HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. [Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.] [Assessment Boundary: Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.]

HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.* [Clarification Statement: Emphasis is on the application of Le Chatlier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.] [Assessment Boundary: Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.]

HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. [Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.] [Assessment Boundary: Assessment does not include complex chemical reactions.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models **Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables**	**PS1.A: Structure and Properties of Matter** ▪ The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar	**Patterns** ▪ Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of

between systems and their components in the natural and designed worlds.

- **Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS1-4)**

Using Mathematics and Computational Thinking
Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- **Use mathematical representations of phenomena to support claims. (HS-PS1-7)**

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- **Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. (HS-PS1-5)**
- **Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will**

chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HS-PS1-2) (Note: This Disciplinary Core Idea is also addressed by HS-PS1-1.)

- A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. (HS-PS1-4)

PS1.B: Chemical Reactions

- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (HS-PS1-4),(HS-PS1-5)
- In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. (HS-PS1-6)
- The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS-PS1-2),(HS-PS1-7)

ETS1.C: Optimizing the Design Solution

- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (secondary to HS-PS1-6)

phenomena. (HS-PS1-2),(HS-PS1-5)

Energy and Matter

- The total amount of energy and matter in closed systems is conserved. (HS-PS1-7)
- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-PS1-4)

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-PS1-6)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes the universe is a vast single system in which basic laws are consistent. (HS-PS1-7)

continue to do so in the future. (HS-PS1-2) ▪ Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-PS1-6)	
Connections to other DCIs in this grade-band: HS.PS3.A (HS-PS1-4),(HS-PS1-5); HS.PS3.B (HS-PS1-4),(HS-PS1-6),(HS-PS1-7); HS.PS3.D (HS-PS1-4); HS.LS1.C (HS-PS1-2),(HS-PS1-4),(HS-PS1-7); HS.LS2.B (HS-PS1-7); HS.ESS2.C (HS-PS1-2)	
Articulation to DCIs across grade-bands: MS.PS1.A (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7); MS.PS1.B (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-6),(HS-PS1-7); MS.PS2.B (HS-PS1-3),(HS-PS1-4),(HS-PS1-5); MS.PS3.A (HS-PS1-5); MS.PS3.B (HS-PS1-5); MS.PS3.D (HS-PS1-4); MS.LS1.C (HS-PS1-4),(HS-PS1-7); MS.LS2.B (HS-PS1-7); MS.ESS2.A (HS-PS1-7)	
California Common Core State Standards Connections:	
ELA/Literacy –	
RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS1-5)
WHST.9–12.2.a–e	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (HS-PS1-2),(HS-PS1-5)
WHST.9–12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-PS1-2)
WHST.9–12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-PS1-6)
SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-PS1-4)
Mathematics –	
MP.2	Reason abstractly and quantitatively. (HS-PS1-5),(HS-PS1-7)
MP.4	Model with mathematics. (HS-PS1-4)
N-Q.1-3	Reason quantitatively and use units to solve problems.★ (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7)

HS Forces and Interactions

HS Forces and Interactions

Students who demonstrate understanding can:

HS-PS2-1. **Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. [Clarification Statement: Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.] [Assessment Boundary: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.]**

HS-PS2-2. **Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. [Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle.] [Assessment Boundary: Assessment is limited to systems of two macroscopic bodies moving in one dimension.]**

HS-PS2-3. **Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.* [Clarification Statement: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.] [Assessment Boundary: Assessment is limited to qualitative evaluations and/or algebraic manipulations.]**

HS-PS2-4. **Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. [Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.] [Assessment Boundary: Assessment is limited to systems with two objects.]**

HS-PS2-5. **Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. [Assessment Boundary: Assessment is limited to designing and conducting investigations with provided materials and tools.]**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations **Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.** ▪ **Plan and conduct an investigation individually and collaboratively to produce data to serve as**	**PS2.A: Forces and Motion** ▪ Newton's second law accurately predicts changes in the motion of macroscopic objects. (HS-PS2-1) ▪ Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. (HS-PS2-2) ▪ If a system interacts with objects outside itself, the total momentum of the system can change;	**Patterns** ▪ Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS2-4) **Cause and Effect** ▪ Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS2-

the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, or time), and refine the design accordingly. (HS-PS2-5) **Analyzing and Interpreting Data** **Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.** ▪ **Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (HS-PS2-1)** **Using Mathematics and Computational Thinking** **Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.** ▪ **Use mathematical representations of phenomena to describe explanations. (HS-PS2-2),(HS-PS2-4)** **Constructing Explanations and Designing Solutions** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses**	however, any such change is balanced by changes in the momentum of objects outside the system. (HS-PS2-2),(HS-PS2-3) **PS2.B: Types of Interactions** ▪ Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (HS-PS2-4) ▪ Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (HS-PS2-4),(HS-PS2-5) **PS3.A: Definitions of Energy** ▪ "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. (secondary to HS-PS2-5) **ETS1.A: Defining and Delimiting Engineering Problems** ▪ Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (secondary to HS-PS2-3) **ETS1.C: Optimizing the Design Solution** ▪ Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (secondary to HS-PS2-3)	1),(HS-PS2-5) ▪ Systems can be designed to cause a desired effect. (HS-PS2-3) **Systems and System Models** ▪ When investigating or describing a system, the boundaries and initial conditions of the system need to be defined. (HS-PS2-2)

to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. ▪ **Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects. (HS-PS2-3)** **----------** ***Connections to Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** ▪ **Theories and laws provide explanations in science. (HS-PS2-1),(HS-PS2-4)** ▪ **Laws are statements or descriptions of the relationships among observable phenomena. (HS-PS2-1),(HS-PS2-4)**	
Connections to other DCIs in this grade-band: **HS.PS3.A (HS-PS2-4),(HS-PS2-5); HS.PS3.C (HS-PS2-1); HS.PS4.B (HS-PS2-5); HS.ESS1.A (HS-PS2-1),(HS-PS2-2),(HS-PS2-4); HS.ESS1.B (HS-PS2-4); HS.ESS2.A (HS-PS2-5); HS.ESS1.C (HS-PS2-1),(HS-PS2-2),(HS-PS2-4); HS.ESS2.C (HS-PS2-1),(HS-PS2-4); HS.ESS3.A (HS-PS2-4),(HS-PS2-5)**	
Articulation to DCIs across grade-bands: **MS.PS2.A (HS-PS2-1),(HS-PS2-2),(HS-PS2-3); MS.PS2.B (HS-PS2-4),(HS-PS2-5); MS.PS3.C (HS-PS2-1),(HS-PS2-2),(HS-PS2-3); MS.ESS1.B (HS-PS2-4),(HS-PS2-5)**	
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.11-12.1** **Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS2-1)** **RST.11-12.7** **Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-PS2-1)** **WHST.9–12.7** **Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-PS2-3),(HS-PS2-5)** **WHST.11-12.8** **Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-PS2-5)**	

WHST.9–12.9	**Draw evidence from informational texts to support analysis, reflection, and research. (HS-PS2-1),(HS-PS2-5)**
Mathematics –	
MP.2	**Reason abstractly and quantitatively. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4)**
MP.4	**Model with mathematics. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4)**
N-Q.1-3	**Reason quantitatively and use units to solve problems.★ (HS-PS2-1),(HS-PS2-2),(HS-PS2-4),(HS-PS2-5)**
A-SSE.1.a,b	**Interpret expressions that represent a quantity in terms of its context.★ (HS-PS2-1),(HS-PS2-4)**
A-SSE.3.a-c	**Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★ (HS-PS2-1),(HS-PS2-4)**
A-CED.1	**Create equations and inequalities in one variable including ones with absolute value and use them to solve problems.★ (HS-PS2-1),(HS-PS2-2)**
A-CED.2	**Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.★ (HS-PS2-1),(HS-PS2-2)**
A-CED.4	**Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.★ (HS-PS2-1),(HS-PS2-2)**
F-IF.7.a-e	**Graph functions expressed symbolically and show key features of the graph, by in hand in simple cases and using technology for more complicated cases.★ (HS-PS2-1)**
S-ID.1	**Represent data with plots on the real number line (dot plots, histograms, and box plots).★ (HS-PS2-1)**

HS Energy

Students who demonstrate understanding can:

HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. [Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.] [Assessment Boundary: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.]

HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects). [Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.]

HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.* [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.] [Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.]

HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). [Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.] [Assessment Boundary: Assessment is limited to investigations based on materials and tools provided to students.]

HS-PS3–5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. [Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.] [Assessment Boundary: Assessment is limited to systems containing two objects.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models **Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables**	**PS3.A: Definitions of Energy** ▪ Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That	**Cause and Effect** ▪ Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known

between systems and their components in the natural and designed worlds.

- **Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS3-2),(HS-PS3–5)**

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- **Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, or time), and refine the design accordingly. (HS-PS3-4)**

Using Mathematics and Computational Thinking

Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- **Create a computational model or simulation of a phenomenon, designed device, process, or system. (HS-PS3-1)**

there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HS-PS3-1),(HS-PS3-2)

- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HS-PS3-2),(HS-PS3-3)
- These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (HS-PS3-2)

PS3.B: Conservation of Energy and Energy Transfer

- Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (HS-PS3-1)
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PS3-1),(HS-PS3-4)
- Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g., relative positions of charged particles, and compression of a spring) and how kinetic energy depends on mass and speed, about smaller scale mechanisms within the system. (HS-PS3–5)

Systems and System Models

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-PS3-4)
- Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models. (HS-PS3-1)

Energy and Matter

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-PS3-3)
- Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems. (HS-PS3-2)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-PS3-3)

Constructing Explanations and Designing Solutions **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.** ▪ **Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-PS3-3)**	allow the concept of conservation of energy to be used to predict and describe system behavior. (HS-PS3-1) ▪ The availability of energy limits what can occur in any system. (HS-PS3-1) ▪ Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (HS-PS3-4) **PS3.C: Relationship Between Energy and Forces** ▪ When two objects interacting through a field change relative position, the energy stored in the field is changed. (HS-PS3–5) **PS3.D: Energy in Chemical Processes** ▪ Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (HS-PS3-3),(HS-PS3-4) **ETS1.A: Defining and Delimiting Engineering Problems** ▪ Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (secondary to HS-PS3-3)	--- ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ▪ Science assumes the universe is a vast single system in which basic laws are consistent. (HS-PS3-1)

Connections to other DCIs in this grade-band: **HS.PS1.A (HS-PS3-2); HS.PS1.B (HS-PS3-1),(HS-PS3-2); HS.PS2.B (HS-PS3-2),(HS-PS3–5); HS.LS2.B (HS-PS3-1); HS.ESS1.A (HS-PS3-1),(HS-PS3-4); HS.ESS2.A (HS-PS3-1),(HS-PS3-2),(HS-PS3-4); HS.ESS2.D (HS-PS3-4); HS.ESS3.A (HS-PS3-3)**

Articulation to DCIs across grade-bands: **MS.PS1.A (HS-PS3-2); MS.PS2.B (HS-PS3-2),(HS-PS3–5); MS.PS3.A (HS-PS3-1),(HS-PS3-2),(HS-PS3-3); MS.PS3.B (HS-PS3-1),(HS-PS3-3),(HS-PS3-4); MS.PS3.C (HS-PS3-2),(HS-PS3–5); MS.ESS2.A (HS-PS3-1),(HS-PS3-3)**

California Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1	**Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS3-4)**
WHST.9–12.7	**Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a**

	problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-PS3-3),(HS-PS3-4),(HS-PS3–5)
WHST.11-12.8	**Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-PS3-4),(HS-PS3–5)**
WHST.9–12.9	**Draw evidence from informational texts to support analysis, reflection, and research. (HS-PS3-4),(HS-PS3–5)**
SL.11-12.5	**Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-PS3-1),(HS-PS3-2),(HS-PS3–5)**
Mathematics –	
MP.2	**Reason abstractly and quantitatively. (HS-PS3-1),(HS-PS3-2),(HS-PS3-3),(HS-PS3-4),(HS-PS3–5)**
MP.4	**Model with mathematics. (HS-PS3-1),(HS-PS3-2),(HS-PS3-3),(HS-PS3-4),(HS-PS3–5)**
N-Q.1-3	**Reason quantitatively and use units to solve problems.★ (HS-PS3-1),(HS-PS3-3)**

HS Waves and Electromagnetic Radiation

Students who demonstrate understanding can:

HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. [Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.]

HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information. [Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.]

HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. [Clarification Statement: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect.] [Assessment Boundary: Assessment does not include using quantum theory.]

HS-PS4-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. [Clarification Statement: Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.] [Assessment Boundary: Assessment is limited to qualitative descriptions.]

HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.* [Clarification Statement: Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.] [Assessment Boundary: Assesments are limited to qualitative information. Assessments do not include band theory.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades 9–12 builds from grades K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- **Evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design. (HS-PS4-2)**

Disciplinary Core Ideas

PS3.D: Energy in Chemical Processes

- Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy. (secondary to HS-PS4-5)

PS4.A: Wave Properties

- The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS4-1)
- Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale

Using Mathematics and Computational Thinking
Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- **Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations. (HS-PS4-1)**

Engaging in Argument from Evidence
Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.

- **Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-PS4-3)**

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- **Evaluate the validity and reliability of multiple claims that appear in scientific and technical texts or media reports, verifying the data when possible. (HS-PS4-4)**
- **Communicate technical information or ideas (e.g.,**

(HS-PS4-1)

- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. (HS-PS4-2),(HS-PS4-5)
- [From the 3–5 grade band endpoints] Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. (Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.) (HS-PS4-3)

PS4.B: Electromagnetic Radiation

- Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (HS-PS4-3)
- When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells. (HS-PS4-4)
- Photoelectric materials emit electrons when they absorb light of a high-enough frequency. (HS-PS4-5)

PS4.C: Information Technologies and Instrumentation

mechanisms within the system. (HS-PS4-4)

- Systems can be designed to cause a desired effect. (HS-PS4-5)

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-PS4-3)

Stability and Change

- Systems can be designed for greater or lesser stability. (HS-PS4-2)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Science and engineering complement each other in the cycle known as research and development (R&D). (HS-PS4-5)

Influence of Engineering, Technology, and Science on Society and the Natural World

- Modern civilization depends on major technological systems. (HS-PS4-2),(HS-PS4-5)
- Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-PS4-2)

about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-PS4-5) --- ***Connections to Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** ▪ **A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science commACIS validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-PS4-3)**	▪ Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, or scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. (HS-PS4-5)
Connections to other DCIs in this grade-band: **HS.PS1.C (HS-PS4-4); HS.PS3.A (HS-PS4-4),(HS-PS4-5); HS.PS3.D (HS-PS4-3),(HS-PS4-4); HS.LS1.C (HS-PS4-4); HS.ESS1.A (HS-PS4-3); HS.ESS2.A (HS-PS4-1); HS.ESS2.D (HS-PS4-3)**	
Articulation to DCIs across grade-bands: **MS.PS3.D (HS-PS4-4); MS.PS4.A (HS-PS4-1),(HS-PS4-2),(HS-PS4-5); MS.PS4.B (HS-PS4-1),(HS-PS4-2),(HS-PS4-3),(HS-PS4-4),(HS-PS4-5); MS.PS4.C (HS-PS4-2),(HS-PS4-5); MS.LS1.C (HS-PS4-4); MS.ESS2.D (HS-PS4-4)**	
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.9-10.8** **Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. (HS-PS4-2),(HS-PS4-3),(HS-PS4-4)** **RST.11-12.1** **Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS4-2),(HS-PS4-3),(HS-PS4-4)** **RST.11-12.7** **Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, or multimedia) in order to address a question or solve a problem. (HS-PS4-1),(HS-PS4-4)** **RST.11-12.8** **Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-PS4-2),(HS-PS4-3),(HS-PS4-4)** **WHST.9–12.2.a–e** **Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (HS-PS4-5)**	

WHST.11-12.8	**Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-PS4-4)**
Mathematics –	
MP.2	**Reason abstractly and quantitatively. (HS-PS4-1),(HS-PS4-3)**
MP.4	**Model with mathematics. (HS-PS4-1)**
A-SSE.1.1-b	**Interpret expressions that represent a quantity in terms of its context.★ (HS-PS4-1),(HS-PS4-3)**
A-SSE.B.3.a-c	**Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★ (HS-PS4-1),(HS-PS4-3)**
A.CED.4	**Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.★ (HS-PS4-1),(HS-PS4-3)**

HS Engineering Design

HS Engineering Design

Students who demonstrate understanding can:

HS-ETS1.1 **Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.**

HS-ETS1.2 **Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**

HS-ETS1.3 **Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.**

HS-ETS1.4 **Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K–12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- **Analyze complex real-world problems by specifying criteria and constraints for successful solutions. (HS-ETS1-1)**

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 9–12 builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- **Use mathematical models and/or computer simulations to predict the effects of a design**

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS-ETS1-1)
- Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. (HS-ETS1-1)

ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (HS-ETS1-3)
- Both physical models and computers can be

Crosscutting Concepts

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales. (HS-ETS1-4)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ETS1-1) (HS-ETS1-3)

solution on systems and/or the interactions between systems. (HS-ETS1-4) **Constructing Explanations and Designing Solutions** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.** ▪ **Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ETS1-2)** ▪ **Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ETS1-3)**	used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (HS-ETS1-4) **ETS1.C: Optimizing the Design Solution** ▪ Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (HS-ETS1-2)
Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems include: **Physical Science: HS-PS2-3, HS-PS3-3** ***Connections to HS-ETS1.B: Designing Solutions to Engineering Problems include:*** **Earth and Space Science: HS-ESS3-2, HS-ESS3-4, Life Science: HS-LS2-7, HS-LS4-6** ***Connections to HS-ETS1.C: Optimizing the Design Solution include:*** **Physical Science: HS-PS1-6, HS-PS2-3**	
Articulation of DCIs across grade-bands: **MS.ETS1.A (HS-ETS1-1),(HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4); MS.ETS1.B (HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4); MS.ETS1.C (HS-ETS1-2),(HS-ETS1-4)**	
California Common Core State Standards Connections: ***ELA/Literacy –*** **RST.11-12.7** **Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-ETS1-1),(HS-ETS1-3)** **RST.11-12.8** **Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-ETS1-1),(HS-ETS1-3)** **RST.11-12.9** **Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (HS-ETS1-1),(HS-ETS1-3)** **Mathematics –**	

MP.2	Reason abstractly and quantitatively. (HS-ETS1-1),(HS-ETS1-3),(HS-ETS1-4)
MP.4	Model with mathematics. (HS-ETS1-1),(HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4)

Standards for:

Social Science

7–12

Grade Seven

History-Social Science Content Standards.

World History and Geography: Medieval and Early Modern Times

Students in grade seven study the social, cultural, and technological changes that occurred in Europe, Africa, and Asia in the years A. D. 500Ð 1789. After reviewing the ancient world and the ways in which archaeologists and historians uncover the past, students study the history and geography of great civilizations that were developing concurrently throughout the world during medieval and early modern times. They examine the growing economic interaction among civilizations as well as the exchange of ideas, beliefs, technologies, and commodities. They learn about the resulting growth of Enlightenment philosophy and the new examination of the concepts of reason and authority, the natural rights of human beings and the divine right of kings, experimentalism in science, and the dogma of belief. Finally, students assess the political forces let loose by the Enlightenment, particularly the rise of democratic ideas, and they learn about the continuing influence of these ideas in the world today.

7.1 Students analyze the causes and effects of the vast expansion and ultimate disintegration of the Roman Empire.

1. Study the early strengths and lasting contributions of Rome (e.g., significance of Roman citizenship; rights under Roman law; Roman art, architecture, engineering, and philosophy; preservation and transmission of Christianity) and its ultimate internal weaknesses (e.g., rise of autonomous military powers within the empire, undermining of citizenship by the growth of corruption and slavery, lack of education, and distribution of news).
2. Discuss the geographic borders of the empire at its height and the factors that threatened its territorial cohesion.
3. Describe the establishment by Constantine of the new capital in Constantinople and the development of the Byzantine Empire, with an emphasis on the consequences of the development of two distinct European civilizations, Eastern Orthodox and Roman Catholic, and their two distinct views on church-state relations.

7.2 Students analyze the geographic, political, economic, religious, and social structures of the civilizations of Islam in the Middle Ages.

1. Identify the physical features and describe the climate of the Arabian peninsula, its relationship to surrounding bodies of land and water, and nomadic and sedentary ways of life.
2. Trace the origins of Islam and the life and teachings of Muhammad, including Islamic teachings on the connection with Judaism and Christianity.
3. Explain the significance of the Qur'an and the Sunnah as the primary sources of Islamic beliefs, practice, and law, and their influence in Muslims' daily life.
4. Discuss the expansion of Muslim rule through military conquests and treaties, emphasizing the cultural blending within Muslim civilization and the spread and acceptance of Islam and the Arabic language.
5. Describe the growth of cities and the establishment of trade routes among Asia, Africa, and Europe, the products and inventions that traveled along these routes (e.g., spices, textiles, paper, steel, new crops), and the role of merchants in Arab society.
6. Understand the intellectual exchanges among Muslim scholars of Eurasia and Africa and the contributions Muslim scholars

made to later civilizations in the areas of science, geography, mathematics, philosophy, medicine, art, and literature.

7.3 Students analyze the geographic, political, economic, religious, and social structures of the civilizations of China in the Middle Ages.

1. Describe the reunification of China under the Tang Dynasty and reasons for the spread of Buddhism in Tang China, Korea, and Japan.
2. Describe agricultural, technological, and commercial developments during the Tang and Sung periods.
3. Analyze the influences of Confucianism and changes in Confucian thought during the Sung and Mongol periods.
4. Understand the importance of both overland trade and maritime expeditions between China and other civilizations in the Mongol Ascendancy and Ming Dynasty.
5. Trace the historic influence of such discoveries as tea, the manufacture of paper, wood-block printing, the compass, and gunpowder.
6. Describe the development of the imperial state and the scholar-official class.

7.4 Students analyze the geographic, political, economic, religious, and social structures of the sub-Saharan civilizations of Ghana and Mali in Medieval Africa.

1. Study the Niger River and the relationship of vegetation zones of forest, savannah, and desert to trade in gold, salt, food, and slaves; and the growth of the Ghana and Mali empires.
2. Analyze the importance of family, labor specialization, and regional commerce in the development of states and cities in West Africa.
3. Describe the role of the trans-Saharan caravan trade in the changing religious and cultural characteristics of West Africa and the influence of Islamic beliefs, ethics, and law.
4. Trace the growth of the Arabic language in government, trade, and Islamic scholarship in West Africa.
5. Describe the importance of written and oral traditions in the transmission of African history and culture.

7.5 Students analyze the geographic, political, economic, religious, and social structures of the civilizations of Medieval Japan.

1. Describe the significance of Japan's proximity to China and Korea and the intellectual, linguistic, religious, and philosophical influence of those countries on Japan.
2. Discuss the reign of Prince Shotoku of Japan and the characteristics of Japanese society and family life during his reign.
3. Describe the values, social customs, and traditions prescribed by the lord-vassal system consisting of *shogun, daimyo,* and *samurai* and the lasting influence of the warrior code in the twentieth century.
4. Trace the development of distinctive forms of Japanese Buddhism.
5. Study the ninth and tenth centuries' golden age of literature, art, and drama and its lasting effects on culture today, including Murasaki Shikibu's *Tale of Genji.*
6. Analyze the rise of a military society in the late twelfth century and the role of the samurai in that society.

7.6 Students analyze the geographic, political, economic, religious, and social structures of the civilizations of Medieval Europe.

1. Study the geography of the Europe and the Eurasian land mass, including its location, topography, waterways, vegetation, and climate and their relationship to ways of life in Medieval Europe.

2. Describe the spread of Christianity north of the Alps and the roles played by the early church and by monasteries in its diffusion after the fall of the western half of the Roman Empire.
3. Understand the development of feudalism, its role in the medieval European economy, the way in which it was influenced by physical geography (the role of the manor and the growth of towns), and how feudal relationships provided the foundation of political order.
4. Demonstrate an understanding of the conflict and cooperation between the Papacy and European monarchs (e.g., Charlemagne, Gregory VII, Emperor Henry IV).
5. Know the significance of developments in medieval English legal and constitutional practices and their importance in the rise of modern democratic thought and representative institutions (e.g., Magna Carta, parliament, development of habeas corpus, an independent judiciary in England).
6. Discuss the causes and course of the religious Crusades and their effects on the Christian, Muslim, and Jewish populations in Europe, with emphasis on the increasing contact by Europeans with cultures of the Eastern Mediterranean world.
7. Map the spread of the bubonic plague from Central Asia to China, the Middle East, and Europe and describe its impact on global population.
8. Understand the importance of the Catholic church as a political, intellectual, and aesthetic institution (e.g., founding of universities, political and spiritual roles of the clergy, creation of monastic and mendicant religious orders, preservation of the Latin language and religious texts, St. Thomas Aquinas's synthesis of classical philosophy with Christian theology, and the concept of "natural law").
9. Know the history of the decline of Muslim rule in the Iberian Peninsula that culminated in the Reconquista and the rise of Spanish and Portuguese kingdoms.

7.7 Students compare and contrast the geographic, political, economic, religious, and social structures of the Meso-American and Andean civilizations.

1. Study the locations, landforms, and climates of Mexico, Central America, and South America and their effects on Mayan, Aztec, and Incan economies, trade, and development of urban societies.
2. Study the roles of people in each society, including class structures, family life, war-fare, religious beliefs and practices, and slavery.
3. Explain how and where each empire arose and how the Aztec and Incan empires were defeated by the Spanish.
4. Describe the artistic and oral traditions and architecture in the three civilizations.
5. Describe the Meso-American achievements in astronomy and mathematics, including the development of the calendar and the Meso-American knowledge of seasonal changes to the civilizations' agricultural systems.

7.8 Students analyze the origins, accomplishments, and geographic diffusion of the Renaissance.

1. Describe the way in which the revival of classical learning and the arts fostered a new interest in humanism (i.e., a balance between intellect and religious faith).
2. Explain the importance of Florence in the early stages of the Renaissance and the growth of independent trading cities (e.g., Venice), with emphasis on the cities' importance in the spread of Renaissance ideas.
3. Understand the effects of the reopening of the ancient "Silk Road" between Europe and China, including Marco Polo's travels and the location of his routes.

4. Describe the growth and effects of new ways of disseminating information (e.g., the ability to manufacture paper, translation of the Bible into the vernacular, printing).
5. Detail advances made in literature, the arts, science, mathematics, cartography, engineering, and the understanding of human anatomy and astronomy (e.g., by Dante Alighieri, Leonardo da Vinci, Michelangelo di Buonarroti Simoni, Johann Gutenberg, William Shakespeare).

7.9 Students analyze the historical developments of the Reformation.

1. List the causes for the internal turmoil in and weakening of the Catholic church (e.g., tax policies, selling of indulgences).
2. Describe the theological, political, and economic ideas of the major figures during the Reformation (e.g., Desiderius Erasmus, Martin Luther, John Calvin, William Tyndale).
3. Explain Protestants' new practices of church self-government and the influence of those practices on the development of democratic practices and ideas of federalism.
4. Identify and locate the European regions that remained Catholic and those that became Protestant and explain how the division affected the distribution of religions in the New World.
5. Analyze how the Counter-Reformation revitalized the Catholic church and the forces that fostered the movement (e.g., St. Ignatius of Loyola and the Jesuits, the Council of Trent).
6. Understand the institution and impact of missionaries on Christianity and the diffusion of Christianity from Europe to other parts of the world in the medieval and early modern periods; locate missions on a world map.
7. Describe the Golden Age of cooperation between Jews and Muslims in medieval Spain that promoted creativity in art, literature, and science, including how that cooperation was terminated by the religious persecution of individuals and groups (e.g., the Spanish Inquisition and the expulsion of Jews and Muslims from Spain in 1492).

7.10 Students analyze the historical developments of the Scientific Revolution and its lasting effect on religious, political, and cultural institutions.

1. Discuss the roots of the Scientific Revolution (e.g., Greek rationalism; Jewish, Christian, and Muslim science; Renaissance humanism; new knowledge from global exploration).
2. Understand the significance of the new scientific theories (e.g., those of Copernicus, Galileo, Kepler, Newton) and the significance of new inventions (e.g., the telescope, microscope, thermometer, barometer).
3. Understand the scientific method advanced by Bacon and Descartes, the influence of new scientific rationalism on the growth of democratic ideas, and the coexistence of science with traditional religious beliefs.

7.11 Students analyze political and economic change in the sixteenth, seventeenth, and eighteenth centuries (the Age of Exploration, the Enlightenment, and the Age of Reason).

1. Know the great voyages of discovery, the locations of the routes, and the influence of cartography in the development of a new European worldview.
2. Discuss the exchanges of plants, animals, technology, culture, and ideas among Europe, Africa, Asia, and the Americas in the fifteenth and sixteenth centuries and the major economic and social effects on each continent.
3. Examine the origins of modern capitalism; the influence of mercantilism and cottage industry; the elements and importance of a market economy in seventeenth-century Europe; the changing international trading and marketing patterns, including their locations on a world map; and the influence of explorers and map makers.
4. Explain how the main ideas of the Enlightenment can be traced back to such movements as the Renaissance, the Reformation,

and the Scientific Revolution and to the Greeks, Romans, and Christianity.

5. Describe how democratic thought and institutions were influenced by Enlightenment thinkers (e.g., John Locke, Charles-Louis Montesquieu, American founders).
6. Discuss how the principles in the Magna Carta were embodied in such documents as the English Bill of Rights and the American Declaration of Independence.

Grade Eight

History-Social Science Content Standards.

United States History and Geography: Growth and Conflict

Students in grade eight study the ideas, issues, and events from the framing of the Constitution up to World War I, with an emphasis on America's role in the war. After reviewing the development of America's democratic institutions founded on the Judeo-Christian heritage and English parliamentary traditions, particularly the shaping of the Constitution, students trace the development of American politics, society, culture, and economy and relate them to the emergence of major regional differences. They learn about the challenges facing the new nation, with an emphasis on the causes, course, and consequences of the Civil War. They make connections between the rise of industrialization and contemporary social and economic conditions.

8.1 Students understand the major events preceding the founding of the nation and relate their significance to the development of American constitutional democracy.

1. Describe the relationship between the moral and political ideas of the Great Awakening and the development of revolutionary fervor.
2. Analyze the philosophy of government expressed in the Declaration of Independence, with an emphasis on government as a means of securing individual rights (e.g., key phrases such as "all men are created equal, that they are endowed by their Creator with certain unalienable Rights").
3. Analyze how the American Revolution affected other nations, especially France.
4. Describe the nation's blend of civic republicanism, classical liberal principles, and English parliamentary traditions.

8.2 Students analyze the political principles underlying the U.S. Constitution and compare the enumerated and implied powers of the federal government.

1. Discuss the significance of the Magna Carta, the English Bill of Rights, and the May-flower Compact.
2. Analyze the Articles of Confederation and the Constitution and the success of each in implementing the ideals of the Declaration of Independence.
3. Evaluate the major debates that occurred during the development of the Constitution and their ultimate resolutions in such areas as shared power among institutions, divided state-federal power, slavery, the rights of individuals and states (later addressed by the addition of the Bill of Rights), and the status of American Indian nations under the commerce clause.
4. Describe the political philosophy underpinning the Constitution as specified in the *Federalist Papers* (authored by James Madison, Alexander Hamilton, and John Jay) and the role of such leaders as Madison, George Washington, Roger Sherman, Gouverneur Morris, and James Wilson in the writing and ratification of the Constitution.

5. Understand the significance of Jefferson's Statute for Religious Freedom as a forerunner of the First Amendment and the origins, purpose, and differing views of the founding fathers on the issue of the separation of church and state.
6. Enumerate the powers of government set forth in the Constitution and the fundamental liberties ensured by the Bill of Rights.
7. Describe the principles of federalism, dual sovereignty, separation of powers, checks and balances, the nature and purpose of majority rule, and the ways in which the American idea of constitutionalism preserves individual rights.

8.3 Students understand the foundation of the American political system and the ways in which citizens participate in it.

1. Analyze the principles and concepts codified in state constitutions between 1777 and 1781 that created the context out of which American political institutions and ideas developed.
2. Explain how the ordinances of 1785 and 1787 privatized national resources and transferred federally owned lands into private holdings, townships, and states.
3. Enumerate the advantages of a common market among the states as foreseen in and protected by the Constitution's clauses on interstate commerce, common coinage, and full-faith and credit.
4. Understand how the conflicts between Thomas Jefferson and Alexander Hamilton resulted in the emergence of two political parties (e.g., view of foreign policy, Alien and Sedition Acts, economic policy, National Bank, funding and assumption of the revolutionary debt).
5. Know the significance of domestic resistance movements and ways in which the central government responded to such movements (e.g., Shays' Rebellion, the Whiskey Rebel-lion).
6. Describe the basic law-making process and how the Constitution provides numerous opportunities for citizens to participate in the political process and to monitor and influence government (e.g., function of elections, political parties, interest groups).
7. Understand the functions and responsibilities of a free press.

8.4 Students analyze the aspirations and ideals of the people of the new nation.

1. Describe the country's physical landscapes, political divisions, and territorial expansion during the terms of the first four presidents.
2. Explain the policy significance of famous speeches (e.g., Washington's Farewell Address, Jefferson's 1801 Inaugural Address, John Q. Adams's Fourth of July 1821 Address).
3. Analyze the rise of capitalism and the economic problems and conflicts that accompanied it (e.g., Jackson's opposition to the National Bank; early decisions of the U.S. Supreme Court that reinforced the sanctity of contracts and a capitalist economic system of law).
4. Discuss daily life, including traditions in art, music, and literature, of early national America (e.g., through writings by Washington Irving, James Fenimore Cooper).

8.5 Students analyze U.S. foreign policy in the early Republic.

1. Understand the political and economic causes and consequences of the War of 1812 and know the major battles, leaders, and events that led to a final peace.
2. Know the changing boundaries of the United States and describe the relationships the country had with its neighbors (current Mexico and Canada) and Europe, including the influence of the Monroe Doctrine, and how those relationships

influenced westward expansion and the Mexican-American War.

3. Outline the major treaties with American Indian nations during the administrations of the first four presidents and the varying outcomes of those treaties.

8.6 Students analyze the divergent paths of the American people from 1800 to the mid-1800s and the challenges they faced, with emphasis on the Northeast.

1. Discuss the influence of industrialization and technological developments on the region, including human modification of the landscape and how physical geography shaped human actions (e.g., growth of cities, deforestation, farming, mineral extraction).
2. Outline the physical obstacles to and the economic and political factors involved in building a network of roads, canals, and railroads (e.g., Henry Clay's American System).
3. List the reasons for the wave of immigration from Northern Europe to the United States and describe the growth in the number, size, and spatial arrangements of cities (e.g., Irish immigrants and the Great Irish Famine).
4. Study the lives of black Americans who gained freedom in the North and founded schools and churches to advance their rights and communities.
5. Trace the development of the American education system from its earliest roots, including the roles of religious and private schools and Horace Mann's campaign for free public education and its assimilating role in American culture.
6. Examine the women's suffrage movement (e.g., biographies, writings, and speeches of Elizabeth Cady Stanton, Margaret Fuller, Lucretia Mott, Susan B. Anthony).
7. Identify common themes in American art as well as transcendentalism and individualism (e.g., writings about and by Ralph Waldo Emerson, Henry David Thoreau, Herman Melville, Louisa May Alcott, Nathaniel Hawthorne, Henry Wadsworth Longfellow).

8.7 Students analyze the divergent paths of the American people in the South from 1800 to the mid-1800s and the challenges they faced.

1. Describe the development of the agrarian economy in the South, identify the locations of the cotton-producing states, and discuss the significance of cotton and the cotton gin.
2. Trace the origins and development of slavery; its effects on black Americans and on the region's political, social, religious, economic, and cultural development; and identify the strategies that were tried to both overturn and preserve it (e.g., through the writings and historical documents on Nat Turner, Denmark Vesey).
3. Examine the characteristics of white Southern society and how the physical environment influenced events and conditions prior to the Civil War.
4. Compare the lives of and opportunities for free blacks in the North with those of free blacks in the South.

8.8 Students analyze the divergent paths of the American people in the West from 1800 to the mid-1800s and the challenges they faced.

1. Discuss the election of Andrew Jackson as president in 1828, the importance of Jacksonian democracy, and his actions as president (e.g., the spoils system, veto of the National Bank, policy of Indian removal, opposition to the Supreme Court).
2. Describe the purpose, challenges, and economic incentives associated with westward expansion, including the concept of Manifest Destiny (e.g., the Lewis and Clark expedition, accounts of the removal of Indians, the Cherokees' "Trail of Tears," settlement of the Great Plains) and the territorial acquisitions that spanned numerous decades.

3. Describe the role of pioneer women and the new status that western women achieved (e.g., Laura Ingalls Wilder, Annie Bidwell; slave women gaining freedom in the West; Wyoming granting suffrage to women in 1869).
4. Examine the importance of the great rivers and the struggle over water rights.
5. Discuss Mexican settlements and their locations, cultural traditions, attitudes toward slavery, land-grant system, and economies.
6. Describe the Texas War for Independence and the Mexican-American War, including territorial settlements, the aftermath of the wars, and the effects the wars had on the lives of Americans, including Mexican Americans today.

8.9 Students analyze the early and steady attempts to abolish slavery and to realize the ideals of the Declaration of Independence.

1. Describe the leaders of the movement (e.g., John Quincy Adams and his proposed constitutional amendment, John Brown and the armed resistance, Harriet Tubman and the Underground Railroad, Benjamin Franklin, Theodore Weld, William Lloyd Garrison, Frederick Douglass).
2. Discuss the abolition of slavery in early state constitutions.
3. Describe the significance of the Northwest Ordinance in education and in the banning of slavery in new states north of the Ohio River.
4. Discuss the importance of the slavery issue as raised by the annexation of Texas and California's admission to the union as a free state under the Compromise of 1850.
5. Analyze the significance of the States' Rights Doctrine, the Missouri Compromise (1820), the Wilmot Proviso (1846), and the Compromise of 1850, Henry Clay's role in the Missouri Compromise and the Compromise of 1850, the Kansas-Nebraska Act (1854), the *Dred Scott* v. *Sandford* decision (1857), and the Lincoln-Douglas debates (1858).
6. Describe the lives of free blacks and the laws that limited their freedom and economic opportunities.

8.10 Students analyze the multiple causes, key events, and complex consequences of the Civil War.

1. Compare the conflicting interpretations of state and federal authority as emphasized in the speeches and writings of statesmen such as Daniel Webster and John C. Calhoun.
2. Trace the boundaries constituting the North and the South, the geographical differences between the two regions, and the differences between agrarians and industrialists.
3. Identify the constitutional issues posed by the doctrine of nullification and secession and the earliest origins of that doctrine.
4. Discuss Abraham Lincoln's presidency and his significant writings and speeches and their relationship to the Declaration of Independence, such as his "House Divided" speech (1858), Gettysburg Address (1863), Emancipation Proclamation (1863), and inaugural addresses (1861 and 1865).
5. Study the views and lives of leaders (e.g., Ulysses S. Grant, Jefferson Davis, Robert E. Lee) and soldiers on both sides of the war, including those of black soldiers and regiments.
6. Describe critical developments and events in the war, including the major battles, geographical advantages and obstacles, technological advances, and General Lee's surrender at Appomattox.
7. Explain how the war affected combatants, civilians, the physical environment, and future warfare.

8.11 Students analyze the character and lasting consequences of Reconstruction.

1. List the original aims of Reconstruction and describe its effects on the political and social structures of different regions.

2. Identify the push-pull factors in the movement of former slaves to the cities in the North and to the West and their differing experiences in those regions (e.g., the experiences of Buffalo Soldiers).
3. Understand the effects of the Freedmen's Bureau and the restrictions placed on the rights and opportunities of freedmen, including racial segregation and "Jim Crow" laws.
4. Trace the rise of the Ku Klux Klan and describe the Klan's effects.
5. Understand the Thirteenth, Fourteenth, and Fifteenth Amendments to the Constitution and analyze their connection to Reconstruction.

8.12 Students analyze the transformation of the American economy and the changing social and political conditions in the United States in response to the Indus-trial Revolution.

1. Trace patterns of agricultural and industrial development as they relate to climate, use of natural resources, markets, and trade and locate such development on a map.
2. Identify the reasons for the development of federal Indian policy and the wars with American Indians and their relationship to agricultural development and industrialization.
3. Explain how states and the federal government encouraged business expansion through tariffs, banking, land grants, and subsidies.
4. Discuss entrepreneurs, industrialists, and bankers in politics, commerce, and industry (e.g., Andrew Carnegie, John D. Rockefeller, Leland Stanford).
5. Examine the location and effects of urbanization, renewed immigration, and industrialization (e.g., the effects on social fabric of cities, wealth and economic opportunity, the conservation movement).
6. Discuss child labor, working conditions, and laissez-faire policies toward big business and examine the labor movement, including its leaders (e.g., Samuel Gompers), its demand for collective bargaining, and its strikes and protests over labor conditions.
7. Identify the new sources of large-scale immigration and the contributions of immigrants to the building of cities and the economy; explain the ways in which new social and economic patterns encouraged assimilation of newcomers into the mainstream amidst growing cultural diversity; and discuss the new wave of nativism.
8. Identify the characteristics and impact of Grangerism and Populism.
9. Name the significant inventors and their inventions and identify how they improved the quality of life (e.g., Thomas Edison, Alexander Graham Bell, Orville and Wilbur Wright).

Grades 9 Through 12: Introduction

History-Social Science Content Standards.

Historical and Social Sciences Analysis Skills

The intellectual skills noted below are to be learned through, and applied to, the content standards for grades nine through twelve. They are to be assessed only in conjunction with the content standards in grades nine through twelve.

In addition to the standards for grades nine through twelve, students demonstrate the following intellectual, reasoning, reflection, and research skills.

Chronological and Spatial Thinking

1. Students compare the present with the past, evaluating the consequences of past events and decisions and determining the lessons that were learned.
2. Students analyze how change happens at different rates at different times; understand that some aspects can change while others remain the same; and understand that change is complicated and affects not only technology and politics but also values and beliefs.
3. Students use a variety of maps and documents to interpret human movement, including major patterns of domestic and international migration, changing environmental preferences and settlement patterns, the frictions that develop between population groups, and the diffusion of ideas, technological innovations, and goods.
4. Students relate current events to the physical and human characteristics of places and regions.

Historical Research, Evidence, and Point of View

1. Students distinguish valid arguments from fallacious arguments in historical interpretations.
2. Students identify bias and prejudice in historical interpretations.
3. Students evaluate major debates among historians concerning alternative interpretations of the past, including an analysis of authors' use of evidence and the distinctions between sound generalizations and misleading oversimplifications.
4. Students construct and test hypotheses; collect, evaluate, and employ information from multiple primary and secondary sources; and apply it in oral and written presentations.

Historical Interpretation

1. Students show the connections, causal and otherwise, between particular historical events and larger social, economic, and political trends and developments.
2. Students recognize the complexity of historical causes and effects, including the limitations on determining cause and effect.
3. Students interpret past events and issues within the context in which an event unfolded rather than solely in terms of present-day norms and values.
4. Students understand the meaning, implication, and impact of historical events and recognize that events could have taken other directions.
5. Students analyze human modifications of landscapes and examine the resulting environmental policy issues.
6. Students conduct cost-benefit analyses and apply basic economic indicators to analyze the aggregate economic behavior of the U.S. economy.

Grade Nine

History-Social Science Content Standards.

Geography

Geographic literacy is necessary for enhancing economic competitiveness, preserving quality of life, sustaining the environment, and ensuring national security. As individuals and as members of society, humans face decisions on where to live, what to build where, how and where to travel, how to conserve energy, how to wisely manage scarce resources, and how to cooperate or compete with others.

Geography Standard 9.1 – World in Spatial Terms and Uses of Geography Students organize information and solve geographic problems using geographical tools, representations, and technologies.

WG.9.1.1 Describe the impact of technology on the study of geography and gather geographic information using technological tools
WG.9.1.2 Explain Earth's grid system, using latitude and longitude to locate key places and to answer geographic questions about that place
WG.9.1.3 Compare and contrast various types of maps and map projections and evaluate distortions associated with each map projection
WG.9.1.4 Use geographic representations to locate the world's continents, major landforms, major bodies of water and major countries and to solve geographic problems

Standard 9.2 – Physical Systems Students answer geographic questions about Earth's physical systems to explain ecosystems and natural processes.

WG.9.2.1 Describe and categorize elements of the natural environment as belonging to one of the four components of Earth's physical systems: atmosphere, lithosphere, biosphere, or hydrosphere
WG.9.2.2 Identify and locate world climate regions and evaluate the impact of the Earth/Sun relationship, ocean currents, wind currents, and elevation on each climate region
WG.9.2.3 Compare and contrast regions of the world by analyzing the plant and animal life indigenous to the region (ecosystems)
WG.9.2.4 Explain and give examples of natural and human processes that shape Earth's surface and identify specific locations where these processes occur

Standard 9.3 – Region Students examine the unifying characteristics of a given region and determine the challenges and opportunities created by the development of that region.

WG.9.3.1 Analyze how cooperation, conflict, and self-interest impact the cultural, political, and economic regions of the world and relations between nations
WG.9.3.2 Determine the unifying characteristics that regions possess and explain changes that they have experienced over time
WG.9.3.3 Explain how human and physical characteristics facilitate or hinder regional interactions

Standard 9.4 – Place Students will identify the physical and cultural characteristics of a particular location and investigate changes to it over time.

WG.9.4.1 Determine the physical and human characteristics that comprise the identity of a given place
WG.9.4.2 Analyze the distinguishing physical characteristics of a given place to determine their impact on human activities
WG.9.4.3 Identify and analyze distinguishing human characteristics of a given place to determine their influence on historical event
WG.9.4.4 Evaluate the impact of historical events on culture and relationships among groups
WG.9.4.5 Examine the relationship between social, economic, and government systems and describe how each system has changed a given place over time

Standard 5 – Human Systems Students examine the movement of human populations, information, ideas, and goods throughout history and its impact on human settlement and the economies of various countries.

WG.9.5.1 Describe and classify reasons for human migration in terms of push or pull factors to determine the changes and similarities in these factors over time
WG.9.5.2 Use population pyramids, geographic data and maps to analyze the current impact of population growth and to predict future population trends

WG.9.5.3 Describe and illustrate specific examples of economic interdependence in various regions
WG.9.5.4 Determine the factors that contribute to a country's standard of living
WG.9.5.5 Explain how changes in technology have contributed to the spread of ideas and information throughout the world

Standard 9.6 – Environment and Society Students analyze ways in which humans adapt to, modify, and depend upon Earth's physical environment.

WG.9.6.1 Describe technological advances that have allowed humans to modify the environment and analyze the impact of these advances on the environment
WG.9.6.2 Identify challenges posed by the physical environment and evaluate strategies that will allow humans to more effectively deal with these challenges
WG.9.6.3 Analyze the distribution of resources and describe their impact on human systems (past, present, and future)
WG.9.6.4 Assess the role of government and business in preserving or consuming natural resources and protecting or destroying the physical environment

Grade Ten

History-Social Science Content Standards.

World History, Culture, and Geography: The Modern World

Students in grade ten study major turning points that shaped the modern world, from the late eighteenth century through the present, including the cause and course of the two world wars. They trace the rise of democratic ideas and develop an understanding of the historical roots of current world issues, especially as they pertain to international relations. They extrapolate from the American experience that democratic ideals are often achieved at a high price, remain vulnerable, and are not practiced everywhere in the world. Students develop an understanding of current world issues and relate them to their historical, geographic, political, economic, and cultural contexts. Students consider multiple accounts of events in order to understand international relations from a variety of perspectives.

10.1 Students relate the moral and ethical principles in ancient Greek and Roman philosophy, in Judaism, and in Christianity to the development of Western political thought.

1. Analyze the similarities and differences in Judeo-Christian and Greco-Roman views of law, reason and faith, and duties of the individual.
2. Trace the development of the Western political ideas of the rule of law and illegitimacy of tyranny, using selections from Plato's *Republic* and Aristotle's *Politics.*
3. Consider the influence of the U.S. Constitution on political systems in the contemporary world.

10.2 Students compare and contrast the Glorious Revolution of England, the American Revolution, and the French Revolution and their enduring effects worldwide on the political expectations for self-government and individual liberty.

1. Compare the major ideas of philosophers and their effects on the democratic revolutions in England, the United States, France, and Latin America (e.g., John Locke, Charles-Louis Montesquieu, Jean-Jacques Rousseau, Simón Bolívar, Thomas Jefferson, James Madison).
2. List the principles of the Magna Carta, the English Bill of Rights (1689), the American Declaration of Independence (1776), the French Declaration of the Rights of Man and the Citizen (1789), and the U.S. Bill of Rights (1791).

3. Understand the unique character of the American Revolution, its spread to other parts of the world, and its continuing significance to other nations.
4. Explain how the ideology of the French Revolution led France to develop from constitutional monarchy to democratic despotism to the Napoleonic empire.
5. Discuss how nationalism spread across Europe with Napoleon but was repressed for a generation under the Congress of Vienna and Concert of Europe until the Revolutions of 1848.

10.3 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.

1. Analyze why England was the first country to industrialize.
2. Examine how scientific and technological changes and new forms of energy brought about massive social, economic, and cultural change (e.g., the inventions and discoveries of James Watt, Eli Whitney, Henry Bessemer, Louis Pasteur, Thomas Edison).
3. Describe the growth of population, rural to urban migration, and growth of cities associated with the Industrial Revolution.
4. Trace the evolution of work and labor, including the demise of the slave trade and the effects of immigration, mining and manufacturing, division of labor, and the union movement.
5. Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.
6. Analyze the emergence of capitalism as a dominant economic pattern and the responses to it, including Utopianism, Social Democracy, Socialism, and Communism.
7. Describe the emergence of Romanticism in art and literature (e.g., the poetry of William Blake and William Wordsworth), social criticism (e.g., the novels of Charles Dickens), and the move away from Classicism in Europe.

10.4 Students analyze patterns of global change in the era of New Imperialism in at least two of the following regions or countries: Africa, Southeast Asia, China, India, Latin America, and the Philippines.

1. Describe the rise of industrial economies and their link to imperialism and colonial-ism (e.g., the role played by national security and strategic advantage; moral issues raised by the search for national hegemony, Social Darwinism, and the missionary impulse; material issues such as land, resources, and technology).
2. Discuss the locations of the colonial rule of such nations as England, France, Germany, Italy, Japan, the Netherlands, Russia, Spain, Portugal, and the United States.
3. Explain imperialism from the perspective of the colonizers and the colonized and the varied immediate and long-term responses by the people under colonial rule.
4. Describe the independence struggles of the colonized regions of the world, including the roles of leaders, such as Sun Yat-sen in China, and the roles of ideology and religion.

10.5 Students analyze the causes and course of the First World War.

1. Analyze the arguments for entering into war presented by leaders from all sides of the Great War and the role of political and economic rivalries, ethnic and ideological conflicts, domestic discontent and disorder, and propaganda and nationalism in mobilizing the civilian population in support of "total war."
2. Examine the principal theaters of battle, major turning points, and the importance of geographic factors in military decisions and outcomes (e.g., topography, waterways, distance, climate).
3. Explain how the Russian Revolution and the entry of the United States affected the course and outcome of the war.

4. Understand the nature of the war and its human costs (military and civilian) on all sides of the conflict, including how colonial peoples contributed to the war effort.
5. Discuss human rights violations and genocide, including the Ottoman government's actions against Armenian citizens.

10.6 Students analyze the effects of the First World War.

1. Analyze the aims and negotiating roles of world leaders, the terms and influence of the Treaty of Versailles and Woodrow Wilson's Fourteen Points, and the causes and effects of the United States's rejection of the League of Nations on world politics.
2. Describe the effects of the war and resulting peace treaties on population movement, the international economy, and shifts in the geographic and political borders of Europe and the Middle East.
3. Understand the widespread disillusionment with prewar institutions, authorities, and values that resulted in a void that was later filled by totalitarians.
4. Discuss the influence of World War I on literature, art, and intellectual life in the West (e.g., Pablo Picasso, the "lost generation" of Gertrude Stein, Ernest Hemingway).

10.7 Students analyze the rise of totalitarian governments after World War I.

1. Understand the causes and consequences of the Russian Revolution, including Lenin's use of totalitarian means to seize and maintain control (e.g., the Gulag).
2. Trace Stalin's rise to power in the Soviet Union and the connection between economic policies, political policies, the absence of a free press, and systematic violations of human rights (e.g., the Terror Famine in Ukraine).
3. Analyze the rise, aggression, and human costs of totalitarian regimes (Fascist and Communist) in Germany, Italy, and the Soviet Union, noting especially their common and dissimilar traits.

10.8 Students analyze the causes and consequences of World War II.

1. Compare the German, Italian, and Japanese drives for empire in the 1930s, including the 1937 Rape of Nanking, other atrocities in China, and the Stalin-Hitler Pact of 1939.
2. Understand the role of appeasement, nonintervention (isolationism), and the domestic distractions in Europe and the United States prior to the outbreak of World War II.
3. Identify and locate the Allied and Axis powers on a map and discuss the major turning points of the war, the principal theaters of conflict, key strategic decisions, and the resulting war conferences and political resolutions, with emphasis on the importance of geographic factors.
4. Describe the political, diplomatic, and military leaders during the war (e.g., Winston Churchill, Franklin Delano Roosevelt, Emperor Hirohito, Adolf Hitler, Benito Mussolini, Joseph Stalin, Douglas MacArthur, Dwight Eisenhower).
5. Analyze the Nazi policy of pursuing racial purity, especially against the European Jews; its transformation into the Final Solution; and the Holocaust that resulted in the murder of six million Jewish civilians.
6. Discuss the human costs of the war, with particular attention to the civilian and military losses in Russia, Germany, Britain, the United States, China, and Japan.

10.9 Students analyze the international developments in the post-World World War II world.

1. Compare the economic and military power shifts caused by the war, including the Yalta Pact, the development of nuclear

weapons, Soviet control over Eastern European nations, and the economic recoveries of Germany and Japan.

2. Analyze the causes of the Cold War, with the free world on one side and Soviet client states on the other, including competition for influence in such places as Egypt, the Congo, Vietnam, and Chile.
3. Understand the importance of the Truman Doctrine and the Marshall Plan, which established the pattern for America's postwar policy of supplying economic and military aid to prevent the spread of Communism and the resulting economic and political competition in arenas such as Southeast Asia (i.e., the Korean War, Vietnam War), Cuba, and Africa.
4. Analyze the Chinese Civil War, the rise of Mao Tse-tung, and the subsequent political and economic upheavals in China (e.g., the Great Leap Forward, the Cultural Revolution, and the Tiananmen Square uprising).
5. Describe the uprisings in Poland (1952), Hungary (1956), and Czechoslovakia (1968) and those countries' resurgence in the 1970s and 1980s as people in Soviet satellites sought freedom from Soviet control.
6. Understand how the forces of nationalism developed in the Middle East, how the Holocaust affected world opinion regarding the need for a Jewish state, and the significance and effects of the location and establishment of Israel on world affairs.
7. Analyze the reasons for the collapse of the Soviet Union, including the weakness of the command economy, burdens of military commitments, and growing resistance to Soviet rule by dissidents in satellite states and the non-Russian Soviet republics.
8. Discuss the establishment and work of the United Nations and the purposes and functions of the Warsaw Pact, SEATO, NATO, and the Organization of American States.

10.10 Students analyze instances of nation-building in the contemporary world in at least two of the following regions or countries: the Middle East, Africa, Mexico and other parts of Latin America, and China.

1. Understand the challenges in the regions, including their geopolitical, cultural, military, and economic significance and the international relationships in which they are involved.
2. Describe the recent history of the regions, including political divisions and systems, key leaders, religious issues, natural features, resources, and population patterns.
3. Discuss the important trends in the regions today and whether they appear to serve the cause of individual freedom and democracy.

10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).

Grade Eleven

History-Social Science Content Standards.

United States History and Geography: Continuity and Change in the Twentieth Century

Students in grade eleven study the major turning points in American history in the twentieth century. Following a review of the nation's beginnings and the impact of the Enlightenment on U.S. democratic ideals, students build upon the tenth grade study of global industrialization to understand the emergence and impact of new technology and a corporate economy, including the social and cultural effects. They trace the change in the ethnic composition of American society; the movement toward equal rights for racial minorities and

women; and the role of the United States as a major world power. An emphasis is placed on the expanding role of the federal government and federal courts as well as the continuing tension between the individual and the state. Students consider the major social problems of our time and trace their causes in historical events. They learn that the United States has served as a model for other nations and that the rights and freedoms we enjoy are not accidents, but the results of a defined set of political principles that are not always basic to citizens of other countries. Students understand that our rights under the U.S. Constitution are a precious inheritance that depends on an educated citizenry for their preservation and protection.

11.1 Students analyze the significant events in the founding of the nation and its attempts to realize the philosophy of government described in the Declaration of Independence.

1. Describe the Enlightenment and the rise of democratic ideas as the context in which the nation was founded.
2. Analyze the ideological origins of the American Revolution, the Founding Fathers' philosophy of divinely bestowed unalienable natural rights, the debates on the drafting and ratification of the Constitution, and the addition of the Bill of Rights.
3. Understand the history of the Constitution after 1787 with emphasis on federal versus state authority and growing democratization.
4. Examine the effects of the Civil War and Reconstruction and of the industrial revolution, including demographic shifts and the emergence in the late nineteenth century of the United States as a world power.

11.2 Students analyze the relationship among the rise of industrialization, large-scale rural-to-urban migration, and massive immigration from Southern and Eastern Europe.

1. Know the effects of industrialization on living and working conditions, including the portrayal of working conditions and food safety in Upton Sinclair's *The Jungle.*
2. Describe the changing landscape, including the growth of cities linked by industry and trade, and the development of cities divided according to race, ethnicity, and class.
3. Trace the effect of the Americanization movement.
4. Analyze the effect of urban political machines and responses to them by immigrants and middle-class reformers.
5. Discuss corporate mergers that produced trusts and cartels and the economic and political policies of industrial leaders.
6. Trace the economic development of the United States and its emergence as a major industrial power, including its gains from trade and the advantages of its physical geography.
7. Analyze the similarities and differences between the ideologies of Social Darwinism and Social Gospel (e.g., using biographies of William Graham Sumner, Billy Sunday, Dwight L. Moody).
8. Examine the effect of political programs and activities of Populists.
9. Understand the effect of political programs and activities of the Progressives (e.g., federal regulation of railroad transport, Children's Bureau, the Sixteenth Amendment, Theodore Roosevelt, Hiram Johnson).

11.3 Students analyze the role religion played in the founding of America, its lasting moral, social, and political impacts, and issues regarding religious liberty.

1. Describe the contributions of various religious groups to American civic principles and social reform movements (e.g., civil and human rights, individual responsibility and the work ethic, antimonarchy and self-rule, worker protection, family-centered communities).

2. Analyze the great religious revivals and the leaders involved in them, including the First Great Awakening, the Second Great Awakening, the Civil War revivals, the Social Gospel Movement, the rise of Christian liberal theology in the nineteenth century, the impact of the Second Vatican Council, and the rise of Christian fundamentalism in current times.
3. Cite incidences of religious intolerance in the United States (e.g., persecution of Mormons, anti-Catholic sentiment, anti-Semitism).
4. Discuss the expanding religious pluralism in the United States and California that resulted from large-scale immigration in the twentieth century.
5. Describe the principles of religious liberty found in the Establishment and Free Exercise clauses of the First Amendment, including the debate on the issue of separation of church and state.

11.4 Students trace the rise of the United States to its role as a world power in the twentieth century.

1. List the purpose and the effects of the Open Door policy.
2. Describe the Spanish-American War and U.S. expansion in the South Pacific.
3. Discuss America's role in the Panama Revolution and the building of the Panama Canal.
4. Explain Theodore Roosevelt's Big Stick diplomacy, William Taft's Dollar Diplomacy, and Woodrow Wilson's Moral Diplomacy, drawing on relevant speeches.
5. Analyze the political, economic, and social ramifications of World War I on the home front.
6. Trace the declining role of Great Britain and the expanding role of the United States in world affairs after World War II.

11.5 Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.

1. Discuss the policies of Presidents Warren Harding, Calvin Coolidge, and Herbert Hoover.
2. Analyze the international and domestic events, interests, and philosophies that prompted attacks on civil liberties, including the Palmer Raids, Marcus Garvey's "back-to-Africa" movement, the Ku Klux Klan, and immigration quotas and the responses of organizations such as the American Civil Liberties Union, the National Association for the Advancement of Colored People, and the Anti-Defamation League to those attacks.
3. Examine the passage of the Eighteenth Amendment to the Constitution and the Volstead Act (Prohibition).
4. Analyze the passage of the Nineteenth Amendment and the changing role of women in society.
5. Describe the Harlem Renaissance and new trends in literature, music, and art, with special attention to the work of writers (e.g., Zora Neale Hurston, Langston Hughes).
6. Trace the growth and effects of radio and movies and their role in the worldwide diffusion of popular culture.
7. Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.

11.6 Students analyze the different explanations for the Great Depression and how the New Deal fundamentally changed the role of the federal government.

1. Describe the monetary issues of the late nineteenth and early twentieth centuries that gave rise to the establishment of the Federal Reserve and the weaknesses in key sectors of the economy in the late 1920s.

2. Understand the explanations of the principal causes of the Great Depression and the steps taken by the Federal Reserve, Congress, and Presidents Herbert Hoover and Franklin Delano Roosevelt to combat the economic crisis.
3. Discuss the human toll of the Depression, natural disasters, and unwise agricultural practices and their effects on the depopulation of rural regions and on political movements of the left and right, with particular attention to the Dust Bowl refugees and their social and economic impacts in California.
4. Analyze the effects of and the controversies arising from New Deal economic policies and the expanded role of the federal government in society and the economy since the 1930s (e.g., Works Progress Administration, Social Security, National Labor Relations Board, farm programs, regional development policies, and energy development projects such as the Tennessee Valley Authority, California Central Valley Project, and Bonneville Dam).
5. Trace the advances and retreats of organized labor, from the creation of the American Federation of Labor and the Congress of Industrial Organizations to current issues of a postindustrial, multinational economy, including the United Farm Workers in California.

11.7 Students analyze America's participation in World War II.

1. Examine the origins of American involvement in the war, with an emphasis on the events that precipitated the attack on Pearl Harbor.
2. Explain U.S. and Allied wartime strategy, including the major battles of Midway, Normandy, Iwo Jima, Okinawa, and the Battle of the Bulge.
3. Identify the roles and sacrifices of individual American soldiers, as well as the unique contributions of the special fighting forces (e.g., the Tuskegee Airmen, the 442nd Regimental Combat team, the Navajo Code Talkers).
4. Analyze Roosevelt's foreign policy during World War II (e.g., Four Freedoms speech).
5. Discuss the constitutional issues and impact of events on the U.S. home front, including the internment of Japanese Americans (e.g., *Fred Korematsu v. United States of America)* and the restrictions on German and Italian resident aliens; the response of the administration to Hitler's atrocities against Jews and other groups; the roles of women in military production; and the roles and growing political demands of African Americans.
6. Describe major developments in aviation, weaponry, communication, and medicine and the war's impact on the location of American industry and use of resources.
7. Discuss the decision to drop atomic bombs and the consequences of the decision (Hiroshima and Nagasaki).
8. Analyze the effect of massive aid given to Western Europe under the Marshall Plan to rebuild itself after the war and the importance of a rebuilt Europe to the U.S. economy.

11.8 Students analyze the economic boom and social transformation of post-World War II America.

1. Trace the growth of service sector, white collar, and professional sector jobs in business and government.
2. Describe the significance of Mexican immigration and its relationship to the agricultural economy, especially in California.
3. Examine Truman's labor policy and congressional reaction to it.
4. Analyze new federal government spending on defense, welfare, interest on the national debt, and federal and state spending on education, including the California Master Plan.
5. Describe the increased powers of the presidency in response to the Great Depression, World War II, and the Cold War.

6. Discuss the diverse environmental regions of North America, their relationship to local economies, and the origins and prospects of environmental problems in those regions.
7. Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.
8. Discuss forms of popular culture, with emphasis on their origins and geographic diffusion (e.g., jazz and other forms of popular music, professional sports, architectural and artistic styles).

11.9 Students analyze U.S. foreign policy since World War II.

1. Discuss the establishment of the United Nations and International Declaration of Human Rights, International Monetary Fund, World Bank, and General Agreement on Tariffs and Trade (GATT) and their importance in shaping modern Europe and maintaining peace and international order.
2. Understand the role of military alliances, including NATO and SEATO, in deterring communist aggression and maintaining security during the Cold War.
3. Trace the origins and geopolitical consequences (foreign and domestic) of the Cold War and containment policy, including the following:
    - The era of McCarthyism, instances of domestic Communism (e.g., Alger Hiss) and blacklisting
    - The Truman Doctrine
    - The Berlin Blockade
    - The Korean War
    - The Bay of Pigs invasion and the Cuban Missile Crisis
    - Atomic testing in the American West, the "mutual assured destruction" doctrine, and disarmament policies
    - The Vietnam War
    - Latin American policy
4. List the effects of foreign policy on domestic policies and vice versa (e.g., protests during the war in Vietnam, the "nuclear freeze" movement).
5. Analyze the role of the Reagan administration and other factors in the victory of the West in the Cold War.
6. Describe U.S. Middle East policy and its strategic, political, and economic interests, including those related to the Gulf War.
7. Examine relations between the United States and Mexico in the twentieth century, including key economic, political, immigration, and environmental issues.

11.10 Students analyze the development of federal civil rights and voting rights.

1. Explain how demands of African Americans helped produce a stimulus for civil rights, including President Roosevelt's ban on racial discrimination in defense industries in 1941, and how African Americans' service in World War II produced a stimulus for President Truman's decision to end segregation in the armed forces in 1948.
2. Examine and analyze the key events, policies, and court cases in the evolution of civil rights, including *Dred Scott* v. *Sandford, Plessy* v. *Ferguson, Brown* v. *Board of Education, Regents of the University of California* v. *Bakke,* and California Proposition 209.
3. Describe the collaboration on legal strategy between African American and white civil rights lawyers to end racial segregation in higher education.
4. Examine the roles of civil rights advocates (e.g., A. Philip Randolph, Martin Luther King, Jr., Malcolm X, Thurgood Marshall, James Farmer, Rosa Parks), including the significance of Martin Luther King, Jr. 's "Letter from Birmingham Jail" and "I Have a Dream" speech.

5. Discuss the diffusion of the civil rights movement of African Americans from the churches of the rural South and the urban North, including the resistance to racial desegregation in Little Rock and Birmingham, and how the advances influenced the agendas, strategies, and effectiveness of the quests of American Indians, Asian Americans, and Hispanic Americans for civil rights and equal opportunities.
6. Analyze the passage and effects of civil rights and voting rights legislation (e.g., 1964 Civil Rights Act, Voting Rights Act of 1965) and the Twenty-Fourth Amendment, with an emphasis on equality of access to education and to the political process.
7. Analyze the women's rights movement from the era of Elizabeth Stanton and Susan Anthony and the passage of the Nineteenth Amendment to the movement launched in the 1960s, including differing perspectives on the roles of women.

11.11 Students analyze the major social problems and domestic policy issues in contemporary American society.

1. Discuss the reasons for the nation's changing immigration policy, with emphasis on how the Immigration Act of 1965 and successor acts have transformed American society.
2. Discuss the significant domestic policy speeches of Truman, Eisenhower, Kennedy, Johnson, Nixon, Carter, Reagan, Bush, and Clinton (e.g., with regard to education, civil rights, economic policy, environmental policy).
3. Describe the changing roles of women in society as reflected in the entry of more women into the labor force and the changing family structure.
4. Explain the constitutional crisis originating from the Watergate scandal.
5. Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.
6. Analyze the persistence of poverty and how different analyses of this issue influence welfare reform, health insurance reform, and other social policies.
7. Explain how the federal, state, and local governments have responded to demographic and social changes such as population shifts to the suburbs, racial concentrations in the cities, Frostbelt-to-Sunbelt migration, international migration, decline of family farms, increases in out-of-wedlock births, and drug abuse.

Grade Twelve

History-Social Science Content Standards.

Principles of American Democracy and Economics

Students in grade twelve pursue a deeper understanding of the institutions of American government. They compare systems of government in the world today and analyze the history and changing interpretations of the Constitution, the Bill of Rights, and the current state of the legislative, executive, and judiciary branches of government. An emphasis is placed on analyzing the relationship among federal, state, and local governments, with particular attention paid to important historical documents such as the *Federalist Papers.* These standards represent the culmination of civic literacy as students prepare to vote, participate in community activities, and assume the responsibilities of citizenship.

In addition to studying government in grade twelve, students will also master fundamental economic concepts, applying the tools (graphs, statistics, equations) from other subject areas to the understanding of operations and institutions of economic systems. Studied in a historic context are the basic economic principles of micro- and

macroeconomics, international economics, comparative economic systems, measurement, and methods.

Principles of American Democracy

12.1 Students explain the fundamental principles and moral values of American democracy as expressed in the U.S. Constitution and other essential documents of American democracy.

1. Analyze the influence of ancient Greek, Roman, English, and leading European political thinkers such as John Locke, Charles-Louis Montesquieu, Niccolò Machiavelli, and William Blackstone on the development of American government.
2. Discuss the character of American democracy and its promise and perils as articulated by Alexis de Tocqueville.
3. Explain how the U.S. Constitution reflects a balance between the classical republican concern with promotion of the public good and the classical liberal concern with protecting individual rights; and discuss how the basic premises of liberal constitutionalism and democracy are joined in the Declaration of Independence as "self-evident truths."
4. Explain how the Founding Fathers' realistic view of human nature led directly to the establishment of a constitutional system that limited the power of the governors and the governed as articulated in the *Federalist Papers.*
5. Describe the systems of separated and shared powers, the role of organized interests (Federalist *Paper Number 10),* checks and balances (Federalist *Paper Number 51),* the importance of an independent judiciary (Federalist *Paper Number 78),* enumerated powers, rule of law, federalism, and civilian control of the military.
6. Understand that the Bill of Rights limits the powers of the federal government and state governments.

12.2 Students evaluate and take and defend positions on the scope and limits of rights and obligations as democratic citizens, the relationships among them, and how they are secured.

1. Discuss the meaning and importance of each of the rights guaranteed under the Bill of Rights and how each is secured (e.g., freedom of religion, speech, press, assembly, petition, privacy).
2. Explain how economic rights are secured and their importance to the individual and to society (e.g., the right to acquire, use, transfer, and dispose of property; right to choose one's work; right to join or not join labor unions; copyright and patent).
3. Discuss the individual's legal obligations to obey the law, serve as a juror, and pay taxes.
4. Understand the obligations of civic-mindedness, including voting, being informed on civic issues, volunteering and performing public service, and serving in the military or alternative service.
5. Describe the reciprocity between rights and obligations; that is, why enjoyment of one's rights entails respect for the rights of others.
6. Explain how one becomes a citizen of the United States, including the process of naturalization (e.g., literacy, language, and other requirements).

12.3 Students evaluate and take and defend positions on what the fundamental values and principles of civil society are (i.e., the autonomous sphere of voluntary personal, social, and economic relations that are not part of government), their interdependence, and the meaning and importance of those values and principles for a free society.

1. Explain how civil society provides opportunities for individuals to associate for social, cultural, religious, economic, and political purposes.

2. Explain how civil society makes it possible for people, individually or in association with others, to bring their influence to bear on government in ways other than voting and elections.
3. Discuss the historical role of religion and religious diversity.
4. Compare the relationship of government and civil society in constitutional democracies to the relationship of government and civil society in authoritarian and totalitarian regimes.

12.4 Students analyze the unique roles and responsibilities of the three branches of government as established by the U.S. Constitution.

1. Discuss Article I of the Constitution as it relates to the legislative branch, including eligibility for office and lengths of terms of representatives and senators; election to office; the roles of the House and Senate in impeachment proceedings; the role of the vice president; the enumerated legislative powers; and the process by which a bill becomes a law.
2. Explain the process through which the Constitution can be amended.
3. Identify their current representatives in the legislative branch of the national government.
4. Discuss Article II of the Constitution as it relates to the executive branch, including eligibility for office and length of term, election to and removal from office, the oath of office, and the enumerated executive powers.
5. Discuss Article III of the Constitution as it relates to judicial power, including the length of terms of judges and the jurisdiction of the Supreme Court.
6. Explain the processes of selection and confirmation of Supreme Court justices.

12.5 Students summarize landmark U.S. Supreme Court interpretations of the Constitution and its amendments.

1. Understand the changing interpretations of the Bill of Rights over time, including interpretations of the basic freedoms (religion, speech, press, petition, and assembly) articulated in the First Amendment and the due process and equal-protection-of-the-law clauses of the Fourteenth Amendment.
2. Analyze judicial activism and judicial restraint and the effects of each policy over the decades (e.g., the Warren and Rehnquist courts).
3. Evaluate the effects of the Court's interpretations of the Constitution in *Marbury* v. *Madison, McCulloch* v. *Maryland,* and *United States* v. *Nixon,* with emphasis on the arguments espoused by each side in these cases.
4. Explain the controversies that have resulted over changing interpretations of civil rights, including those in *Plessy* v. *Ferguson, Brown* v. *Board of Education, Miranda* v. *Arizona, Regents of the University of California* v. *Bakke, Adarand Constructors, Inc.* v. *Pena,* and *United States* v. *Virginia* (VMI).

12.6 Students evaluate issues regarding campaigns for national, state, and local elective offices.

1. Analyze the origin, development, and role of political parties, noting those occasional periods in which there was only one major party or were more than two major parties.
2. Discuss the history of the nomination process for presidential candidates and the increasing importance of primaries in general elections.
3. Evaluate the roles of polls, campaign advertising, and the controversies over campaign funding.
4. Describe the means that citizens use to participate in the political process (e.g., voting, campaigning, lobbying, filing a legal challenge, demonstrating, petitioning, picketing, running for political office).
5. Discuss the features of direct democracy in numerous states (e.g., the process of referendums, recall elections).

6. Analyze trends in voter turnout; the causes and effects of reapportionment and redistricting, with special attention to spatial districting and the rights of minorities; and the function of the Electoral College.

12.7 Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.

1. Explain how conflicts between levels of government and branches of government are resolved.
2. Identify the major responsibilities and sources of revenue for state and local governments.
3. Discuss reserved powers and concurrent powers of state governments.
4. Discuss the Ninth and Tenth Amendments and interpretations of the extent of the federal government's power.
5. Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.
6. Compare the processes of lawmaking at each of the three levels of government, including the role of lobbying and the media.
7. Identify the organization and jurisdiction of federal, state, and local (e.g., California) courts and the interrelationships among them.
8. Understand the scope of presidential power and decision making through examination of case studies such as the Cuban Missile Crisis, passage of Great Society legislation, War Powers Act, Gulf War, and Bosnia.

12.8 Students evaluate and take and defend positions on the influence of the media on American political life.

1. Discuss the meaning and importance of a free and responsible press.
2. Describe the roles of broadcast, print, and electronic media, including the Internet, as means of communication in American politics.
3. Explain how public officials use the media to communicate with the citizenry and to shape public opinion.

12.9 Students analyze the origins, characteristics, and development of different political systems across time, with emphasis on the quest for political democracy, its advances, and its obstacles.

1. Explain how the different philosophies and structures of feudalism, mercantilism, socialism, fascism, communism, monarchies, parliamentary systems, and constitutional liberal democracies influence economic policies, social welfare policies, and human rights practices.
2. Compare the various ways in which power is distributed, shared, and limited in systems of shared powers and in parliamentary systems, including the influence and role of parliamentary leaders (e.g., William Gladstone, Margaret Thatcher).
3. Discuss the advantages and disadvantages of federal, con federal, and unitary systems of government.
4. Describe for at least two countries the consequences of conditions that gave rise to tyrannies during certain periods (e.g., Italy, Japan, Haiti, Nigeria, Cambodia).
5. Identify the forms of illegitimate power that twentieth-century African, Asian, and Latin American dictators used to gain and hold office and the conditions and interests that supported them.
6. Identify the ideologies, causes, stages, and outcomes of major Mexican, Central American, and South American revolutions in the nineteenth and twentieth centuries.
7. Describe the ideologies that give rise to Communism, methods of maintaining control, and the movements to overthrow such governments in Czechoslovakia, Hungary, and Poland, including

the roles of individuals (e.g., Alexander Solzhenitsyn, Pope John Paul II, Lech Walesa, Vaclav Havel).

8. Identify the successes of relatively new democracies in Africa, Asia, and Latin America and the ideas, leaders, and general societal conditions that have launched and sustained, or failed to sustain, them.

12.10 Students formulate questions about and defend their analyses of tensions within our constitutional democracy and the importance of maintaining a balance between the following concepts: majority rule and individual rights; liberty and equality; state and national authority in a federal system; civil disobedience and the rule of law; freedom of the press and the right to a fair trial; the relationship of religion and government.

Principles of Economics

12.1 Students understand common economic terms and concepts and economic reasoning.

1. Examine the causal relationship between scarcity and the need for choices.
2. Explain opportunity cost and marginal benefit and marginal cost.
3. Identify the difference between monetary and nonmonetary incentives and how changes in incentives cause changes in behavior.
4. Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.
5. Analyze the role of a market economy in establishing and preserving political and personal liberty (e.g., through the works of Adam Smith).

12.2 Students analyze the elements of America's market economy in a global setting.

1. Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.
2. Discuss the effects of changes in supply and/ or demand on the relative scarcity, price, and quantity of particular products.
3. Explain the roles of property rights, competition, and profit in a market economy.
4. Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.
5. Understand the process by which competition among buyers and sellers determines a market price.
6. Describe the effect of price controls on buyers and sellers.
7. Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.
8. Explain the role of profit as the incentive to entrepreneurs in a market economy.
9. Describe the functions of the financial markets.
10. Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.

12.3 Students analyze the influence of the federal government on the American economy.

1. Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.

2. Identify the factors that may cause the costs of government actions to outweigh the benefits.
3. Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.
4. Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).

12.4 Students analyze the elements of the U.S. labor market in a global setting.

1. Understand the operations of the labor market, including the circumstances surrounding the establishment of principal American labor unions, procedures that unions use to gain benefits for their members, the effects of unionization, the mini-mum wage, and unemployment insurance.
2. Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.
3. Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.
4. Explain the effects of international mobility of capital and labor on the U.S. economy.

12.5 Students analyze the aggregate economic behavior of the U.S. economy.

1. Distinguish between nominal and real data.
2. Define, calculate, and explain the significance of an unemployment rate, the number of new jobs created monthly, an inflation or deflation rate, and a rate of economic growth.
3. Distinguish between short-term and long-term interest rates and explain their relative significance.

12.6 Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States's borders.

1. Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.
2. Compare the reasons for and the effects of trade restrictions during the Great Depression compared with present-day arguments among labor, business, and political leaders over the effects of free trade on the economic and social interests of various groups of Americans.
3. Understand the changing role of international political borders and territorial sovereignty in a global economy.
4. Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.

Standards for:

Physical Education

7–12

GRADE SEVEN

STANDARD 1

Students demonstrate the motor skills and movement patterns needed to perform a variety of physical activities.

Manipulative Skills

1.1 Demonstrate mature techniques for the following patterns: overhand, sidearm, and underhand throwing; catching; kicking/punting; striking; trapping; dribbling (hand and foot); and volleying.

Rhythmic Skills

1.2 Perform multicultural dances.

Combinations of Movement Patterns and Skills

1.3 Combine manipulative, locomotor, and non-locomotor skills into movement patterns.

1.4 Demonstrate body management and object-manipulation skills needed for successful participation in individual and dual physical activities.

1.5 Demonstrate body management and locomotor skills needed for successful participation in track and field and combative activities.

1.6 Demonstrate body management and object-manipulation skills needed for successful participation in introductory adventure/outdoor activities.

STANDARD 2

Students demonstrate knowledge of movement concepts, principles, and strategies that apply to the learning and performance of physical activities.

Manipulative Skills

2.1 Identify and describe key elements in the mature performance of overhand, sidearm, and underhand throwing; catching; kicking/punting; striking; trapping; dribbling (hand and foot); and volleying.

Movement Concepts

2.2 Analyze movement patterns and correct errors.

2.3 Use principles of motor learning to establish, monitor, and meet goals for motor skill development.

2.4 Explain and demonstrate spin and rebound principles for performing manipulative skills.

2.5 Compare and contrast the effectiveness of practicing skills as a whole and practicing skills in smaller parts.

2.6 Diagram and demonstrate basic offensive and defensive strategies for individual and dual physical activities.

Combination of Movement Patterns and Skills

2.7 Develop an individual or dual game that uses a manipulative skill, two different offensive strategies, and a scoring system and teach it to another person.

STANDARD 3

Students assess and maintain a level of physical fitness to improve health and performance.

3.1 Assess one's own muscle strength, muscle endurance, aerobic capacity, flexibility, and body composition by using a scientifically based health-related fitness assessment.

3.2 Evaluate individual measures of physical fitness in relationship to patterns of physical activity.

3.3 Develop individual goals, from research-based standards, for each of the five components of health-related physical fitness.

3.4 Plan a weekly personal physical fitness program in collaboration with the teacher.

3.5 Participate in moderate to vigorous physical activity a minimum of four days each week.

3.6 Assess periodically the attainment of, or progress toward, personal physical fitness goals and make necessary adjustments to a personal physical fitness program.

STANDARD 4

Students demonstrate knowledge of physical fitness concepts, principles, and strategies to improve health and performance.

4.1 Develop a one-week personal physical fitness plan specifying the proper warm-up and cool-down activities
4.2 Identify physical activities that are effective in improving each of the health-related physical fitness components.
4.3 Match personal preferences in physical activities with each of the five components of health-related physical fitness.
4.4 Explain the effects of physical activity on heart rate during exercise, during the recovery phase, and while to body is at rest.
4.5 Describe the role of physical activity and nutrition in achieving physical fitness.
4.6 Identify and apply the principles of overload in safe, age-appropriate activities.
4.7 Explain progression, overload, and specificity as principles of exercise.
4.8 Discuss the effect of extremity growth rates on physical fitness.

STANDARD 5

Students demonstrate and utilize knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility
5.1 Identify appropriate and inappropriate risks involved in adventure, individual, and dual physical activities.
5.2 Accept responsibility for individual improvement.

Social Interaction
5.3 Demonstrate an acceptance of differences in physical development and personal preferences as they affect participation in physical activity.

Group Dynamics
5.4 Evaluate the effect of expressing encouragement to others while participating in a group physical activity.
5.5 Identify the responsibilities of a leader in physical activity.

GRADE EIGHT

STANDARD 1

Students demonstrate the motor skills and movement patterns needed to perform a variety of physical activities.

Rhythmic Skills
1.1 Identify and demonstrate square dance steps, positions, and patterns set to music.
1.2 Create and perform a square dance.

Combinations of Movement Patterns and Skills
1.3 Demonstrate basic offensive and defensive skills and strategies in team physical activities.
1.4 Apply locomotor, non-locomotor, and manipulative skills to team physical activities.
1.5 Demonstrate fundamental gymnastic/tumbling skills.
1.6 Create and perform a routine using fundamental gymnastic/tumbling skills, locomotor and non-locomotor movement patterns, and the elements of speed, direction, and level.

STANDARD 2

Students demonstrate knowledge of movement concepts, principles, and strategies that apply to the learning and performance of physical activities.

Movement Concepts

2.1 Describe and demonstrate how movement skills learned in one physical activity can be transferred and used to help learn another physical activity.

2.2 Explain the rotation principles used in performing various manipulative skills.

2.3 Explain how growth in height and weight affects performance and influences the selection of developmentally appropriate physical activities.

Combination of Movement Patterns and Skills

2.4 Identify the characteristics of a highly skilled performance for the purpose of improving one's own performance.

2.5 Diagram, explain, and justify offensive and defensive strategies in modified and team sports, games, and activities.

2.6 Develop and teach a team game that uses elements of spin or rebound, designated offensive and defensive space, a penalty system, and a scoring system.

STANDARD 3

Students assess and maintain a level of physical fitness to improve health and performance.

3.1 Assess the components of health-related physical fitness (muscle strength, muscle endurance, aerobic capacity, flexibility, and body composition) by using a scientifically based health-related physical fitness assessment.

3.2 Refine individual personal physical fitness goals for each of the five components of health-related physical fitness, using research-based criteria.

3.3 Plan and implement a two-week personal physical fitness plan in collaboration with the teacher.

3.4 Participate in moderate to vigorous physical activity a minimum of four days each week.

3.5 Assess periodically the attainment of, or progress toward, personal physical fitness goals and make necessary adjustments to a personal physical fitness program.

3.6 Participate safely in moderate to vigorous physical activity when conditions are atypical (weather, travel, injury).

STANDARD 4

Students demonstrate knowledge of physical fitness concepts, principles, and strategies to improve health and performance.

4.1 Develop a two-week personal physical fitness plan specifying the proper warm-up and cool-down activities and the principles of exercise for each of the five components of health-related physical fitness.

4.2 Identify appropriate physical activities that can be performed if one's physical fitness program is disrupted by inclement weather, travel from home or school, or a minor injury.

4.3 Identify ways of increasing physical activity in routine daily activities.

4.4 Identify and apply basic principles in weight/resistance training and safety practices.

4.5 Explain the effects of nutrition and participation in physical activity on weight control, self-concept, and physical performance.

4.6 Explain the different types of conditioning for different physical activities.

STANDARD 5

Students demonstrate and utilize knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility

5.1 Abide by the decisions of the officials, accept the outcome of the game, and show appreciation toward participants.

5.2 Organize and work cooperatively with a group to achieve the goals of the group.

5.3 Identify and evaluate three preferences for lifelong physical activity and determine one's responsibility for developing skills, acquiring knowledge of concepts, and achieving fitness.

Social Interaction

5.4 Identify the contributions of members of a group or team and reward members for accomplishing a task or goal.

Group Dynamics

5.5 Accept the roles of group members within the structure of a game or activity.

5.6 Describe leadership roles and responsibilities in the context of team games and activities.

5.7 Model support toward individuals of all ability levels and encourage others to be supportive and inclusive of all individuals.

HIGH SCHOOL

The high school course descriptions presented here communicate the essence of the high school physical education experience. The content articulates the knowledge, skills, and confidence students need to maintain meaningful physical activity throughout their lifetime.

The course sequence provides a blueprint for delivering the content in a manner that equips students to make a successful transition from the physical education instructional program to participation in physical activity during adulthood. The adult lifestyle demands that individuals initiate and monitor their own participation in physical activity. Family responsibilities, career demands, and individual choices influence physical activity patterns.

High School Courses 1 and 2 provide the foundation for high school instruction. Students develop proficient movement skills in each area of physical education; they expand their capabilities for independent learning; and they examine practices that allow for sound decision making to enhance successful participation in movement activities.

High School Courses 3 and 4 are electives that provide students with the opportunity to explore a variety of physical activities in search of one they can enjoy and participate in for a lifetime.

Course 4 electives are designed as a continuation of Course 3 and are intended for students who have completed Course 3 and who want an intensive experience in an activity that they may wish to participate in for years to come.

HIGH SCHOOL COURSE 1

STANDARD 1

Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.

1.1 Combine and apply movement patterns, simple to complex, in aquatic, rhythms/dance, and individual and dual activities.

1.2 Demonstrate proficient movement skills in aquatic, rhythms/dance, and individual and dual activities.

1.3 Identify, explain, and apply the skill-related components of balance, reaction time, agility, coordination, explosive power, and speed that enhance performance levels in aquatic, rhythms/dance, and individual dual activities.

1.4 Explain and demonstrate advanced offensive, defensive, and transition strategies in aquatic and individual and dual activities.

1.5 Explain the use of the principles of biomechanics (leverage, force, inertia, rotary motion, opposition, and buoyancy); apply the principles to achieve advanced performance in aquatic, rhythms/dance, and individual and dual activities; and evaluate the performance based on the use of the principles.

1.6 Examine the physical, emotional, cognitive, and scientific factors that affect performance and explain the relationship based on those factors.

1.7 Analyze and evaluate feedback from proprioception, from others, and from the performance of complex motor (movement) activities to

improve performance in aquatic, rhythms/dance, individual activities, and dual activities.
1.8 Analyze and explain which training and conditioning practices have the greatest impact on skill acquisition and performance in aquatic, rhythms/dance, and individual and dual activities.
1.9 Create or modify practice/training plans based on evaluative feedback of skill acquisition and performance in aquatic, rhythms/dance, and individual and dual activities.
1.10 Analyze situations and determine appropriate strategies for improved performance in aquatic, rhythms/dance, and individual and dual activities.
1.11 Assess the effect/outcome of a particular performance strategy in aquatic, rhythms/dance, and individual and dual activities.
1.12 Demonstrate independent learning of movement skills.

STANDARD 2
Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Participate in moderate to vigorous physical activity at least four days each week.
2.2 Participate in enjoyable and challenging physical activities that develop and maintain the five components of physical fitness.
2.3 Meet health-related physical fitness standards established by a scientifically based health-related fitness assessment.
2.4 Use physical fitness test results to set and adjust goals to improve fitness.
2.5 Improve and maintain physical fitness by adjusting physical activity levels according to the principles of exercise.
2.6 Identify the physical fitness requirements of an occupation.
2.7 Develop and implement a one-month personal physical fitness plan.
2.8 Analyze consumer physical fitness products and programs.
2.9 Explain the inherent risks associated with physical activity in extreme environments.
2.10 Identify and list available fitness resources in the community.
2.11 Explain the role of physical activity in the prevention of disease and the reduction of health care costs.

STANDARD 3
Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility
3.1 Accept personal responsibility to create and maintain a physically and emotionally safe and non-threatening environment for physical activity.
3.2 Act independently of negative peer pressure during physical activity.
3.3 Identify and evaluate personal psychological responses to physical activity.
3.4 Describe the enjoyment, self-expression, challenge, and social benefits experienced by achieving one's best in physical activities.
3.5 Develop personal goals to improve one's performance in physical activities.

Social Interaction
3.6 Discuss the changing psychological and sociological needs of a diverse society in relation to physical activity.
3.7 Analyze the role that physical activity plays in social interaction and cooperative opportunities in the family and the workplace.
3.8 Recognize the value of physical activity in understanding multiculturalism.

Group Dynamics
3.9 Recognize and evaluate the role of cooperation and positive interactions with others when participating in physical activity.
3.10 Identify and utilize the potential strengths of each individual in physical activities.

HIGH SCHOOL COURSE 2

STANDARD 1

Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.

1.1 Combine and apply movement patterns, from simple to complex, in combative, gymnastic/ tumbling, and team activities.
1.2 Demonstrate proficient movement skills in combative, gymnastic/tumbling, and team activities.
1.3 Explain the skill-related components of balance, reaction time, agility, coordination, explosive power, and speed that enhance performance levels in combative, gymnastic/tumbling, and team activities and apply those components in performance.
1.4 Explain and demonstrate advanced offensive, defensive, and transition strategies and tactics in combative, gymnastic/tumbling, and team activities.
1.5 Explain the use of the principles of biomechanics (leverage, force, inertia, rotary motion, and opposition); apply the principles to achieve advanced performance in combative, gymnastic/tumbling, and team activities; and evaluate the performance based on use of the principles.
1.6 Evaluate the relationships of physical, emotional, and cognitive factors affecting individual and team performance.
1.7 Analyze and evaluate feedback from proprioception, from others, and from the performance of complex motor (movement) activities to improve performance in combative, gymnastics/tumbling, and team activities.
1.8 Analyze and explain which training and conditioning practices have the greatest impact on skill acquisition and performance in combative, gymnastic/tumbling, and team activities.
1.9 Create or modify practice/training plans based on evaluative feedback from skill acquisition and performance in combative, gymnastic/tumbling, and team activities.
1.10 Analyze situations to determine appropriate strategies to use in combative, gymnastic/tumbling, and team activities.
1.11 Assess the effect/outcome of a particular performance strategy used in combative, gymnastic/tumbling, and team activities.
1.12 Evaluate independent learning of movement skills.

STANDARD 2

Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Participate in moderate to vigorous physical activity at least four days each week.
2.2 Participate in challenging physical fitness activities using the principles of exercise to meet individual needs and interests.
2.3 Identify and achieve levels of excellence in physical fitness that enhance physical and mental performance beyond the standards established by scientifically based health-related fitness assessments.
2.4 Assess levels of physical fitness and adjust physical activity to accommodate changes in age, growth, and development.
2.5 Justify the use of particular physical activities to achieve desired fitness goals.
2.6 Develop and describe a physical fitness plan that enhances personal health and performance in future leisure and workplace activities.
2.7 Develop and implement an appropriate personal physical fitness program for a family or community member.
2.8 Explain how to evaluate consumer physical fitness products and programs.
2.9 Identify and evaluate ergogenic aids that claim to enhance body composition, appearance, physical fitness, and performance.
2.10 Evaluate the availability and quality of fitness resources in the community.
2.11 Use and analyze scientifically based data and protocols to assess oneself on the five components of health-related physical fitness.

STANDARD 3
Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility
3.1 Participate in physical activities for personal enjoyment.
3.2 Examine and explain the ways in which personal characteristics, performance styles, and preferences for activities may change over a lifetime.
3.3Evaluate the psychological benefits derived from regular participation in physical activity.
3.4 Explain and analyze the role of individual attitude, motivation, and determination in achieving personal satisfaction from challenging physical activities.
3.5 Evaluate and refine personal goals to improve performance in physical activities.

Social Interaction
3.6 Identify the effects of individual differences, such as age, gender, ethnicity, socioeconomic status, and culture, on preferences for and participation in physical activity.
3.7 Explain how to select and modify physical activities to allow for participation by younger children, the elderly, and individuals with special needs.

Group Dynamics
3.8 Identify leadership skills, perform planned leadership assignments, and assume spontaneous leadership roles.
3.9 Encourage others to be supportive and inclusive of individuals of all ability levels.

HIGH SCHOOL COURSE 3A
Adventure/Outdoor Activities

High School Courses 1 and 2 are designed to be completed before a student enrolls in High School Course 3A.

STANDARD 1
Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.

1.1 Demonstrate advanced knowledge and skills in two or more adventure/outdoor activities.
1.2 Identify the characteristics and critical elements of a highly skilled performance in adventure/outdoor activities and demonstrate them.
1.3 Apply previously learned movement concepts and principles to the learning and development of the motor skills required for successful participation in adventure/outdoor pursuits and activities.
1.4 Identify and apply the principles of biomechanics necessary for the safe and successful performance of adventure/outdoor activities.
1.5 List the safety equipment required for participation in outdoor pursuits and adventures; describe and demonstrate the use of such equipment.
1.6 Demonstrate independent learning of movement skills in adventure/outdoor activities.

STANDARD 2
Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Participate in adventure/outdoor activities that improve health-related physical fitness.
2.2 Analyze the effects of adventure/outdoor activities on a personal physical fitness program and personal levels of health-related physical fitness.
2.3 Improve or maintain physical fitness by adjusting physical activity levels according to the principles of exercise.

2.4 Explain the relationship between participation in adventure/outdoor activities and health.

STANDARD 3
Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility
3.1 Compare and contrast the effective leadership skills used in adventure/outdoor activities and those used in other physical activities.
3.2 Develop personal goals to improve performance in adventure/outdoor activities.
3.3 Identify and analyze adventure/outdoor physical activities that enhance personal enjoyment.
3.4 Evaluate the risks and safety factors that may affect participation in adventure/outdoor activities throughout a lifetime.

Social Interaction
3.5 Explain how to select and modify adventure/outdoor activities to allow for participation by younger children, the elderly, and individuals with special needs.
3.6 Analyze the role of social interaction in the successful participation in and enjoyment of adventure/outdoor activities.

Group Dynamics
3.7 Accept and perform planned and spontaneous leadership assignments and roles in adventure/outdoor activities.
3.8 Analyze the role that cooperation and leadership play in adventure/outdoor activities.
3.9 Engage in adventure/outdoor activities both in school and outside school.

HIGH SCHOOL COURSE 3B
Aerobic Activities

High School Courses 1 and 2 are designed to be completed before a student enrolls in High School Course 3B.

STANDARD 1
Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.

1.1 Demonstrate advanced knowledge and skills in two or more aerobic activities, selecting one or more from each of the following categories:

Category 1	*Category 2*
Aerobic dance	Cross-country skiing
Running	Cycling
Skating	Rowing
Swimming	Triathlon
	Walking

1.2 Identify the characteristics and critical elements of a highly skilled performance in aerobic activities and demonstrate them.
1.3 Apply previously learned movement concepts to the learning and development of the motor skills required for successful participation in aerobic activities.
1.4 Identify and apply the principles of biomechanics necessary for the safe and successful performance of aerobic activities.
1.5 List the safety equipment required for participation in aerobic activities; describe and demonstrate the use of such equipment.
1.6 Demonstrate independent learning of movement skills in aerobic activities.

STANDARD 2
Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Identify and achieve a personal level of excellence in physical fitness.
2.2 Engage independently in physical activity that increases aerobic capacity.
2.3 Evaluate goal-setting and other strategies as effective tools for maintaining and increasing adherence to a physical activity program.
2.4 Measure health-related physical fitness periodically and adjust physical activity to achieve fitness goals.
2.5 Identify and explain the positive effects of participation in aerobic activity on personal health.

STANDARD 3
Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility
3.1 Engage independently in aerobic activities.
3.2 Develop personal goals to improve performance in aerobic activities.
3.3 Compare and contrast the effective leadership skills used in aerobic activities and those used in other physical activities.
3.4 Identify and analyze aerobic activities that enhance both personal enjoyment and the challenge.
3.5 Evaluate the risks and safety factors that may affect participation in aerobic activities throughout a lifetime.

Social Interaction
3.6 Invite others to join in aerobic activity.
3.7 Explain how to select and modify aerobic activities to allow for participation by younger children, the elderly, and individuals with special needs.
3.8 Analyze the role of social interaction in the successful participation in and enjoyment of aerobic activities.

Group Dynamics
3.9 Accept and perform planned and spontaneous leadership assignments and roles in aerobic activities.
3.10 Analyze the role that cooperation and leadership play in aerobic activities.
3.11 Engage in aerobic activities both in school and outside school.

HIGH SCHOOL COURSE 3C
Individual and Dual Activities

High School Courses 1 and 2 are designed to be completed before a student enrolls in High School Course 3C.

STANDARD 1
Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies essential to perform a variety of physical activities.

1.1 Demonstrate advanced knowledge and skills in two or more individual and dual activities, selecting one or more from each of the following categories:

Individual	***Dual***
Archery	Badminton
Cycling	Handball
Golf	Racquetball
Gymnastics/Tumbling	Squash
Skating	Tennis
Skiing	Two-Player Volleyball
Surfing	
Yoga	

1.2 Identify the characteristics and critical elements of a highly skilled performance in individual and dual activities and demonstrate them.

1.3 Apply previously learned movement concepts to the learning and development of the motor skills required for successful participation in individual and dual activities.
1.4 Identify and apply the principles of biomechanics necessary for the safe and successful performance of individual and dual activities.
1.5 List the safety equipment required for participation in individual and dual activities; describe and demonstrate the use of such equipment.
1.6 Demonstrate independent learning of movement skills in individual and dual activities.

STANDARD 2
Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Meet physical fitness standards that exceed those of a scientifically based health-related fitness assessment.
2.2 Participate in individual and dual activities that improve or maintain health-related physical fitness.
2.3 Analyze the effects of individual and dual activities on a personal physical fitness program and personal levels of health-related physical fitness.
2.4 Improve or maintain physical fitness by adjusting physical activity levels according to the principles of exercise.
2.5 Explain the relationship between participation in individual and in dual activities and health.
2.6 Demonstrate the ability to develop criteria and analyze factors to consider in the purchase of fitness products and programs related to individual and dual activities.
2.7 Develop and implement a month-long personal physical fitness plan that includes individual and dual activities.

STANDARD 3
Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility
3.1 Compare and contrast the effective leadership skills used in individual and dual activities and those used in other physical activities.
3.2 Develop personal goals to improve performance in individual and dual activities.
3.3 Identify and analyze individual and dual physical activities that enhance personal enjoyment.
3.4 Evaluate the risks and safety factors that may affect participation in individual and dual activities throughout a lifetime.

Social Interaction
3.5 Explain how to select and modify individual and dual activities to allow for participation by younger children, the elderly, and individuals with special needs.
3.6 Analyze the role of social interaction in the successful participation in and enjoyment of individual and dual activities.

Group Dynamics
3.7 Accept and perform planned and spontaneous leadership assignments and roles in individual and dual activities.
3.8 Analyze the role that cooperation and leadership play in individual and dual activities.
3.9 Engage in individual and dual activities both in school and outside school.

HIGH SCHOOL COURSE 3D
Dance

High School Courses 1 and 2 are designed to be completed before a student enrolls in High School Course 3D.

STANDARD 1
Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.

1.1 Demonstrate advanced knowledge and skills in two or more dance activities, selecting one or more

From each of the following categories:

Category 1	*Category 2*
Ballet	Modern
Folk	Social
Jazz	Square

1.2 Identify the characteristics and critical elements of a highly skilled performance in dance activities and demonstrate them.
1.3 Apply previously learned movement concepts to the learning and development of the motor skills required for successful participation in dance activities.
1.4 Identify and apply the principles of biomechanics necessary for the safe and successful performance of dance activities.
1.5 List the safety equipment and facilities required for participation in dance activities; describe and demonstrate the use of such equipment and facilities.
1.6 Demonstrate independent learning of movement skills in dance activities.

STANDARD 2
Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Meet physical fitness standards that exceed those of a scientifically based health-related fitness assessment.
2.2 Participate in dance activities that improve or maintain personal levels of health-related physical fitness.
2.3 Analyze the effects of dance activities on a personal physical fitness program and personal levels of health-related physical fitness.
2.4 Improve or maintain one's physical fitness by adjusting physical activity levels according to the principles of exercise.
2.5 Explain the relationship between participation in dance activities and health.
2.6 Demonstrate the ability to develop criteria and analyze factors to consider in the purchase of products and programs related to dance activities.
2.7 Develop and implement a month-long personal physical fitness plan that includes dance activities.

STANDARD 3
Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility
3.1 Compare and contrast the effective leadership skills used in dance activities and those used in other physical activities.
3.2 Develop personal goals to improve performance in dance activities.
3.3 Identify and analyze dance activities that enhance personal enjoyment.
3.4 Evaluate the risks and safety factors that may affect participation in dance activities throughout a lifetime.

Social Interaction
3.5 Explain how to select and modify dance activities to allow for participation by younger children, the elderly, and individuals with special needs.
3.6 Analyze the role of social interaction in the successful participation in and enjoyment of dance activities.

Group Dynamics

3.7 Accept and perform planned and spontaneous leadership assignments and roles in dance activities.

3.8 Analyze the role that cooperation and leadership play in dance activities.

3.9 Engage in dance activities both in school and outside school.

HIGH SCHOOL COURSE 3E
Aquatic Activities

High School Courses 1 and 2 are designed to be completed before a student enrolls in High School Course 3E.

STANDARD 1
Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.

1.1 Demonstrate advanced knowledge and skills in two or more aquatic activities, selecting one or more

From each of the following categories:

Category 1	***Category 2***
Diving	Life Guarding
Kayaking/ Canoeing/ Rowing	Scuba Diving
Snorkeling	Synchronized swimming
Swimming	Water polo

1.2 Identify the characteristics and critical elements of a highly skilled performance in aquatic activities and demonstrate them.

1.3 Apply previously learned movement concepts to the learning and development of motor-skills required for successful participation in aquatic activities.

1.4 Identify and apply the principles of biomechanics necessary for the safe and successful performance of aquatic activities.

1.5 List the safety equipment required for participation in aquatic activities; describe and demonstrate the use of such equipment.

1.6 Demonstrate independent learning of movement skills in aquatic activities.

1.7 Identify and practice the safety skills necessary for entering swimming pools, lakes, rivers, and oceans (e.g., walking, jumping, falling, and diving).

1.8 Demonstrate and explain basic water rescue with and without equipment.

1.9 Demonstrate and explain basic cardiopulmonary resuscitation.

STANDARD 2
Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Meet physical fitness standards that exceed those of a scientifically based health-related fitness assessment.

2.2 Participate in aquatic activities that improve or maintain health-related physical fitness.

2.3 Analyze the effects of participation in aquatic activities on levels of health-related physical fitness activities and a personal fitness program.

2.4 Improve or maintain one's physical fitness by adjusting physical activity levels according to the principles of exercise.

2.5 Explain the relationship between participation in aquatic activities and indicators of good health.

2.6 Demonstrate the ability to develop criteria and analyze factors to consider in the purchase of products and programs related to aquatic activities.

2.7 Develop and implement a month-long personal physical fitness plan that includes aquatic activities.

2.8 Explain how aquatic activities contribute to the development and maintenance of health-related physical fitness.

2.9 Create and implement aquatic programs that improve health-related physical fitness.

STANDARD 3

Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility

3.1 Compare and contrast the effective leadership skills used in aquatic activities and those used in other physical activities.
3.2 Develop personal goals to improve performance in aquatic activities.
3.3 Identify and analyze aquatic activities that enhance personal enjoyment.
3.4 Evaluate the risks and safety factors that may affect participation in aquatic activities throughout a lifetime.
3.5 Identify and demonstrate personal responsibilities for safety and hygiene in the aquatics setting.

Social Interaction

3.6 Explain how to select and modify aquatic activities to allow for participation by younger children, the elderly, and individuals with special needs.
3.7 Analyze the role of social interaction in the successful participation in and enjoyment of aquatic activities.

Group Dynamics

3.8 Accept and perform planned and spontaneous leadership assignments and roles in aquatic activities.
3.9 Analyze the role that cooperation and leadership play in aquatic activities.
3.10 Engage in aquatic activities both in school and outside school.

HIGH SCHOOL COURSE 3F

Weight Training and Fitness

High School Courses 1 and 2 are designed to be completed before a student enrolls in High School Course 3F.

STANDARD 1

Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.

1.1 Explain the principles of biomechanics of first-, second-, and third-class levers and apply those principles to a variety of lifting techniques.
1.2 Observe and analyze the lifting techniques of another person (or oneself through video) and write an analysis of the performance.
1.3 Demonstrate proper spotting techniques for all lifts and exercises that require spotting.
1.4 Observe and analyze the techniques of another person (or oneself through video) performing a pylometric exercise and write an analysis of the performance.
1.5 Measure and assess multiple performances of another person in the following areas: balance, reaction time, agility, coordination, power, and speed.
1.6 Identify and apply the principles of biomechanics necessary for the safe and successful performance of weight lifting.
1.7 List the safety equipment required for participation in weight training; describe and demonstrate the use of such equipment.
1.8 Demonstrate independent learning of movement skills in weight training.

STANDARD 2

Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Establish a set of personal physical fitness goals, using the principles of training, and create a strength-training and conditioning program.
2.2 Identify the prime mover muscles, antagonistic muscles, and stabilizer muscles for each of the major weight-training exercises.

2.3 Assess multiple performances of another person in the following areas: muscular strength, muscular endurance, cardiorespiratory endurance, and flexibility.
2.4 Explain how the principles of biomechanics, muscle development, gender, age, training experience, training technique, and specificity affect performance related to strength training.
2.5 Demonstrate and explain the techniques and concepts of three types of weight-training programs.
2.6 Demonstrate and explain the concepts of two different conditioning programs.
2.7 Develop and use a personal physical fitness log to record all workout data on a daily basis.
2.8 Meet increasingly higher levels of speed, strength, power, and endurance.
2.9 Meet physical fitness standards that exceed those of scientifically based health-related fitness assessments.

STANDARD 3
Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility
3.1 Display safe and responsible behavior while training.
3.2 Describe the role of motivation in physical activity.
3.3 Describe how the perception of effort and quality is a personal assessment and describe the role that perception plays in achieving fitness goals.
3.4 Develop personal goals to improve performance in weight training and fitness.
3.5 Identify and analyze weight-training and fitness activities that enhance personal enjoyment.
3.6 Evaluate the risks and safety factors that may affect participation in weight training and fitness throughout a lifetime.

Social Interaction
3.7 Explain how to select and modify weight-training and fitness activities to allow for participation by younger children, the elderly, and individuals with special needs.
3.8 Analyze the role of social interaction in the successful participation in and enjoyment of weight training and fitness activities.

Group Dynamics
3.9 Assist others in the achievement of their fitness goals.

HIGH SCHOOL COURSE 4A
Advanced Adventure/Outdoor Activities

High School Courses 1, 2, and 3A are designed to be completed before a student enrolls in High School Course 4A.

STANDARD 1
Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.

1.1 Demonstrate expertise in one adventure/outdoor activity.
1.2 Analyze and evaluate the interrelationship of the principles of biomechanics and the use of strategies in high-level performance.
1.3 Create or modify practice/training plans based on evaluative feedback from skill acquisition and performance of adventure/outdoor activities.
1.4 Practice adventure/outdoor activities in real-world settings.

STANDARD 2
Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Achieve a level of fitness that improves health and performance and provides opportunities for enjoyment and challenge in an adventure/outdoor activity.

2.2 Design a personal physical fitness program to be completed in a home or gym and that will be consistent with the demands of an adventure/outdoor activity.

STANDARD 3

Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility

3.1 Evaluate changes in self-responsibility as skill levels in adventure/outdoor activities improve.

3.2 Set personal goals for improved performance and enjoyment of adventure/outdoor activities.

Group Dynamics

3.3 Perform and evaluate planned and spontaneous leadership assignments and roles in high-level adventure/outdoor activities.

HIGH SCHOOL COURSE 4B

Advanced Aerobic Activities

High School Courses 1, 2, and 3B are designed to be completed before a student enrolls in High School Course 4B.

STANDARD 1

Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.

1.1 Demonstrate expertise in two or more of the following aerobic activities, preferably one from each category:

Category 1	*Category 2*
Aerobic dance	Cross-country skiing
Running	Cycling
Skating	Rowing
Swimming	Triathlon
	Walking

1.2 Analyze and evaluate the interrelationship of the principles of biomechanics and the use of strategies in high-level performance.

1.3 Create or modify practice/training plans based on evaluative feedback from skill acquisition and performance.

1.4 Practice aerobic activities in real-world settings.

STANDARD 2

Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Identify and achieve levels of personal excellence in health-related physical fitness.

2.2 Adjust personal fitness goals on the basis of fitness assessment measures to improve performance in aerobic activities.

2.3 Design a personal physical fitness program in preparation for the demands of a competitive aerobic activities.

STANDARD 3

Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility

3.1 Demonstrate a physically active lifestyle that provides for enjoyment and challenge through aerobic activity.

3.2 Identify the qualities of aerobic activity that enhance personal enjoyment.

3.3 Evaluate changes in self-responsibility as skill levels in aerobic activities improve.

3.4 Set personal goals for improved performance and enjoyment of aerobic activities.

Group Dynamics

3.5 Perform and evaluate planned and spontaneous leadership assignments and roles in high-level aerobic activities.

HIGH SCHOOL COURSE 4C

Advanced Individual and Dual Activities

High School Courses 1, 2, and 3C are designed to be completed before a student enrolls in High School Course 4C.

STANDARD 1

Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.

1.1 Demonstrate expertise in two or more of the following individual and dual activities, preferably one from each category:

Individual	*Dual*
Archery	Badminton
Cycling	Handball
Golf	Racquetball
Gymnastics/Tumbling	Squash
Skating	Tennis
Skiing	Two-Player volleyball
Surfing	
Yoga	

1.2 Analyze and evaluate the interrelationship of the principles of biomechanics and the use of strategies in high-level performance in individual and dual activities.

1.3 Create or modify practice/training plans based on evaluative feedback from skill acquisition and performance.

1.4 Practice individual and dual activities in real-world settings.

STANDARD 2

Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Develop personal physical fitness standards that exceed those of a scientifically based health-related physical fitness assessment.

2.2 Demonstrate the ability to develop criteria and analyze factors to consider in the purchase of products and programs related to individual and dual activities.

2.3 Achieve a level of fitness that improves health and performance and provides opportunities for enjoyment and challenge in individual and dual activities.

2.4 Design a personal physical fitness program to be completed in a home or gym and that will be consistent with the demands of a selected individual or dual activity.

STANDARD 3

Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility

3.1 Evaluate changes in self-responsibility as skill levels in individual and dual activities improve.

3.2 Set personal goals for improved performance and enjoyment of individual and dual activities.

Group Dynamics

3.3 Perform and evaluate planned and spontaneous leadership assignments and roles in high-level Individual and dual activities.

HIGH SCHOOL COURSE 4D

Advanced Dance

High School Courses 1, 2, and 3D are designed to be completed before a student enrolls in High School

Course 4D.

STANDARD 1
Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.

1.1 Demonstrate expertise in two or more of the following dance activities, preferably one from each category:

Category 1	*Category 2*
Ballet	Modern
Folk	Social
Jazz	Square

1.2 Analyze and evaluate the interrelationship of the principles of biomechanics and the use of strategies in high-level performance in dance activities.
1.3 Create or modify practice/training plans based on evaluative feedback from skill acquisition and performance.
1.4 Practice dance in real-world settings.
1.5 Demonstrate skills in choreography.

STANDARD 2
Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.

2.1 Achieve a level of fitness that improves health and performance and provides opportunities for enjoyment and challenge in a dance activity.
2.2 Design a personal physical fitness program to be completed in a home or gym and that will be consistent with the demands of a dance activity.
2.3 Adjust personal fitness goals on the basis of fitness assessment measures to improve performance in dance activities.

STANDARD 3
Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Self-Responsibility
3.1 Evaluate changes in self-responsibility as skill levels in dance activities improve.
3.2 Set personal goals for improved performance and enjoyment of dance activities.

Group Dynamics
3.3 Perform planned and spontaneous leadership assignments and roles in high-level dance activities.

High School Health

Required Semester long course during grade 11or 12.

This course will help students make informed decisions, modify behaviors, and change social conditions in ways that are beneficial to one's health. Students will gain literacy in the following topics: Nutrition and Physical Activity, Growth, Development, and Sexual Health, Injury Prevention and Safety, Alcohol, Tobacco, and Other Drugs, Mental, Emotional, and Social Health, Personal and Community Health.

Standard 1: Essential Health Concepts - All students will comprehend essential concepts related to enhancing health.
Standard 2: Analyzing Health Influences - All students will demonstrate the ability to analyze internal and external influences that affect health.
Standard 3: Accessing Valid Health Information - All students will demonstrate the ability to access and analyze health information, products, and services.
Standard 4: Interpersonal Communication - All students will demonstrate the ability to use interpersonal communication skills to enhance health.
Standard 5: Decision Making - All students will demonstrate the ability to use decision-making skills to enhance health.
Standard 6: Goal Setting - All students will demonstrate the ability to use goal-setting skills to enhance health.
Standard 7: Practicing Health-Enhancing Behaviors - All students will demonstrate the ability to practice behaviors that reduce risk and promote health.

In addition to the standards above, ACIS International School recognizes that traffic safety is a major concern for Thailand. Statistical data shows that traffic accidents occur more frequently, approximately 60% for young people between the ages of 15-20. This means that the majority of accidents are happening to students. The main factors, shown in statistical data, is human error. This indicates the need for action to tackle and prevent traffic accidents. To share responsibility for society and the nation in tackling this problem, RVP has developed action plans for a traffic accident reduction campaign to instill awareness in safety among the youth in educational institutions in various provinces across the country through the establishment of the project named "RVP Road Safety Camp: RSC". The project is intended to encourage and cultivate awareness in safety among young road users who are the future's adults. This is a sustainable and continuous measure to prevent and reduce traffic accidents for today and for the future.

http://www.thairsc.com/eng/rscaward.html

The purposes of the project and the Standards ACIS International School will use:

Standard 1: To instill safety awareness among the youth.
Standard 2: To support the accident protection and prevention for the youth.
Standard 3: To encourage the youth to take part in preventing and reducing accidents.
Standard 4: To serve as a Long-term measure to reduce losses from accidents.
Standard 5: To complement and support the government's accident prevention measures.
Standard 6: To promote a strong community that can take care of their own safety.

Standards for:

Art

7–12

Academic content standards for Visual and Performing Arts adopted by the California State Board of Education.

Grade Seven
Visual and Performing Arts: Visual Arts Content Standards.

1.0 ARTISTIC PERCEPTION

Processing, Analyzing, and Responding to Sensory Information Through the Language and Skills Unique to the Visual Arts

Students perceive and respond to works of art, objects in nature, events, and the environment. They also use the vocabulary of the visual arts to express their observations.

Develop Perceptual Skills and Visual Arts Vocabulary

1.1 Describe the environment and selected works of art, using the elements of art and the principles of design.
1.2 Identify and describe scale (proportion) as applied to two-dimensional and three-dimensional works of art.
Analyze Art Elements and Principles of Design

1.3 Identify and describe the ways in which artists convey the illusion of space (e.g., placement, overlapping, relative size, atmospheric perspective, and linear perspective).
1.4 Analyze and describe how the elements of art and the principles of design contribute to the expressive qualities of their own works of art.

2.0 CREATIVE EXPRESSION

Creating, Performing, and Participating in the Visual Arts

Students apply artistic processes and skills, using a variety of media to communicate meaning and intent in original works of art.
Skills, Processes, Materials, and Tools

2.1 Develop increasing skill in the use of at least three different media.
2.2 Use different forms of perspective to show the illusion of depth on a two-dimensional surface.
2.3 Develop skill in using mixed media while guided by a selected principle of design.
2.4 Develop skill in mixing paints and showing color relationships.

Communication and Expression Through Original Works of Art

2.5 Interpret reality and fantasy in original two-dimensional and three-dimensional works of art.
2.6 Create an original work of art, using film, photography, computer graphics, or video.
2.7 Create a series of works of art that express a personal statement demonstrating skill in applying the elements of art and the principles of design.

3.0 HISTORICAL AND CULTURAL CONTEXT

Understanding the Historical Contributions and Cultural Dimensions of the Visual Arts

Students analyze the role and development of the visual arts in past and present cultures throughout the world, noting human diversity as it relates to the visual arts and artists.

Role and Development of the Visual Arts

3.1 Research and describe how art reflects cultural values in various traditions throughout the world.
Diversity of the Visual Arts

3.2 Compare and contrast works of art from various periods, styles, and cultures and explain how those works reflect the society in which they were made.

4.0 AESTHETIC VALUING

Responding to, Analyzing, and Making Judgments About Works in the Visual Arts

Students analyze, assess, and derive meaning from works of art, including their own, according to the elements of art, the principles of design, and aesthetic qualities.

Derive Meaning

4.1 Explain the intent of a personal work of art and draw possible parallels between it and the work of a recognized artist.
4.2 Analyze the form (how a work of art looks) and content (what a work of art communicates) of works of art.

Make Informed Judgments

4.3 Take an active part in a small-group discussion about the artistic value of specific works of art, with a wide range of the viewpoints of peers being considered.
4.4 Develop and apply specific and appropriate criteria individually or in groups to assess and critique works of art.
4.5 Identify what was done when a personal work of art was reworked and explain how those changes improved the work.

5.0 CONNECTIONS, RELATIONSHIPS, APPLICATIONS

Connecting and Applying What Is Learned in the Visual Arts to Other Art Forms and Subject Areas and to Careers

Students apply what they learn in the visual arts across subject areas. They develop competencies and creative skills in problem solving, communication, and management of time and resources that contribute to lifelong learning and career skills. They also learn about careers in and related to the visual arts.

Connections and Applications

5.1 Study the music and art of a selected historical era and create a multimedia presentation that reflects that time and culture.
5.2 Use various drawing skills and techniques to depict lifestyles and scenes from selected civilizations.

Visual Literacy

5.3 Examine art, photography, and other two and three-dimensional images, comparing how different visual representations of the same object lead to different interpretations of its meaning, and describe or illustrate the results.

Careers and Career-Related Skills

5.4 Identify professions in or related to the visual arts and some of the specific skills needed for those professions.

Grade Eight
Visual and Performing Arts: Visual Arts Content Standards.

1.0 ARTISTIC PERCEPTION

Processing, Analyzing, and Responding to Sensory Information Through the Language and Skills Unique to the Visual Arts

Students perceive and respond to works of art, objects in nature, events, and the environment. They also use the vocabulary of the visual arts to express their observations.

Develop Perceptual Skills and Visual Arts Vocabulary

1.1 Use artistic terms when describing the intent and content of works of art.

Analyze Art Elements and Principles of Design

1.2 Analyze and justify how their artistic choices contribute to the expressive quality of their own works of art.
1.3 Analyze the use of the elements of art and the principles of design as they relate to meaning in video, film, or electronic media.

2.0 CREATIVE EXPRESSION

Creating, Performing, and Participating in the Visual Arts

Students apply artistic processes and skills, using a variety of media to communicate meaning and intent in original works of art.

Skills, Processes, Materials, and Tools

2.1 Demonstrate an increased knowledge of technical skills in using more complex two-dimensional art media and processes (e.g., printing press, silk screening, computer graphics software).
2.2 Design and create maquettes for three-dimensional sculptures.

Communication and Expression Through Original Works of Art

2.3 Create an original work of art, using film, photography, computer graphics, or video.
2.4 Design and create an expressive figurative sculpture.
2.5 Select a medium to use to communicate a theme in a series of works of art.
2.6 Design and create both additive and subtractive sculptures.
2.7 Design a work of public art appropriate to and reflecting a location.

3.0 HISTORICAL AND CULTURAL CONTEXT

Understanding the Historical Contributions and Cultural Dimensions of the Visual Arts

Students analyze the role and development of the visual arts in past and present cultures throughout the world, noting human diversity as it relates to the visual arts and artists.

Role and Development of the Visual Arts

3.1 Examine and describe or report on the role of a work of art created to make a social comment or protest social conditions.
3.2 Compare, contrast, and analyze styles of art from a variety of times and places in Western and non-Western cultures.

Diversity of the Visual Arts

3.3 Identify major works of art created by women and describe the impact of those works on society at that time.
3.4 Discuss the contributions of various immigrant cultures to the art of a particular society.

4.0 AESTHETIC VALUING

Responding to, Analyzing, and Making Judgments About Works in the Visual Arts

Students analyze, assess, and derive meaning from works of art, including their own, according to the elements of art, the principles of design, and aesthetic qualities.

Derive Meaning

4.1 Define their own points of view and investigate the effects on their interpretation of art from cultures other than their own.
4.2 Develop a theory about the artist's intent in a series of works of art, using reasoned statements to support personal opinions.

4.3 Construct an interpretation of a work of art based on the form and content of the work.

Make Informed Judgments

4.4 Develop and apply a set of criteria as individuals or in groups to assess and critique works of art.
4.5 Present a reasoned argument about the artistic value of a work of art and respond to the arguments put forward by others within a classroom setting.
4.6 Select a grouping of their own works of art that reflects growth over time and describe the progression.

5.0 CONNECTIONS, RELATIONSHIPS, APPLICATIONS

Connecting and Applying What Is Learned in the Visual Arts to Other Art Forms and Subject Areas and to Careers

Students apply what they learn in the visual arts across subject areas. They develop competencies and creative skills in problem solving, communication, and management of time and resources that contribute to lifelong learning and career skills. They also learn about careers in and related to the visual arts.

Connections and Applications

5.1 Select a favorite artist and some of his or her works of art and create a music video that expresses personal ideas and views about the artist.
5.2 Create a painting, satirical drawing, or editorial cartoon that expresses personal opinions about current social or political issues.

Visual Literacy

5.3 Demonstrate an understanding of the effects of visual communication media (e.g., television, music videos, film, Internet) on all aspects of society.

Careers and Career-Related Skills
5.4 Work collaboratively with a community artist to create a work of art, such as a mural, and write a report about the skills needed to become a professional artist.

Nine Through Twelve-Proficient
Visual and Performing Arts: Visual Arts Content Standards.

1.0 ARTISTIC PERCEPTION

Processing, Analyzing, and Responding to Sensory Information Through the Language and Skills Unique to the Visual Arts

Students perceive and respond to works of art, objects in nature, events, and the environment. They also use the vocabulary of the visual arts to express their observations.

Develop Perceptual Skills and Visual Arts Vocabulary

1.1 Identify and use the principles of design to discuss, analyze, and write about visual aspects in the environment and in works of art, including their own.
1.2 Describe the principles of design as used in works of art, focusing on dominance and subordination.

Analyze Art Elements and Principles of Design

1.3 Research and analyze the work of an artist and write about the artist's distinctive style and its contribution to the meaning of the work.
1.4 Analyze and describe how the composition of a work of art is affected by the use of a particular principle of design.

Impact of Media Choice

1.5 Analyze the material used by a given artist and describe how its use influences the meaning of the work.
1.6 Compare and contrast similar styles of works of art done in electronic media with those done with materials traditionally used in the visual arts.

2.0 CREATIVE EXPRESSION

Creating, Performing, and Participating in the Visual Arts

Students apply artistic processes and skills, using a variety of media to communicate meaning and intent in original works of art.

Skills, Processes, Materials, and Tools

2.1 Solve a visual arts problem that involves the effective use of the elements of art and the principles of design.
2.2 Prepare a portfolio of original two-and three-dimensional works of art that reflects refined craftsmanship and technical skills.
2.3 Develop and refine skill in the manipulation of digital imagery (either still or video).
2.4 Review and refine observational drawing skills.

Communication and Expression Through Original Works of Art

2.5 Create an expressive composition, focusing on dominance and subordination.
2.6 Create a two or three-dimensional work of art that addresses a social issue.

3.0 HISTORICAL AND CULTURAL CONTEXT

Understanding the Historical Contributions and Cultural Dimensions of the Visual Arts

Students analyze the role and development of the visual arts in past and present cultures throughout the world, noting human diversity as it relates to the visual arts and artists.

Role and Development of the Visual Arts

3.1 Identify similarities and differences in the purposes of art created in selected cultures.
3.2 Identify and describe the role and influence of new technologies on contemporary works of art.

Diversity of the Visual Arts

3.3 Identify and describe trends in the visual arts and discuss how the issues of time, place, and cultural influence are reflected in selected works of art.
3.4 Discuss the purposes of art in selected contemporary cultures.

4.0 AESTHETIC VALUING

Responding to, Analyzing, and Making Judgments About Works in the Visual Arts

Students analyze, assess, and derive meaning from works of art, including their own, according to the elements of art, the principles of design, and aesthetic qualities.

Derive Meaning

4.1 Articulate how personal beliefs, cultural traditions, and current social, economic, and political contexts influence the interpretation of the meaning or message in a work of art.
4.2 Compare the ways in which the meaning of a specific work of art has been affected over time because of changes in interpretation and context.

Make Informed Judgments

4.3 Formulate and support a position regarding the aesthetic value of a specific work of art and change or defend that position after considering the views of others.
4.4 Articulate the process and rationale for refining and reworking one of their own works of art.
4.5 Employ the conventions of art criticism in writing and speaking about works of art.

5.0 CONNECTIONS, RELATIONSHIPS, APPLICATIONS

Connecting and Applying What Is Learned in the Visual Arts to Other Art Forms and Subject Areas and to Careers

Students apply what they learn in the visual arts across subject areas. They develop competencies and creative skills in problem solving, communication, and management of time and resources that contribute to lifelong learning and career skills. They also learn about careers in and related to the visual arts.

Connections and Applications

5.1 Design an advertising campaign for a theatre or dance production held at a school, creating images that represent characters and major events in the production.
5.2 Create a work of art that communicates a cross-cultural or universal theme taken from literature or history.

Visual Literacy

5.3 Compare and contrast the ways in which different media (television, newspapers, magazines) cover the same art exhibition.
Careers and Career-Related Skills
5.4 Demonstrate an understanding of the various skills of an artist, art critic, art historian, art collector, art gallery owner, and philosopher of art (aesthetician).

Nine Through Twelve-Advanced
Visual and Performing Arts: Visual Arts Content Standards.

1.0 ARTISTIC PERCEPTION

Processing, Analyzing, and Responding to Sensory Information Through the Language and Skills Unique to the Visual Arts

Students perceive and respond to works of art, objects in nature, events, and the environment. They also use the vocabulary of the visual arts to express their observations.

Develop Perceptual Skills and Visual Arts Vocabulary

1.1 Analyze and discuss complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual in works of art.
1.2 Discuss a series of their original works of art, using the appropriate vocabulary of art.
1.3 Analyze their works of art as to personal direction and style.

Analyze Art Elements and Principles of Design

1.4 Research two periods of painting, sculpture, film, or other media and discuss their similarities and differences, using the language of the visual arts.
1.5 Compare how distortion is used in photography or video with how the artist uses distortion in painting or sculpture.

1.6 Describe the use of the elements of art to express mood in one or more of their works of art.

Impact of Media Choice

1.7 Select three works of art from their art portfolio and discuss the intent of the work and the use of the media.
1.8 Analyze the works of a well-known artist as to the art media selected and the effect of that selection on the artist's style.

2.0 CREATIVE EXPRESSION

Creating, Performing, and Participating in the Visual Arts

Students apply artistic processes and skills, using a variety of media to communicate meaning and intent in original works of art.

Skills, Processes, Materials, and Tools

2.1 Create original works of art of increasing complexity and skill in a variety of media that reflect their feelings and points of view.
2.2 Plan and create works of art that reflect complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual.
2.3 Assemble and display objects or works of art as a part of a public exhibition.

Communication and Expression Through Original Works of Art

2.4 Demonstrate in their own works of art a personal style and an advanced proficiency in communicating an idea, theme, or emotion.
2.5 Use innovative visual metaphors in creating works of art.
2.6 Present a universal concept in a multimedia work of art that demonstrates knowledge of technology skills.

3.0 HISTORICAL AND CULTURAL CONTEXT

Understanding the Historical Contributions and Cultural Dimensions of the Visual Arts

Students analyze the role and development of the visual arts in past and present cultures throughout the world, noting human diversity as it relates to the visual arts and artists.

Role and Development of the Visual Arts

3.1 Identify contemporary styles and discuss the diverse social, economic, and political developments reflected in the works of art examined.
3.2 Identify contemporary artists worldwide who have achieved regional, national, or international recognition and discuss ways in which their work reflects, plays a role in, and influences present-day culture.

Diversity of the Visual Arts

3.3 Investigate and discuss universal concepts expressed in works of art from diverse cultures.
3.4 Research the methods art historians use to determine the time, place, context, value, and culture that produced a given work of art.

4.0 AESTHETIC VALUING

Responding to, Analyzing, and Making Judgments About Works in the Visual Arts

Students analyze, assess, and derive meaning from works of art, including their own, according to the elements of art, the principles of design, and aesthetic qualities.

Derive Meaning

4.1 Describe the relationship involving the art maker (artist), the making (process), the artwork (product), and the viewer.
4.2 Identify the intentions of artists creating contemporary works of art and explore the implications of those intentions.
4.3 Analyze and articulate how society influences the interpretation and message of a work of art.

Make Informed Judgments

4.4 Apply various art-related theoretical perspectives to their own works of art and the work of others in classroom critiques.
4.5 Construct a rationale for the validity of a specific work of art artwork that falls outside their own conceptions of art.
4.6 Develop written criteria for the selection of a body of work from their portfolios that represents significant achievements.

5.0 CONNECTIONS, RELATIONSHIPS, APPLICATIONS

Connecting and Applying What Is Learned in the Visual Arts to Other Art Forms and Subject Areas and to Careers

Students apply what they learn in the visual arts across subject areas. They develop competencies and creative skills in problem solving, communication, and management of time and resources that contribute to lifelong learning and career skills. They also learn about careers in and related to the visual arts.

Connections and Applications

5.1 Speculate on how advances in technology might change the definition and function of the visual arts.

Visual Literacy

5.2 Compare and contrast works of art, probing beyond the obvious and identifying psychological content found in the symbols and images.
Careers and Career-Related Skills
5.3 Prepare portfolios of their original works of art for a variety of purposes (e.g., review for post-secondary application, exhibition, job application, and personal collection).
5.4 Investigate and report on the essential features of modern or emerging technologies that affect or will affect visual artists and the definition of the visual arts.

Standards for:

Foreign Language

The *World Language Content Standards for California Public Schools*

7–12

Organization of the Standards

The World Language Content Standards for California Public Schools, represents a strong consensus that the study of a wide variety of world languages and cultures is part of the core curriculum.

The content standards were developed to accommodate all languages and describe the various stages a learner goes through to become proficient. Therefore, the content standards are not language-specific. The content standards that follow are not tied to specific grade levels; instead, they describe the stages of linguistic and cultural acquisition. For ease of presentation, the standards are separated into five categories: Content, Communication, Cultures, Structures, and Settings. The categories should be taught together and, in practice, merge into seamless instruction within the various stages of the Language Learning Continuum.

Content
Language users address a wide variety of topics that are appropriate to their age and stage. As students develop their ability to communicate in the target language and culture, they are able to more fully address topics that increase in complexity along the Language Learning Continuum.

Communication
Real-world communication takes place in a variety of ways. It may be interpersonal: culturally appropriate listening, reading, viewing, speaking, signing, and writing take place as a shared activity among language users. It may be interpretive: language users listen, view, and read by using knowledge of cultural products, practices, and perspectives. It may be presentational: speaking, signing, and writing take place in culturally appropriate ways.

Cultures
Culturally appropriate language use requires an understanding of the relationship between the products and practices of the culture and its underlying perspectives. Students must acquire the ability to interact appropriately with target culture bearers in order to communicate successfully. This category allows students to make connections and comparisons between languages and cultures.

Structures
The content standards use the term structures to capture the multiple components of grammar that learners must control in order to successfully communicate in linguistically and culturally appropriate ways. Students need to acquire orthography, the writing systems of languages that have them; phonology, the sound systems of languages or parameters in ASL; morphology, the rules for word formation; syntax, the principles of sentence structure; semantics, language-based meaning systems; and pragmatics, meaning systems connected to language use.

Settings
Language users need to carry out tasks in a variety of situations representative of those they will experience in the target culture. The success of learner communication will depend on the situation in which the language is used. Understanding social linguistic norms will assist learners in communicating effectively in real-world encounters.

Content

As students become literate in the target language, they acquire relevant content through the study of various topics. This in turn expands their access to information from around the globe. Moreover, the content that students acquire in the language classroom enables them to make connections and reinforce knowledge from other content areas of the curriculum. As they progress along the Language Learning Continuum,* students address a wide variety of content that is age- and stage-appropriate.

Stage I

1.0 Students acquire information, recognize distinctive viewpoints, and further their knowledge of other disciplines.

1.1 Students address discrete elements of daily life, including:

a. Greetings and introductions
b. Family and friends
c. Pets
d. Home and neighborhood
e. Celebrations, holidays, and rites of passage
f. Calendar, seasons, and weather
g. Leisure, hobbies and activities, songs, toys and games, sports
h. Vacations and travel, maps, destinations, and geography
i. School, classroom, schedules, subjects, numbers, time, directions
j. Important dates in the target culture
k. Jobs
l. Food, meals, restaurants
m. Shopping, clothes, colors, and sizes
n. Parts of the body, illness
o. Technology

Stage II

2.0 Students acquire information, recognize distinctive viewpoints, and further their knowledge of other disciplines.

2.1 Students address topics related to self and the immediate environment, including:

a. Social relationships
b. People in the community
c. Zoo and farm animals, fables
d. Care of the home, interacting with people in the community
e. Holiday customs and transition points in life
f. Climate
g. Cultural and leisure-time activities, outdoor, recreational activities, music
h. Transportation, lodging, itineraries, geographic features and landmarks
i. Curricular and extracurricular interests and events
j. Significant historical figures
k. Professions and the working world
l. Cuisine and recipes
m. Clothing and fashion
n. Health, medical care
o. Technological advances and innovation

Stage III

3.0 Students acquire information, recognize distinctive viewpoints, and further their knowledge of other disciplines.

3.1 Students address concrete and factual topics related to the immediate and external environment, including:

a. Social norms
b. Historical and cultural figures, stereotypes
c. Animals and their habitats
d. Community issues, current events
e. Origins of rites of passage, social and regional customs
f. Environmental concerns
g. Media, Internet, television, radio, film
h. Cultural, historical, and geographic aspects of travel
i. Curricular and extracurricular subjects
j. Significant historical events
k. Careers and future plans
l. Nutrition, fitness, and health
m. Geographically and culturally appropriate clothing
n. Cultural differences in health care
o. Effects of technology on the modern world

Stage IV

4.0 Students acquire information, recognize distinctive viewpoints, and further their knowledge of other disciplines.

4.1 Students address complex, concrete, factual, and abstract topics related to the immediate and external environment, including:

a. Societal expectations
b. Cultural and literary archetypes
c. Endangered species
d. World events, social and political issues
e. Belief systems
f. International environmental issues
g. The visual and performing arts
h. The nature of an interdependent world
i. Issues in curricular and extracurricular subjects
j. Authors and their times
k. Transnational careers and economies
l. Issues of world hunger and health
m. Design, production, and marketing of clothing
n. Policy issues in health care
o. The promise and challenge of technology

Communication

To achieve communicative competence, students convey and receive messages effectively. Students actively use language to transmit meaning while responding to real situations. Moreover, they process language in linguistically and culturally appropriate ways while interacting with a wide variety of audiences. As they progress along the Language Learning Continuum, students engage in communication that is age- and stage-appropriate.

Stage I

1.0 Students use **formulaic language** (learned words, signs [ASL], and phrases).

1.1 Engage in oral, written, or signed (ASL) conversations.
1.2 Interpret written, spoken, or signed (ASL) language.
1.3 Present to an audience of listeners, readers, or ASL viewers.

Functions

1.4 List, name, identify, and enumerate.
1.5 Identify learned words, signs (ASL), and phrases in authentic texts.
1.6 Reproduce and present a written, oral, or signed (ASL) product in a culturally authentic way.

Stage II

2.0 Students use **created language** (sentences and strings of sentences).

2.1 Engage in oral, written, or signed (ASL) conversations.
2.2 Interpret written, spoken, or signed (ASL) language.
2.3 Present to an audience of listeners, readers, or ASL viewers.

Functions

2.4 Initiate, participate in, and close a conversation; ask and answer questions.
2.5 Demonstrate understanding of the general meaning, key ideas, and some details in authentic texts.
2.6 Produce and present a simple written, oral, or signed (ASL) product in a culturally authentic way.

Stage III

3.0 Students use **planned language** (paragraphs and strings of paragraphs).

3.1 Engage in oral, written, or signed (ASL) conversations.
3.2 Interpret written, spoken, or signed (ASL) language.
3.3 Present to an audience of listeners, readers, or ASL viewers.

Functions

3.4 Describe, narrate, explain, and state an opinion.

3.5 Demonstrate understanding of the main idea and key details in authentic texts.
3.6 Produce and present a written, oral, or signed (ASL) product in a culturally authentic way.

Stage IV

4.0 Students use **extended language** (coherent and cohesive multiparagraph texts).
4.1 Engage in oral, written, or signed (ASL) conversations.
4.2 Interpret written, spoken, or signed (ASL) language.
4.3 Present to an audience of listeners, readers, or ASL viewers.

Functions

4.4 Discuss, compare and contrast, and support an opinion; persuade.
4.5 Demonstrate understanding of the main ideas and most details in authentic texts.
4.6 Produce and present a complex written, oral, or signed (ASL) product in a culturally authentic way.

Cultures

To understand the connection between language and culture, students discern how a culture views the world. Students comprehend the ideas, attitudes, and values that shape the target culture. Those shared common perspectives, practices, and products incorporate not only formal aspects of a culture such as contributions of literature, the arts, and science, but also the daily living practices, shared traditions, and common patterns of behavior acceptable to a society. As they progress along the Language Learning Continuum, students demonstrate their understanding of cultural perspectives by behaving in culturally appropriate ways.

Stage I

1.0 Students use appropriate responses to rehearsed cultural situations.
1.1 Associate products, practices, and perspectives with the target culture.
1.2 Recognize similarities and differences in the target cultures and between students' own cultures.
1.3 Identify cultural borrowings.

Stage II

2.0 Students choose an appropriate response to a variety of situations.
2.1 Demonstrate understanding of the roles that products, practices, and perspectives play in the culture.
2.2 State similarities and differences in the target cultures and between students' own cultures.
2.3 State reasons for cultural borrowings.

Stage III

3.0 Students determine appropriate responses to situations with complications.
3.1 Use products, practices, and perspectives in culturally appropriate ways.
3.2 Describe similarities and differences in the target cultures and between students' own cultures.
3.3 Describe how products and practices change when cultures come in contact.

Stage IV

4.0 Students improvise appropriate responses to unpredictable situations.

4.1 Demonstrate culturally appropriate use of products, practices, and perspectives to others.
4.2 Explain similarities and differences in the target cultures and between students' own cultures.
4.3 Explain the changes in perspectives when cultures come in contact.

Structures

Languages vary considerably in the structures that learners use to convey meaning; therefore, the following standards are general in order to apply to all languages. It is expected that the curriculum will feature language-specific structures essential to accurate communication. As students acquire vocabulary in the target language, they grasp the associated concepts and comprehend the structures the language uses to convey meaning. Moreover, students discover patterns in the language system. A language system consists of grammar rules, vocabulary, and elements such as gestures and other forms of nonverbal communication. A language system also includes discourse, whereby speakers learn what to say to whom and when. As they progress along the Language Learning Continuum, students use linguistically and grammatically appropriate structures to comprehend and produce messages. Students identify similarities and differences among the languages they know.

Stage I

1.0 Students use orthography, phonology, or ASL parameters to understand words, signs (ASL), and phrases in context.
1.1 Use orthography, phonology, or ASL parameters to produce words or signs (ASL) and phrases in context.
1.2 Identify similarities and differences in the orthography, phonology, or ASL parameters of the languages the students know.

Stage II

2.0 Students use sentence-level elements (morphology or syntax or both) to understand concrete and factual topics.
2.1 Use sentence-level elements (morphology or syntax or both) to produce informal communications.
2.2 Identify similarities and differences in the sentence-level elements (morphology or syntax or both) of the languages the students know.

Stage III

3.0 Students use knowledge of text structure to understand topics related to the external environment.
3.1 Use paragraph-level discourse (text structure) to produce formal communications.
3.2 Identify similarities and differences in the paragraph-level discourse (text structure) of the languages the students know.

Stage IV

4.0 Students use knowledge of extended discourse to understand abstract and academic topics.
4.1 Use extended discourse (native-like text structure) to produce formal communications.
4.2 Identify similarities and differences in the extended discourse (native-like text structure) of the languages the students know.

Settings

For students to communicate effectively, they use elements of language appropriate to a given situation. Language conveys meaning best when the setting, or context, in which it is used, is known. This knowledge of context assists students not only in comprehending meaning but also in using language that is culturally appropriate.

Context also helps define and clarify the meaning of language that is new to the learner. As students' progress along the Language Learning Continuum, they carry out tasks in stage- and age-appropriate situations that reflect the target culture.

Stage I

1.0 Students use language in highly predictable common daily settings.
1.1 Recognize age-appropriate cultural or language-use opportunities outside the classroom.

Stage II

2.0 Students use language in interpersonal settings.
2.1 Participate in age-appropriate cultural or language-use opportunities outside the classroom.

Stage III

3.0 Students use language in informal and some formal settings.
3.1 Initiate age-appropriate cultural or language-use opportunities outside the classroom.

Stage IV

4.0 Students use language in informal and formal settings.
4.1 Sustain age-appropriate cultural or language-use opportunities outside the classroom.

Standards for:

English as a Second Language

https://www.cde.ca.gov/sp/el/er/documents/eldstndspublication14.pdf

7–12

Grade 7

Goal:

English learners read, analyze, interpret, and create a variety of literary and informational text types. They develop an understanding of how language is a complex, dynamic, and social resource for making meaning, as well as how content is organized in different text types and across disciplines using text structure, language features, and vocabulary depending on purpose and audience. They are aware that different languages and variations of English exist, and they recognize their home languages and cultures as resources to value in their own right and also to draw upon in order to build proficiency in English. English learners contribute actively to class and group discussions, asking questions, responding appropriately, and providing useful feedback. They demonstrate knowledge of content through oral presentations, writing tasks, collaborative conversations, and multimedia. They develop proficiency in shifting language use based on task, purpose, audience, and text type.

Critical Principles for Developing Language and Cognition in Academic Contexts:

While advancing along the continuum of English language development levels, English learners at all levels engage in intellectually challenging literacy, disciplinary, and disciplinary literacy tasks. They use language in meaningful and relevant ways appropriate to grade level, content area, topic, purpose, audience, and text type in English language arts, mathematics, science, social studies, and the arts. Specifically, they use language to gain and exchange information and ideas in three communicative modes (collaborative, interpretive, and productive), and they apply knowledge of language to academic tasks via three cross-mode language processes (structuring cohesive texts, expanding and enriching ideas, and connecting and condensing ideas) using various linguistic resources.

Part I: Interacting in Meaningful Ways

A. Collaborative

1. Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics
2. Interacting with others in written English in various communicative forms (print, communicative technology and multimedia)
3. Offering and justifying opinions, negotiating with and persuading others in communicative exchanges
4. Adapting language choices to various contexts (based on task, purpose, audience, and text type)

Corresponding CA CCSS for ELA/Literacy
SL.7.1, 6; L.7.3, 6
W.7.6; WHST.7.6; SL.7.2; L.7.3, 6
W.7.1; WHST.7.1; SL.7.1, 4, 6; L.7.3, 6
W.7.4–5; WHST.7.4–5; SL.7.6; L.7.1, 3, 6

B. Interpretive

5. Listening actively to spoken English in a range of social and academic contexts
6. Reading closely literary and informational texts and viewing multimedia to determine how meaning is conveyed explicitly and implicitly through language 7. Evaluating how well writers and speakers use language to support ideas and arguments with details or evidence depending on modality, text type, purpose, audience, topic, and content area
8. Analyzing how writers and speakers use vocabulary and other language resources for specific purposes (to explain, persuade, entertain, etc.) depending on modality, text type, purpose, audience, topic, and content area

Corresponding CA CCSS for ELA/Literacy
SL.7.1, 3, 6; L.7.1, 3, 6
RL.7.1–7, 9–10; RI.7.1–10; RH.7.1–10;
RST.7.1–10; SL.7.2; L.7.1, 3, 6
RL.7.4–5; RI.7.4, 6, 8; RH.7.4–6, 8; RST.7.4–6,
8; SL.7.3; L.7.3, 5–6
RL.7.4–5; RI.7.4–5; RH.7.4–5; RST.7.4–5;
SL.7.3; L.7.3, 5–6

C. Productive

9. Expressing information and ideas in formal oral presentations on academic topics
10. Writing literary and informational texts to present, describe, and explain ideas and information, using appropriate technology
11. Justifying own arguments and evaluating others' arguments in writing
12. Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas

Corresponding CA CCSS for ELA/Literacy
SL.7.4–6; L.7.1, 3
W.7.1–10; WHST.7.1–2,4–10; L.7.1–6
W.7.1, 8–9; WHST.7.1 ,8–9; L.7.1–3, 6
W.7.4–5; WHST.7.4–5; SL.7.4, 6; L.7.1,3, 5–6

Part II: Learning About How English Works

A. Structuring Cohesive Texts

1. Understanding text structure
2. Understanding cohesion

Corresponding CA CCSS for ELA/Literacy
RL.7.5; RI.7.5; RH.7.5; RST.7.5; W.7.1–5, 10; WHST.7.1-2, 4–5,10; SL.7.4
RI.7.5; RH.7.5; RST.7.5; W.7.1–5,10; WHST.7.1–2, 4–5, 10; L.7.1, 3–6 B.

Expanding and Enriching Ideas
3. Using verbs and verb phrases
4. Using nouns and noun phrases
5. Modifying to add details

Corresponding CA CCSS for ELA/Literacy
W.7.5; WHST.7.5; SL.7.6; L.7.1, 3–6
W.7.5; WHST.7.5; SL.7.6; L.7.1, 3–6
W.7.4–5; WHST.7.4–5; SL.7.6; L.7.1, 3–6 C.

Connecting and Condensing Ideas

6. Connecting ideas
7. Condensing ideas

Corresponding CA CCSS for ELA/Literacy
W.7.1–5; WHST.7.1–2, 4-5; SL.7.4, 6; L.7.1, 3–6
W.7.1–5; WHST.7.1–2, 4–5; SL.7.4, 6; L.7.1, 3–6

Part III: Using Foundational Literacy Skills

RF.K–1.1–4; RF.2–5.3–4 (as appropriate)

Grade 8

Goal:

English learners read, analyze, interpret, and create a variety of literary and informational text types. They develop an understanding of how language is a complex, dynamic, and social resource for making meaning, as well as how content is organized in different text types and across disciplines using text structure, language features, and vocabulary depending on purpose and audience. They are aware that different languages and variations of English exist, and they recognize their home languages and cultures as resources to value in their own

right and also to draw upon in order to build proficiency in English. English learners contribute actively to class and group discussions, asking questions, responding appropriately, and providing useful feedback. They demonstrate knowledge of content through oral presentations, writing tasks, collaborative conversations, and multimedia. They develop proficiency in shifting language use based on task, purpose, audience, and text type.

Critical Principles for Developing Language and Cognition in Academic Contexts:

While advancing along the continuum of English language development levels, English learners at all levels engage in intellectually challenging literacy, disciplinary, and disciplinary literacy tasks. They use language in meaningful and relevant ways appropriate to grade level, content area, topic, purpose, audience, and text type in English language arts, mathematics, science, social studies, and the arts. Specifically, they use language to gain and exchange information and ideas in three communicative modes (collaborative, interpretive, and productive), and they apply knowledge of language to academic tasks via three cross-mode language processes (structuring cohesive texts, expanding and enriching ideas, and connecting and condensing ideas) using various linguistic resources.

Part I: Interacting in Meaningful Ways

A. Collaborative

1. Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics
2. Interacting with others in written English in various communicative forms (print, communicative technology and multimedia)
3. Offering and justifying opinions, negotiating with and persuading others in communicative exchanges
4. Adapting language choices to various contexts (based on task, purpose, audience, and text type)

Corresponding CA CCSS for ELA/Literacy
SL.8.1, 6; L.7.3, 6
W.8.6; WHST.8.6; SL.8.2; L.8.3, 6
W.8.1; WHST.8.1; SL.8.1, 4, 6; L.8.3, 6
W.8.4–5; WHST.8.4–5; SL.8.6; L.8.1, 3, 6

B. Interpretive

5. Listening actively to spoken English in a range of social and academic contexts
6. Reading closely literary and informational texts and viewing multimedia to determine how meaning is conveyed explicitly and implicitly through language
7. Evaluating how well writers and speakers use language to support ideas and arguments with details or evidence depending on modality, text type, purpose, audience, topic, and content area
8. Analyzing how writers and speakers use vocabulary and other language resources for specific purposes (to explain, persuade, entertain, etc.) depending on modality, text type, purpose, audience, topic, and content area

Corresponding CA CCSS for ELA/Literacy
SL.8.1, 3, 6; L.8.1, 3, 6
RL.8.1–7,9–10; RI.8.1–10; RH.8.1–10;
RST.8.1–10; SL.8.2; L.8.1, 3, 6
RL.8.4–5; RI.8.4, 6, 8; RH.8.4–6, 8;
RST.8.4–6, 8; SL.8.3; L.8.3, 5–6
RL.8.4–5; RI.8.4–5; RH.8.4–5; RST.8.4–5;
SL.8.3; L.8.3, 5–6

C. Productive

9. Expressing information and ideas in formal oral presentations on academic topics
10. Writing literary and informational texts to present, describe, and explain ideas and information, using appropriate technology

11. Justifying own arguments and evaluating others' arguments in writing
12. Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas

Corresponding CA CCSS for ELA/Literacy
SL.8.4–6; L.7.1, 3
W.8.1–10; WHST.8.1–2,4–10; L.8.1–6
W.8.1, 8–9; WHST.8.1 ,8–9; L.8.1–3, 6
W.8.4–5; WHST.8.4–5; SL.8.4, 6; L.8.1,3, 5–6

Part II: Learning About How English Works

A. Structuring Cohesive Texts

1. Understanding text structure
2. Understanding cohesion

Corresponding CA CCSS for ELA/Literacy
RL.8.5; RI.7.5; RH.8.5; RST.8.5;
W.8.1–5, 10; WHST.8.1-2, 4–5,10; SL.8.4
RI.8.5; RH.8.5; RST.8.5; W.8.1–5,10;
WHST.8.1–2, 4–5, 10; L.8.1, 3–6 B.

Expanding and Enriching Ideas
3. Using verbs and verb phrases
4. Using nouns and noun phrases
5. Modifying to add details

Corresponding CA CCSS for ELA/Literacy
W.8.5; WHST.8.5; SL.8.6; L.8.1, 3–6
W.8.5; WHST.8.5; SL.8.6; L.8.1, 3–6
W.8.4–5; WHST.8.4–5; SL.8.6; L.8.1, 3–6 C.

Connecting and Condensing Ideas

6. Connecting ideas
7. Condensing ideas

Corresponding CA CCSS for ELA/Literacy
W.8.1–5; WHST.8.1–2, 4-5; SL.8.4, 6; L.8.1, 3–6
W.7.1–5; WHST.8.1–2, 4–5; SL.8.4, 6; L.8.1, 3–6

Part III: Using Foundational Literacy Skills

RF.K–1.1–4; RF.2–5.3–4 (as appropriate)

Grade 9-10

Goal:

English learners read, analyze, interpret, and create a variety of literary and informational text types. They develop an understanding of how language is a complex, dynamic, and social resource for making meaning, as well as how content is organized in different text types and across disciplines using text structure, language features, and vocabulary depending on purpose and audience. They are aware that different languages and variations of English exist, and they recognize their home languages and cultures as resources to value in their own right and also to draw upon in order to build proficiency in English. English learners contribute actively to class and group discussions, asking questions, responding appropriately, and providing useful feedback. They demonstrate knowledge of content through oral presentations, writing tasks, collaborative conversations, and multimedia. They develop proficiency in shifting language use based on task, purpose, audience, and text type.

Critical Principles for Developing Language and Cognition in Academic Contexts:

While advancing along the continuum of English language development levels, English learners at all levels engage in intellectually challenging

literacy, disciplinary, and disciplinary literacy tasks. They use language in meaningful and relevant ways appropriate to grade level, content area, topic, purpose, audience, and text type in English language arts, mathematics, science, social studies, and the arts. Specifically, they use language to gain and exchange information and ideas in three communicative modes (collaborative, interpretive, and productive), and they apply knowledge of language to academic tasks via three cross-mode language processes (structuring cohesive texts, expanding and enriching ideas, and connecting and condensing ideas) using various linguistic resources.

Part I: Interacting in Meaningful Ways

A. Collaborative

1. Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics
2. Interacting with others in written English in various communicative forms (print, communicative technology and multimedia)
3. Offering and justifying opinions, negotiating with and persuading others in communicative exchanges
4. Adapting language choices to various contexts (based on task, purpose, audience, and text type)

Corresponding CA CCSS for ELA/Literacy
SL.9–10.1, 6; L.9–10.3, 6 W.9–10.6;
WHST.9–10.6; SL.9–10.2; L.9–10.3, 6 W.9–10.1;
WHST.9–10.1; SL.9–10.1, 4, 6;
L.9–10.3, 6 W.9–10.4-5; WHST. 9–10.4–5; SL.9–10.6; L.9–10.1, 3, 6

B. Interpretive
5. Listening actively to spoken English in a range of social and academic contexts
6. Reading closely literary and informational texts and viewing multimedia to determine how meaning is conveyed explicitly and implicitly through language
7. Evaluating how well writers and speakers use language to support ideas and arguments with details or evidence depending on modality, text type, purpose, audience, topic, and content area
8. Analyzing how writers and speakers use vocabulary and other language resources for specific purposes (to explain, persuade, entertain, etc.) depending on modality, text type, purpose, audience, topic, and content area

Corresponding CA CCSS for ELA/Literacy
SL.9–10.1, 3, 6; L.9–10.1, 3, 6
RL.9–10.1–7, 9–10; RI.9–10.1–10; RH.9–10.1–10; RST.9–10.1–10;
SL.9–10.2; L.9–10.1, 3, 6
RL.9–10.4–5; RI.9–10.4, 6, 8; RH.9–10.4–6, 8;
RST.9–10.4–6, 8; SL.9–10.3;
L.9–10.3, 5–6
RL.9–10.4–5; RI.9–10.4–5; RH.9–10.4–5;
RST.9–10.4–5; SL.9–10.3;
L.9–10.3, 5–6

C. Productive

9. Expressing information and ideas in formal oral presentations on academic topics
10. Writing literary and informational texts to present, describe, and explain ideas and information, using appropriate technology
11. Justifying own arguments and evaluating others' arguments in writing
12. Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas

Corresponding CA CCSS for ELA/Literacy
SL.9–10.4–6; L.9–10.1, 3
W.9–10.1–10; WHST.9–10.1–2, 4–10; L.9–10.1–6 W.9–10.1, 8–9;
WHST.9–10.1, 8–9; L.9–10.1–3, 6
W.9–10.4–5;
WHST.9–10.4–5; SL.9–10.4, 6; L.9–10.1, 3, 5–6

Part II: Learning About How English Works

A. Structuring Cohesive Texts

1. Understanding text structure
2. Understanding cohesion

Corresponding CA CCSS for ELA/Literacy
RL.9–10.5; RI.9–10.5; RH.9–10.5; RST.9–10.5; W.9–10.1–5, 10;
WHST.9–10.1-2, 4–5, 10;
SL.9–10.4
RI.9–10.5; RH.9–10.5; RST.9–10.5; W.9–10.1–5, 10;
WHST.9–10.1–2, 4–5, 10; L.9–10.1, 3–6

Expanding and Enriching Ideas
3. Using verbs and verb phrases
4. Using nouns and noun phrases
5. Modifying to add details

Corresponding CA CCSS for ELA/Literacy
W.9–10.5; WHST.9–10.5; SL.9–10.6; L.9–10.1, 3–6
W.9–10.5; WHST.9–10.5; SL.9–10.6; L.9–10.1, 3–6
W.9–10.4–5;
WHST.9–10.4–5; SL.9–10.6;
L.9–10.1, 3–6

Connecting and Condensing Ideas

6. Connecting ideas
7. Condensing ideas
Corresponding CA CCSS for ELA/Literacy
W.9–10.1-5; WHST.9–10.1–2, 4–5; SL.9–10.4, 6; L.9–10.1, 3–6
W.9–10.1–5; WHST.9–10.1–2, 4–5; SL.9–10.4, 6; L.9–10.1, 3–6

Part III: Using Foundational Literacy Skills

RF.K–1.1–4; RF.2–5.3–4 (as appropriate)

Grade 11-12

Goal:

English learners read, analyze, interpret, and create a variety of literary and informational text types. They develop an understanding of how language is a complex, dynamic, and social resource for making meaning, as well as how content is organized in different text types and across disciplines using text structure, language features, and vocabulary depending on purpose and audience. They are aware that different languages and variations of English exist, and they recognize their home languages and cultures as resources to value in their own right and also to draw upon in order to build proficiency in English. English learners contribute actively to class and group discussions, asking questions, responding appropriately, and providing useful feedback. They demonstrate knowledge of content through oral presentations, writing tasks, collaborative conversations, and multimedia. They develop proficiency in shifting language use based on task, purpose, audience, and text type.

Critical Principles for Developing Language and Cognition in Academic Contexts:

While advancing along the continuum of English language development levels, English learners at all levels engage in intellectually challenging literacy, disciplinary, and disciplinary literacy tasks. They use language in meaningful and relevant ways appropriate to grade level, content area, topic, purpose, audience, and text type in English language arts, mathematics, science, social studies, and the arts. Specifically, they use language to gain and exchange information and ideas in three communicative modes (collaborative, interpretive, and productive), and they apply knowledge of language to academic tasks via three

cross-mode language processes (structuring cohesive texts, expanding and enriching ideas, and connecting and condensing ideas) using various linguistic resources.

Part I: Interacting in Meaningful Ways

A. Collaborative

1. Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics
2. Interacting with others in written English in various communicative forms (print, communicative technology and multimedia)
3. Offering and justifying opinions, negotiating with and persuading others in communicative exchanges
4. Adapting language choices to various contexts (based on task, purpose, audience, and text type)

Corresponding CA CCSS for ELA/Literacy
SL.11–12.1, 6; L.11–12.3, 6 W.11-12.6;
WHST.11–12.6; SL.11–12.2;
L.11–12.3, 6 W.11–12.1;
WHST.11–12.1; SL.11–12.1, 4, 6; L.11–12.3, 6 W.11–12.4–5;
WHST.11–12.4–5; SL.11–12.6; L.11–12.1, 3, 6

B. Interpretive

5. Listening actively to spoken English in a range of social and academic contexts
6. Reading closely literary and informational texts and viewing multimedia to determine how meaning is conveyed explicitly and implicitly through language
7. Evaluating how well writers and speakers use language to support ideas and arguments with details or evidence depending on modality, text type, purpose, audience, topic, and content area
8. Analyzing how writers and speakers use vocabulary and other language resources for specific purposes (to explain, persuade, entertain, etc.) depending on modality, text type, purpose, audience, topic, and content area

Corresponding CA CCSS for ELA/Literacy
SL.11–12.1, 3, 6; L.11–12.1, 3, 6
RL.11–12.1–7, 9–10; RI.11–12.110;–
RH.11–12.1–10; RST.11–12.1–10; SL.11–12.2; L.11–12.1, 3, 6
RL.11–12.4–5;
RI.11–12.4, 6, 8;
RH.11-12.4–6, 8;
RST.11–12.4–6, 8; SL.11–12.3; L.11–12.3, 5–6
RL.11–12.4–5; RI.11–12.4–5;
RH.11–12.4–5; RST.11– 12.4–5; SL.11–12.3; L.11–12.3, 5–6

C. Productive

9. Expressing information and ideas in formal oral presentations on academic topics
10. Writing literary and informational texts to present, describe, and explain ideas and information, using appropriate technology
11. Justifying own arguments and evaluating others' arguments in writing
12. Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas

Corresponding CA CCSS for ELA/Literacy
SL.11–12.4–6; L.11–12.1, 3
W.11–12.1–10;
WHST.11–12.1–2, 4–10; L.11–12.1–6
W.11–12.1, 8–9;
WHST.11–12.1, 8–9;
L.11–12.1–3, 6
W.11–12.4–5;
WHST.11–12.4–5; SL.11–12.4, 6; L.11–12.1, 3, 5–6

Part II: Learning About How English Works

A. Structuring Cohesive Texts

1. Understanding text structure
2. Understanding cohesion

Corresponding CA CCSS for ELA/Literacy
RL.11–12.5; RI.11–12.5;
RH.11–12.5; RST.11–12.5;
W.11–12.1–5, 10;
WHST.11–12.1–2, 4–5, 10;
SL.11–12.4
RI.11–12.5; RH.11–12.5; RST.11–12.5; W.11–12.1–5, 10;
WHST.11–12.1–2, 4–5, 10; L.11–12.1, 3–6

Expanding and Enriching Ideas
3. Using verbs and verb phrases
4. Using nouns and noun phrases
5. Modifying to add details

Corresponding CA CCSS for ELA/Literacy
W.11–12.5; WHST.11–12.5; SL.11–12.6; L.11–12.1, 3–6
W.11–12.5; WHST.11–12.5; SL.11–12.6; L.11–12.1, 3–6
W.11–12.4–5; WHST.11–12.4–5; SL.11–12.6; L.11–12.1, 3–6

Connecting and Condensing Ideas

6. Connecting ideas
7. Condensing ideas

Corresponding CA CCSS for ELA/Literacy
W.11–12.1–5;
WHST.11–12.1–2, 4–5; SL.11–12.4, 6; L.11–12.1, 3–6
W.11–12.1–5; WHST.11–12.1-2, 4–5; SL.11–12.4, 6;
L.11–12.1, 3–

Part III: Using Foundational Literacy Skills

RF.K–1.1–4; RF.2–5.3–4 (as appropriate)

The Importance of Vocabulary

Over the past several decades, research has repeatedly identified vocabulary knowledge as a critical and powerful factor underlying language and literacy proficiency, including disciplinary literacy (e.g., Graves 1986; Chall, Jacobs, and
Baldwin 1990; Beck and McKeown 1991; Hart and Risley 1995; Blachowicz and Fisher 2004; Baumann, Kame'enui, and Ash 2003; Bowers and Kirby 2010; Carlisle 2010; McCutchen and Logan 2011). Comprehensive and multifaceted approaches to vocabulary instruction include a combination of several critical components: rich and varied language experiences (e.g., wide reading, teacher read-alouds), teaching individual academic words (both general academic and domain-specific), teaching word-learning strategies (including cognate awareness and morphology), and fostering word consciousness and language play (Graves 2000, 2006, 2009). The CA CCSS for ELA/Literacy draw particular attention to domain-specific and general academic vocabulary knowledge and usage due to the prevalence of these types of vocabulary in academic contexts. Research conducted over the past decade, in particular, has demonstrated the positive effects of focusing on domain-specific and general academic vocabulary with K–12 EL students (August et al. 2005; Calderón et al. 2005; Carlo et al. 2004; Collins 2005; Kieffer and Lesaux 2008, 2010; Silverman 2007; Snow, Lawrence, and White, 2009; Spycher 2009; Townsend and Collins 2009)

Graduation Information

7–12

ACIS Graduation Requirements:

To graduate from ACIS International School a student must successfully complete the following minimum requirements in grades 9-12:

Subject	Years Required	Semester(s)	Semester Units of Credit

English	4	8	40
Math	3	6	30
Science	2	4	20
Social Science:			
American Government	1/2	1	5
Economics	1/2	1	5
United States History	1	2	10
Modern World History	1	2	10
World Geography	1/2	1	5
Fine Arts	1	2	10
Foreign Language	2	4	20
Physical Education	2	4	20
Health	1/2	1	5
Electives*		10	50
Totals		46	230

1. Students exempted from physical education must still meet the total prescribed semester-period requirement.

2. Courses taken after the completion of 8th grade will count toward high school graduation requirements. This includes summer school courses taken after the completion of the 8th grade and prior to entering 9th grade.

Notes:

1. The two years of science must include both biological and physical science.
2. Students must pass one year of Algebra I to receive a diploma.

3. To meet the fine arts and foreign language requirement, the student must successfully complete 2 full years of the same foreign language and 1 full year of the fine arts.

* Thai Language and Culture Class: Thai Nationals must take this class everyday in grades 9-12. The class will be worth 5 credits per semester. Non-native Thai and Foreign students must take 1 period per week of this class in grades 9-12, they will earn 1 credit per semester.

Most courses, once passed, cannot be repeated for additional credit toward graduation. Courses failed may not be made up during the regular school year except when space is available. Make-up courses are available in summer school and credit recovery. Credit recovery is available to juniors and seniors. Sophomores may enroll in credit recovery when space is available.

ACIS Grading Scale:

The basic grade point system in use throughout the state of California is based upon 4 points (A=4, B=3, C=2, D=1, F=0). This system is known as non-weighted and is always maintained apart from any weighted system. A 5-point system for Advanced Placement and honors classes is known as a weighted system and is calculated separately. Colleges, universities, foundations, and scholarship institutions make clear distinctions between weighted and unweighted information.

The University of California system requires that a 4.0 scale be used to report grade point averages and they perform the evaluation of students' transcripts to assess additional credit for successfully completed Advanced Placement courses and some Honors level courses. Some applications of the 5-point scale other than college and scholarships include good driver discounts for auto insurance, as well as locally-defined uses such as criteria for scholarship awards. It is important to remember, however, that there are two distinct and separate grade scales that are mutually exclusive. The awarding of an extra grade point for successful completion of Advanced Placement and

honors courses does not affect or enhance the non-weighted grade point average. More specifically, a student receiving a grade of "B" in any course, including Advanced Placement, will not maintain a 4.0 GPA when non-weighted information or rankings are used.

Awarding of grades in Advanced Placement classes:

Criteria for the earning of grades vary from teacher to teacher and are clearly reviewed at the beginning of each Advanced Placement class. The standards in Advanced Placement classes, by their very nature, are high. This is commensurate with both the intent and benefit that comes with these courses. There shall be no lessening of standards based upon either grade point scale. The grades will be based upon widely accepted percentages. Grades received will be the grades earned by each individual student.

Procedures for requesting grade point averages:

Student grade point information will be maintained in both 4-point non-weighted and 5-point weighted formats.

It is the intent of ACIS International School to provide the most reliable and beneficial information to students when they are applying for university admissions or for scholarships. Students must be clear on which type of information is being requested or accepted by the institution and must make their request based on the most appropriate and beneficial information. Students must work closely with the counselors and scholarship coordinator to evaluate which type of information is required.

College Entrance Requirements:

Entrance requirements to colleges or universities vary widely. It is important, therefore, that you check the entrance requirements of the schools in which you might be interested. Any high school graduate may enroll in a US community college; most state universities and private colleges, however, expect a "B" average or better in a college preparatory program. One year of English and one year of mathematics should be included in the senior year program. Important note: Not all summer school and credit recovery classes are accepted by the University of California System or the California State University System.

California State University (CSU) System:

The California State University System requires the following pattern of college preparatory subjects in grades 9 through 12.
(SAT Reasoning test or ACT is required.)
(All grades must be a 'C' or better.)

English ..... 4 year..... 40 semester periods
Mathematics..... 3 years ..... 30 semester periods
Social Science ..... 2 years ..... 20 semester periods
Laboratory Science ... 2 years ..... 20 semester periods
Foreign Language ..... 2 years (same language) .....20 semester periods
Visual and Performing Arts .... 1 year
(same subject) ..... 10 semester periods
College Prep Electives ..... 1 year ..... 10 semester periods

TOTAL 150 semester periods

University of California (UC) System:

A student applying for admission as a freshman to any branch of the University of California or Cal. State University must have completed a minimum of fifteen units (150 semester periods) of high school work during grades 9-12. A one-year course is equal to one unit; a one-semester course is equal to one-half unit.

Fifteen of these required units must have been earned in academic or college preparatory courses, as specified and defined below. Eleven of

the fifteen required courses must be completed prior to the beginning of the senior year. Also, at least seven of the fifteen units must have been earned in courses taken during the last two years of high school. (ACT or SAT Reasoning Test are required.) SAT Subject Area Tests are no longer required. However, particular SAT Subject Area Tests may be required to demonstrate proficiency in competitive majors.

A-G Graduation Requirements:

A) History

UC-approved high school courses
Two years of history, including:

- one year of world or European history, cultures and geography (may be a single yearlong course or two one-semester courses), and
- one year of U.S. history or one-half year of U.S. history and one-half year of civics or American government

SAT Subject Examination
U.S. History: Score of 550 satisfies one year.
World History: Score of 540 satisfies one year.

AP or IB Examination
U.S. History: score of 3, 4 or 5 on the AP U.S. History exam; score of 5, 6 or 7 on the IB History of the Americas HL exam U.S. Government: Score of 3, 4 or 5 on the AP Exam satisfies a half year.

World History/Cultures/Geography: score of 3, 4 or 5 on the AP exam in European History, World History or Human Geography; score of 5, 6 or 7 on the IB History HL or Geography HL exam

B) English

UC-approved high school courses
Four years of college-preparatory English that include frequent writing, from brainstorming to final paper, as well as reading of classic and modern literature. No more than one year of ESL-type courses can be used to meet this requirement.

SAT Examination
An SAT Reasoning Test (taken prior to March 2016) Writing section score of 560 or an SAT Writing and Language (taken March 2016 or later) score of 31 satisfies the first three years of the requirement.

An SAT Reasoning Test Writing section score of 680 or an SAT Writing and Language score of 36 satisfies the entire requirement.

ACT with Writing
Combined English/Writing or English Language Arts (ELA) score of 24 satisfies first three years; score of 30 satisfies entire requirement.

SAT Subject Examination
Literature: Score of 560 satisfies first three years.

AP or IB Examination
Score of 3, 4 or 5 on the AP English Language and Composition or English Literature and Composition Exam; score of 5, 6 or 7 on the IB HL English: Literature exam (formerly IB HL English A1)

C) Mathematics

UC-approved high school courses
Three years of college-preparatory mathematics that include the topics covered in elementary and advanced algebra and two- and three-dimensional geometry. A geometry course or an integrated math course with a sufficient amount of geometry content must be completed. Approved integrated math courses may be used to fulfill part or all of this requirement, as may math courses taken in the seventh and eighth grades if the high school accepts them as equivalent to its own courses.

SAT Subject Examination
Math Level 1: Score of 570 satisfies the two years of required elementary and advanced algebra.

Math Level 2: Score of 480 satisfies the two years of required elementary and advanced algebra.

AP or IB Examination
Score of 3, 4 or 5 on the AP Statistics Exam satisfies elementary and intermediate algebra.

Score of 3, 4 or 5 on the AP Calculus AB or Calculus BC Exam satisfies two years of the requirement (but not geometry).
Score of 5, 6, or 7 on the IB Mathematics HL exam satisfies two years of the requirement (but not geometry).

D) Laboratory science

UC-approved high school courses
Two years of laboratory science providing fundamental knowledge in two of these three foundational subjects: biology, chemistry and physics. The final two years of an approved three-year integrated science program that provides rigorous coverage of at least two of the three foundational subjects may be used to fulfill this requirement. One yearlong interdisciplinary science or integrated science or earth and space sciences course can meet one year of this requirement — and combined with one year of biology or chemistry or physics, fulfills the full requirement.

SAT Subject Examination
Each test clears one year:

- Biology: Score of 540
- Chemistry: Score of 530
- Physics: Score of 530

AP or IB Examination
Score of 3, 4 or 5 on any two AP Exams in Biology, Chemistry, Physics (B, C, 1 or 2) and Environmental Science; score of 5, 6 or 7 on any two IB HL exams in Biology, Chemistry or Physics

E) Language other than English

UC-approved high school courses
Two years, or equivalent to the 2nd level of high school instruction, of the same language other than English are required. (Three years/3rd level of high school instruction recommended). Courses should emphasize speaking and understanding, and include instruction in grammar, vocabulary, reading, composition and culture. American Sign Language and classical languages, such as Latin and Greek, are acceptable. Courses taken in the seventh and eighth grades may be used to fulfill part or all of this requirement if the high school accepts them as equivalent to its own courses.

SAT Subject Examination
The following scores satisfy the entire requirement:

- Chinese With Listening: 520
- French/French With Listening: 540
- German/German With Listening: 510
- Modern Hebrew: 470
- Italian: 520
- Japanese With Listening: 510
- Korean With Listening: 500
- Latin: 530
- Spanish/Spanish With Listening: 520

AP or IB Examination
Score of 3, 4 or 5 on the AP Exam in Chinese Language and Culture, French Language and Culture, German Language and Culture, Italian Language and Culture, Japanese Language and Culture, Spanish Language, Spanish Language and Culture, Spanish Literature and

Culture or Latin; score of 5, 6 or 7 on an IB Language A2 HL exam

F) Visual and performing arts

UC-approved high school courses
One yearlong course of visual and performing arts chosen from the following disciplines: dance, drama/theater, music, interdisciplinary arts or visual art — or two one-semester courses from the same discipline is also acceptable.

AP or IB Examination
Score of 3, 4 or 5 on the AP History of Art, Studio Art or Music Theory Exam; score of 5, 6 or 7 on any one IB HL exam in Dance, Film, Music, Theatre Arts or Visual Arts

G) College-preparatory elective

UC-approved high school courses
One year (two semesters), in addition to those required in "a-f" above, chosen from the following areas: visual and performing arts, history, social science, English, advanced mathematics, laboratory science and language other than English (a third year in the language used for the "e" requirement or two years of another language)

SAT Subject Examination
U.S. History: Score of 550
World History: Score of 540
Writing/English Compositions or Literature: Score of 560
Mathematics Level 2: Score of 520
Science (other than taken for "d" requirement): Same tests and scores as listed above under "d"
Language Other Than English, third year

- Chinese With Listening: 570
- French/French With Listening: 590
- German/German With Listening: 570
- Modern Hebrew: 500
- Italian: 570
- Japanese With Listening: 570
- Korean With Listening: 550
- Latin: 580
- Spanish/Spanish With Listening: 570

A second Language Other Than English: Same tests and scores as listed under "e"

AP or IB Examination
Score of 3, 4 or 5 on any one AP Exam in Computer Science, Microeconomics, Macroeconomics, Human Geography, Psychology, U.S. Government or Comparative Government; score of 5, 6 or 7 on any one IB HL exam in Economics, Philosophy, Psychology, Social and Cultural Anthropology, or Computer Science

USA University Acceptance Requirements:

To meet minimum admission requirements, you must complete 15 yearlong high school courses with a letter grade of C or better — at least 11 of them prior to your last year of high school.

Keep in mind that taking approved high school ("a-g") courses isn't the only way to satisfy these requirements. You also may meet them by completing college courses or earning certain scores on SAT, Advanced Placement or International Baccalaureate exams.

Having a strong understanding of the English language is important for success at UC. That's why we want to make sure you can demonstrate English proficiency before you attend one of our campuses.

How do I know if I need to meet this requirement?
If all of your high school/secondary school education was completed in English, you are considered proficient and do not need to satisfy this requirement.

However, if you've completed some high school or secondary school in a country where English was **not** the language of instruction, you will be required to demonstrate English proficiency if you have had **less than 3 years** of instruction in English.

How do I demonstrate English proficiency?
You can demonstrate proficiency by meeting any of the following exam benchmarks. Keep in mind that you must complete one of these exams by December of your final year of high school/secondary school and submit scores by the following January.

- Score 24 or higher for the ACT combined English/Writing or English Language Arts (ELA)
- Score 560 or higher on the Writing section of the SAT Reasoning test or a score of 31 or higher on Writing and Language in the SAT with Essay (the new SAT, taken March 2016 or later)
- Score 3, 4 or 5 on the AP examination in English Language and Composition, or English Literature and Composition
- Score 6 or 7 on the IB Standard Level examination in English: Literature, or Language and Literature
- Score 5, 6 or 7 on the IB Higher Level examination in English: Literature, or Language and Literature
- Score 6.5 or higher on the International English Language Testing System (IELTS)
- Test of English as a Foreign Language (TOEFL) examination:
    - Internet-based test (iBT): Minimum score of 80 or better
    - Paper-based test (completed prior to Oct. 2017): Minimum score of 550 or better
    - Revised paper-delivered test (completed Oct. 2017 or later): Minimum score of 60 or better

All UC students must satisfy certain requirements before they can receive their undergraduate degree. Good news: Some of these requirements can be met during high school.

Entry-Level Writing Requirement
As a UC undergraduate, you must demonstrate a proficiency in writing. You may meet our Entry-Level Writing Requirement in any of the following ways:

- Score 30 or higher on ACT English Language Arts.
- Score 30 or higher on ACT Combined English/Writing (last administered June 2015).
- Score 680 or higher on the Writing section of the SAT Reasoning Test (last administered January 2016).
- Score 680 or higher on the Evidenced-Based Reading and Writing section of the new SAT exam (effective for students enrolling in fall 2018/students applying to UC in November 2017).
- Score 3 or higher on the College Board Advanced Placement Examination in English (Language or Literature).
- Score 5 or higher on the International Baccalaureate Higher Level Examination or 6 or higher on the Standard Level Examination in English (Language A only).
- Complete with a grade of C or better a transferable college course in English composition worth four quarter or three semester units.
- Achieve a passing score on the UC Analytical Writing Placement Examination, given in the spring every year. If you're admitted to UC and live in California, you'll receive detailed information in April about the exam. If you're not a resident of California, you may take the exam in the fall after you enroll.
- Complete an appropriate English course at UC with a grade of C or better.

American History and Institutions Requirement
All undergraduate degree programs at UC require study in American History and Institutions. This requirement may be met through examination or enrollment in specific courses. Each campus decides how its students may meet the requirement.

Many students fulfill this requirement before entering college by completing a one-year high school course in U.S. history or a half-year course in U.S. history and a half-year course in American government. (This satisfies this requirement at all UC campuses except UC Santa Barbara, which requires students to complete a college-level course. At UCLA, students may complete the course(s) in high school, but must have earned a B average or better.)

U.C. Scholarship Requirement:

The procedure used to calculate the grade point average for the scholarship requirement has several complications. For details, you should talk with your counselor. In general, however, the system is as follows:

The Scholarship requirement defines the grade point average (GPA) students must attain in the 'a-g' subjects (see the 'a-g' course list on page 2) and the scores they must earn on the SAT or ACT Tests to be eligible for admission to UC. To see if a student meets the Scholarship Requirement, use the interactive Preliminary Eligibility Calculator at http://admission.universityofcalifornia.edu/freshman/requirements/index.html. The minimum GPA for California resident students is 3.0

The University calculates the 'a-g' GPA by assigning point values to the grades students earn, totaling the points, and dividing the total by the number of 'a-g' course units. Points are assigned as follows: A = 4 points, B = 3 points, C = 2 points, D = 1 point, and F = 0 points. Only the grades students earn in the "a-g" subjects taken in grades 10 & 11 are used to calculate the preliminary grade point average. 'a-g' courses with grades of D or F must be repeated or validated. Courses taken in the 9th grade can be used to meet the subject requirement if the grade is C or better, but will not be used to calculate the GPA.

The University, not the high school, assigns extra points for up to four units of certified honors level and Advanced Placement courses taken in the last three years of high school: A = 5 points, B = 4 points, and C = 3 points.

Hybrid Block Scheduling:

Monday, Wednesday, Friday

Assembly	7:45- 8:00	15 minutes
Period 1	8:00- 8:53	53 minutes
Period 2	8:56- 9:49	53 minutes
Snack	9:49- 10:04	15 minutes
Period 3	10:07- 11:00	53 minutes
Period 4	11:03- 11:56	53 minutes
Lunch	11:56- 12:41	45 minutes
Period 5	12:44- 1:37	53 minutes
Period 6	1:40- 2:33	53 minutes
Period 7	2:36- 3:29	53 minutes
Clubs	3:30-4:30	60 minutes

Tuesday, Thursday

Assembly	7:45- 8:00	15 minutes
Period 1 (2)	8:00- 9:49	106 minutes
Snack	9:49- 10:04	15 minutes
Period 3 (4)	10:07- 11:56	106 minutes
Lunch	11:56- 12:41	45 minutes
Period 5	12:44- 1:37	53 minutes
Period 6	1:40- 2:33	53 minutes
Period 7	2:36- 3:29	53 minutes
Clubs	3:30-4:30	60 minutes

The double blocks on Tuesday and Thursday are for English and Math.

The double blocking provides additional "Core" instructional time to ensure high quality academic student success.

7th Grade
Monday, Wednesday, Friday

Assembly	7:45- 8:00	15 minutes
English	8:00- 8:53	53 minutes
Math	8:56- 9:49	53 minutes
Snack	9:49- 10:04	15 minutes
Social Studies	10:07- 11:00	53 minutes
Science	11:03- 11:56	53 minutes
Lunch	11:56- 12:41	45 minutes

Thai Language	12:44- 1:37	53 minutes
Art	1:40- 2:33	53 minutes
Foreign Language	2:36- 3:29	53 minutes
Clubs	3:30-4:30	60 minutes

Tuesday, Thursday

Assembly	**7:45- 8:00**	**15 minutes**
English	8:00- 9:49	106 minutes
Snack	9:49- 10:04	15 minutes
Math	10:07- 11:56	106 minutes
Lunch	11:56- 12:41	45 minutes
Thai Language	12:44- 1:37	53 minutes
Computer	1:40- 2:33	53 minutes
Physical Education	2:36- 3:29	53 minutes
Clubs	3:30-4:30	60 minutes

8th Grade

Monday, Wednesday, Friday

Assembly	**7:45- 8:00**	**15 minutes**
Math	8:00- 8:53	53 minutes
English	8:56- 9:49	53 minutes
Snack	9:49- 10:04	15 minutes
Social Studies	10:07- 11:00	53 minutes
Science	11:03- 11:56	53 minutes
Lunch	11:56- 12:41	45 minutes
Thai Language	12:44- 1:37	53 minutes
Art	1:40- 2:33	53 minutes
Foreign Language	2:36- 3:29	53 minutes
Clubs	3:30-4:30	60 minutes

Tuesday, Thursday

Assembly	**7:45- 8:00**	**15 minutes**
Math	8:00- 9:49	106 minutes
Snack	9:49- 10:04	15 minutes
English	10:07- 11:56	106 minutes
Lunch	11:56- 12:41	45 minutes
Thai Language	12:44- 1:37	53 minutes
Computer	1:40- 2:33	53 minutes
Physical Education	2:36- 3:29	53 minutes
Clubs	3:30-4:30	60 minutes

The Middle and High School program at ACIS International School consists of 7- 53 minute periods Monday, Wednesday and Friday. Tuesday and Thursday's have 2- 106 minute periods and 3- 53 minute periods. There are 180 school days scheduled in each academic year.

Instructional Minutes:

Monday, Wednesday, Friday

Assembly	7:45- 8:00	15 minutes	INSTRUCTIONAL MINUTES per year	Periods Per Week
Period 1	8:00- 8:53	53 minutes	5,618	5
Period 2	8:56- 9:49	53 minutes	5,618	5
Snack	9:49- 10:04	15 minutes		
Period 3	10:07- 11:00	53 minutes	5,618	5
Period 4	11:03- 11:56	53 minutes	5,618	5
Lunch	11:56- 12:41	45 minutes		
Period 5	12:44- 1:37	53 minutes	5,618	5
Period 6	1:40- 2:33	53 minutes	5,618	5
Period 7	2:36- 3:29	53 minutes	5,618	5
Clubs	3:30-4:30	60 minutes		

Tuesday, Thursday

Assembly	7:45- 8:00	15 minutes	INSTRUCTIONAL MINUTES Per Year	Period Per Week
Period 1 (2)	8:00- 9:49	106 minutes	7,844	2
Snack	9:49- 10:04	15 minutes		
Period 3 (4)	10:07- 11:56	106 minutes	7,844	2
Lunch	11:56- 12:41	45 minutes		
Period 5	12:44- 1:37	53 minutes	3.922	2
Period 6	1:40- 2:33	53 minutes	3,922	2
Period 7	2:36- 3:29	53 minutes	3,922	2
Clubs	3:30-4:30	60 minutes		

Students have 371 Instructional Minutes per day, 180 Days Per Year. Total Instructional minutes for the year is **66,780**.
English Language Arts meets M/W/F for 5, 53 minute periods and 2, 106 minute periods, for a total of 13,462 instructional minutes per year.
Mathematics meets M/W/F for 5, 53 minute periods and 2, 106 minute periods, for a total of 13,462 instructional minutes per year.
Social Studies and Science will meet for 5, 53 minute periods per week, for a total of 9,540 instructional minutes per year per subject.
Electives such as Foreign Language and Art will meet for 3, 53 minute periods per week, for a total of 5,724 minutes per year.
The remaining 15,052 minutes are for PE, Computer, Thai Language classes and electives, which will vary depending on individual student schedules.

High School credits are accumulated from grades 9-12. All courses have equal graduation credit (5 credits per course, per semester).

Grade 9 Credits	Grade 10 Credits

• **English Language Arts 9 College Prep or Honors (10 credits)** • **Algebra I, Geometry, Algebra II (10 credits)** • **Geography (10 credits)** • **Biology (10 credits)** • **Physical Education (10 credits)** • **Foreign Language*** (10 credits)** • **Art (10 credits)** • **Thai Language (See Requirements Below)** **70 Possible Credits**	• English Language Arts 10 College Prep or Honors (10 credits) • Algebra I, Geometry, Algebra II, Probability & Statistics, Pre-Calculus (10 credits) • World History, Culture and Geography: The Modern World (10 credits) • Chemistry (10 credits) • Physical Education (10 credits) • Foreign Language (10 credits)*** • Electives (10 credits) • Thai Language (See Requirements Below) 70 Possible Credits
Grade 11 Credits	Grade 12 Credits
• **English Language Arts 11 College Prep, Honors, AP (10 credits)** • **Algebra I, Geometry, Algebra II, Probability & Statistics, Pre-Calculus (10 credits)** • **United States History and Geography: Continuity and Change in the Twentieth Century (10 credits)** • **Physics (10 credits) *** • **Physical Education (10 credits)*** • **Health (5 credits)**** • **Foreign Language (10 credits)***** • **Electives (10 credits)** • **Thai Language (See Requirements Below)** **70 Possible Credits**	• English Language Arts 12 College Prep, Honors, AP (10 credits) • Algebra I, Geometry, Algebra II, Probability & Statistics, Pre-Calculus (10 credits)* • Principles of American Democracy and Economics (10 credits) • Zoology (10 credits)* • Physical Education (10 credits)* • Health (5 credits)** • Foreign Language (10 credits)*** • Electives (10 credits) • Thai Language (See Requirements Below) 70 Possible Credits

*Not A Required Course- If graduation requirements have already been met.
**This 1 semester course is required either during grade 11 or grade 12.
***Foreign Language Requirements: 2 years during grades 9-12 of the same Foreign Language.

Thai Language and Culture Class: Thai Nationals must take this class everyday grades 9-12. Non-native Thai and Foreign students must take 1 period per week of this class in grades 9-12.

SCHEDULE CHANGE POLICY

Teacher allotments are dictated by the courses that students sign up for in the spring. If a student changes his/her schedule two weeks into the semester, the student is already behind, and thus, results in a loss

of learning. Therefore, the schedule change policy is designed to promote academic success at ACIS High School.

Students are given curriculum and registration information each spring. Credits are earned for passing grades at the end of the semester. Student initiated schedule changes must be requested before the beginning of each semester. Therefore, student initiated requests will only be considered before the beginning of each semester based on availability. Once the semester begins, there will be no student initiated schedule changes.

No changes will be allowed unless they are deemed necessary by the school.

Students in year-long academic courses must remain in those courses for the entire year. Students will also remain in the elective courses they are placed in or selected at the beginning of the year.

Students should see their guidance counselors to complete a schedule change form only if they meet the requirements for an approved schedule change:

Below are the only approved reasons for a schedule change:

- Student has been scheduled into a course previously passed
- Student has been scheduled into a course out of sequence (i.e., Spanish 3 before Spanish 1)
- Student did not pass a class that was a prerequisite for another
- Student has an incomplete schedule
- Senior is missing a requirement for graduation
- Administrator must balance the class sizes

All other requests outside these parameters must be requested to and approved by an administrator.

Below are some examples of situations that will NOT result in a schedule change:

- A desire for another instructor
- A desire for a class to be a different/specific period
- Student is failing a course that was requested and is afraid that it will affect graduation (students are responsible for maintaining passing grades and will not be pulled from a class in lieu of failing)
- Student requested the course but no longer interested in the subject
- A need to drop or replace a class to improve GPA
- Student is having conflicts with other students in the class (students need to discuss problems with administrators or counselors for conflict resolution)

Special circumstances may require a schedule change after the beginning of the semester. For those special circumstances, there is a three week grace period. During that time changes may be made from one level to another within the same subject. Changes will NOT be granted after the third week of each semester.

Procedure for Dropping or Changing Classes Prior to the Cut-Off-Date

1. Students must request a meeting with their counselor. A form or parental permission is needed unless specified by a counselor.
2. Counselors will give consideration to each request. A completed request form does not guarantee a schedule change. Factors such as class size, availability of classes and/or appropriate placement supersede the request.

Consequences of Dropping Classes After the Cut-Off Date

1. Any request to drop a class after the 3rd week of instruction will result in the class being replaced by an “excused” period for that period ONLY. The excused period option will only be granted to those

students ON TRACK to graduate or are ahead in credits. The student cannot be behind in credits. Students/parents may choose this option up to the 11th week of the semester.
2. Students who request to drop a class after 11 weeks will receive a failing grade.
3. The grade of "F" will be placed on the transcript at the end of the semester for the dropped class and will be averaged into the student's grade point average.
4. The final semester grade report will list the class and indicate the failing grade.

Procedure for Dropping a Class AFTER the Cut-Off Date

1. Students must request a meeting with their counselor to request a class drop/change.
2. Students will fill out the schedule change request form completely, which includes securing all signatures. Students then need to return the completed form to the appropriate counselor.
3. Students must continue with their current schedule until they receive a new one.

Repeating Courses

Students may NOT repeat a course during the regular school year for which they received an "F" grade. Credits must be made up in summer school or credit recovery. Students may repeat a course if attempting to improve on their previous grade; credit for the course will only be given for the greater of the two grades. For example: Student has passed Biology CP with a "D" but would like to repeat the class for a better grade. The student earns a B in the repeated class and while the first class will still show on the transcript, it will not be figured into GPA or credits earned toward graduation.

Academic Honesty

ACIS High School requires simple ethics, that students apply the principles of truth and honesty as they pursue their academic goals. The application of these principles means that all academic work will be done by the student to whom it is assigned, without unauthorized aid of any kind.

In order for students to apply these principles, they must understand the definition of cheating and plagiarism as accepted by ACIS High School.

Definition of Plagiarism

Plagiarism is defined as the act of using the ideas or work of another person or persons as if they were one's own (either intentionally or unintentionally), without giving credit to the source. Such an act is not plagiarism if the thought or idea is common knowledge.

Acknowledgement of an original author or source must be made through appropriate references, i.e., quotation marks, footnotes, or commentary. Examples of plagiarism include, but are not limited to the following: submission of a work, whether in part or in whole, completed by another; submission of a work taken from computer-generated resource materials, including the Internet and other on-line services, failure to give credit for ideas, statements, facts or conclusions which rightfully belong to another; in written work, failure to use quotation marks when quoting directly from another, whether it be a paragraph, a sentence, or even a part of a sentence, close and lengthy paraphrasing of another's writing. A student who is in doubt about the extent of acceptable paraphrasing should consult the instructor.

Definition of Cheating

Cheating is defined as the act of obtaining or attempting to obtain or aiding another to obtain academic credit for work by the use of any dishonest, deceptive or fraudulent means. Examples of cheating during

an examination include, but are not limited to, the following: copying, either in part or in whole, from another's test or examination; discussion of answers or ideas relating to the answers on an examination or test unless such discussion is specifically authorized by the instructor; giving or receiving copies of an examination without the permission of the instructor; using or displaying notes, "cheat sheets," or other information or devices inappropriate to the prescribed test conditions. Students who plagiarize or who alter/interfere with the grading procedures are also considered guilty of cheating.

It is often appropriate for students to study together or to work in teams on projects. However, such students should be careful to avoid the use of unauthorized assistance, and to avoid any implication of cheating, by such means as sitting apart from one another in examinations, presenting the work in a manner which clearly indicates the effort of each individual, or such other method as is appropriate to the particular course.

Procedures/Penalties for Plagiarism or Cheating

1. A student who has cheated or plagiarized -- will receive a "0" on the assignment; -- may receive an additional penalty, up to failing a segment of the course; -- a second, or repeat, offense will receive an "F" for the semester and lose the units earned for the course and will not be allowed to transfer to another course for credit, in place of that failed course.

2. The consequences and penalty for plagiarizing or cheating beyond a "0" for the assignment will be determined at a conference to be called by the student's counselor. The conference will include the student and his/her parent, the teacher, the department chair, the counselor, and an administrator. The decision of this conference will be considered final, and no other on-campus appeal will be allowed.

3. A student who knowingly aids or condones another student's plagiarizing or cheating will be considered as guilty as the other student of the offense. Similar penalties may be invoked.

Course Descriptions for Middle School Core Classes

Grade 7

ENGLISH 7

In this course students explore many writing genres such as expository, persuasive, collaborative writing and analytical essays in order to strengthen and enhance their reading and writing skills. They analyze the connections between the texts they read and the real world. Throughout this course, students read a variety of short stories, novels, essays, and poems. The literature in this course is used to sharpen reading skills, develop vocabulary, and improve comprehension and identification of literary elements such as theme, plot, characterization, and figurative language.

MIDDLE SCHOOL CREATIVE WRITING

In this course, students explore a variety of fiction and nonfiction writing genres, and create authentic publications. Students write poetry, short stories, and personal narratives. In addition, students enhance their writing skills while gaining a deeper understanding of the writing process.

MATH 7

Ratios and Proportional Relationships

Analyze proportional relationships and use them to solve real-world and mathematical problems.

The Number System

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Expressions and Equations

Use properties of operations to generate equivalent expressions.
Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Geometry

Draw, construct and describe geometrical figures and describe the relationships between them.
Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Statistics and Probability

Use random sampling to draw inferences about a population.
Draw informal comparative inferences about two populations.
Investigate chance processes and develop, use, and evaluate probability models.

Geography 7: Medieval and Early Modern Times

Students in grade seven study the social, cultural, and technological changes that occurred in Europe, Africa, and Asia in the years A. D. 500Ð 1789. After reviewing the ancient world and the ways in which archaeologists and historians uncover the past, students study the history and geography of great civilizations that were developing concurrently throughout the world during medieval and early modern times. They examine the growing economic interaction among civilizations as well as the exchange of ideas, beliefs, technologies, and commodities. They learn about the resulting growth of Enlightenment philosophy and the new examination of the concepts of reason and authority, the natural rights of human beings and the divine right of kings, experimentalism in science, and the dogma of belief. Finally, students assess the political forces let loose by the Enlightenment, particularly the rise of democratic ideas, and they learn about the continuing influence of these ideas in the world today.

LIFE SCIENCE 7

Life Science is a 7^{th} grade course that provides students with the opportunity to learn that Life science is the study of living things. The life sciences comprise all fields of science that involve the scientific study of living organisms, like plants, animals, and human beings.

The students will learn about environmental and global issues which effect our world. Emphasis will be placed on skill development to provide students with the basic tools they need to be successful in the course.

PHYSICAL EDUCATION 7

7th grade physical education introduces many activities and through skills and games, ensures that all students achieve an adequate level of skill and confidence in order to participate successfully in game play.

ART GRADE 7

Students are engaged in various studio projects that integrate history, theory, and critical analysis throughout the year. The 7th grade units include elements and principles of design, Islamic and Medieval Christian art, animal sculpture by using paper mache, relief block print, animal drawing, color theory showing abstract expression known as action painting, and applied art in the of Dadaism style. Skills introduced or reviewed to include charcoal drawing, water colors, collage, paper maché sculpture, block printing, color field painting, clay modeling techniques, and digital art using Adobe Photoshop and Art Rage. This course provides students with a hands-on visual problem solving experience and develops their ability to decode visual information-skills which can be utilized in any discipline.

COMPUTER 7

Eighth grade projects require students to analyze problems, devise appropriate action plans, judge best solutions, and develop projects that reflect their creativity, individuality, use of appropriate software and quality work. Essential topics learned in this class include: advanced concepts in Microsoft Word and Excel, desktop publishing, Microsoft PowerPoint, and Internet research and safety. During the year, students will be challenged to use their knowledge of these skills while completing a marketing simulation.

Grade 8

ENGLISH 8

Students develop their analytical minds as they read a variety of texts that span several genres and come in many forms. They learn about extrapolating a text through annotation and understanding each author's purpose within varying genres. With the texts students read and discussions, they begin to foster the skills they need to tackle the level of reading they encounter in high school and beyond.

MATH 8

The Number System

Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations

Work with radicals and integer exponents.

Understand the connection between proportional relationships, lines, and linear equations.

Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions

Define, evaluate, and compare functions.

Use functions to model relationships between quantities.

Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software.

Understand and apply the Pythagorean Theorem.

Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

Statistics and Probability

Investigate patterns of association in bivariate data.

United States History 8

Students in grade eight study the ideas, issues, and events from the framing of the Constitution up to World War I, with an emphasis on America's role in the war. After reviewing the development of America's democratic institutions founded on the Judeo-Christian heritage and English parliamentary traditions, particularly the shaping of the Constitution, students trace the development of American

politics, society, culture, and economy and relate them to the emergence of major regional differences. They learn about the challenges facing the new nation, with an emphasis on the causes, course, and consequences of the Civil War. They make connections between the rise of industrialization and contemporary social and economic conditions.

PHYSICAL SCIENCE 8

Students have been introduced to chemistry and physics in Grades K – 6. In Science 8, they will review and master the subject areas of force and motion, simple machines, energy and heat, atomic structure and the periodic table, properties of matter, mixtures and solutions, and chemical reactions. Students will also learn about the earth science topic of Meteorology. Emphasis is placed on developing such skills as critical thinking, problem solving, drawing conclusions, working cooperatively with others, following written and oral directions, writing, math, use of the scientific method, and generating and interpreting graphs.

PHYSICAL EDUCATION 8

8th grade physical education is designed as a culminating physical education opportunity for students - utilizing the knowledge, skills and strategies they have accumulated during their kindergarten through grade seven experiences. The curriculum for both courses is designed to help students develop positive self-esteem with regard to their physical skills and an appreciation of the lifelong implications of participation in physical activity with regard to their contribution to a healthy lifestyle. A great deal of emphasis is placed upon demonstrating good sportsmanship and character qualities, becoming a knowledgeable spectator, practicing appropriate behaviors for co-ed physical activities, using good judgment, and contributions as a teammate to team and class success.

ART Grade 8

Students are engaged in various studio projects that integrate history, theory, and critical analysis throughout the year. The eighth grade units include art criticism, folk art from around the world, drawing with an emphasis on value, concepts that make an art movement, German expressionism, messages and symbolism in art, and sculpture using clay and other found materials. Skills introduced or reviewed to include charcoal drawing, acrylic painting, collage, paper maché sculpture, block printing, found object sculpture, clay modeling techniques and digital art using Flash and Adobe Photoshop. This course provides students with a hands-on visual problem solving experience and develops their ability to decode visual information-skills which can be utilized in any discipline.

COMPUTER 8

Eighth grade projects require students to analyze problems, devise appropriate action plans, judge best solutions, and develop projects that reflect their creativity, individuality, use of appropriate software and quality work. Essential topics learned in this class include: advanced concepts in Microsoft Word and Excel, desktop publishing, Microsoft PowerPoint, and Internet research and safety. During the year, students will be challenged to use their knowledge of these skills while completing a marketing simulation.

Course Descriptions for High School Core Classes

Grade 9

HONORS ENGLISH 9

Prerequisite: Teacher Recommendation, EXCEEDS EXPECTATIONS or high MEETS EXPECTATIONS score on entrance tests.

Honors English 9 will develop students' ability to analyze American literature, thus enabling them to devise their own standards of literary excellence, to demonstrate the diversity of their cultural, ethical and political heritage, and to develop sophisticated reading, writing, speaking and listening skills. Students will demonstrate their ability to analyze, interpret, and appreciate the literature studied in this course through essays, tests, and discussions, and will demonstrate through tests and essays their knowledge of how literature reflects each period historically, politically, culturally, and socially. Students will demonstrate their knowledge of language skills in both written and oral assignments and will master the California Content Standards for ninth grade. Grammar, usage and mechanics are studied, and vocabulary generated from the anthology and longer works for contextual reinforcement is studied and tested. Suggested works may include The Adventures of Huckleberry Finn, The Glass Menagerie, The Great Gatsby, My Antonia, Of Mice and Men, Olaudah Equiano, A Raisin in the Sun, The Red Badge of Courage, and The Crucible. Daily homework is required.

Meets the UC/CSU "B" or "G" requirement

ENGLISH 9

English 9 is the first year of college preparatory freshman English. Topics include grammar and usage, composition, vocabulary development, critical thinking, and reading. Literature focuses on the short story and nonfiction. Literature emphasis includes the novel, poetry, drama, and epic. Teachers choose from among such works as Fahrenheit 451, Of Mice and Men, The Pearl, Romeo and Juliet, and Animal Farm. Daily homework is required.

Meets the UC/CSU "B" or "G" requirement.

ALGEBRA I

Recommended: Placement through diagnostic testing, previous math class grade, benchmark exams, and teacher recommendation.

Algebra is a one year course that covers the Common Core Standards necessary for a High School Diploma.

This course meets the UC/CSU "C" requirement.

HONORS ALGEBRA

Prerequisite: Grade of "A" or better in Math 8. Placement through diagnostic testing and teacher recommendation

Honors Algebra is a yearlong course. Students learn about operations with algebraic expression, solutions to first and second degree equations, factoring, graphing linear equations, inequalities, irrational numbers, the quadratic formula, and other similar topics. The typical student spends at least one-half hour on homework daily. This course has been aligned to the Common Core Standards for Mathematics.

This course meets the UC/CSU "C" requirement.

BIOLOGY (CP) 9

Biology CP is an in-depth study of the areas of cell biology, genetics, ecology, evolution and human physiology with relevant Earth Science components related to biology in accordance with the Next Generation Science content standards. Students will learn how organisms perform life functions and how they interrelate through a variety of laboratory activities, in-class work, and homework. A minimum of 4 hours of homework a week is expected.

Meets the UC/CSU "D" or "G" requirement.

HONORS BIOLOGY (CP) 9

Prerequisite: 9th graders must have concurrent enrollment in Honors English and Honors Geometry or higher math; or Honors English and Honors Algebra CP. Honors Biology CP is a rigorous, accelerated laboratory science course which focuses on investigating major biological concepts. In addition, emphasis will be placed on the study of chemistry, physics, and statistical analysis as applied to biological systems, genetics, evolution, ecology, and physiological processes in organisms. The course covers with relevant Earth Science components

related to biology in accordance with the Next Generation Science content standards. The course is open to college-preparatory students who have demonstrated exceptional ability in science. A minimum of 5 hours of homework a week is expected.
Meets the UC/CSU “D” or “G” requirement.

WORLD GEOGRAPHY 9
Prerequisite: none World Geography is a semester long course designed to develop students’ awareness of place and locational skills, and to enhance understanding of human and environmental interaction, world regions and their historical, cultural, economic and political characteristics. A minimum of 3 hours of homework a week is expected.
Meets the UC/CSU “G” requirement.

PE 9
Standard 1: Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.
Standard 2: Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.
Standard 3: Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Students in Course 1 will participate and be evaluated in the following types of activities to meet and exceed the California PE standards:
1. Individual and Dual Activities
2. Aquatics
3. Rhythms and Dance
4. Fitness Activities
5. Common Core Literacy and Math Activities

Students will complete the FitnessGram® fitness test in the spring semester. Students will be given a pretest in the fall while marking progress throughout the semester to achieve scores within the Healthy Fitness Zone.

ART 1
Semester
Prerequisite: None
Development of basic fine art theory, exploration of media and skills related to good design. Emphasis placed on using and recognizing the Elements of Art. Meets the Fine Arts graduation requirement.
Meets the UC/CSU "F" requirement.

ART 2
Semester
Prerequisite: Completion of Art 1 with a grade of “D” or better.
Continued development of basic art theory, exploration of media and skills related to good design. Emphasis placed on using and recognizing the Principles of Art. Meets the Fine Arts graduation requirement.
Meets the UC/CSU "F" requirement.

Grade 10

HONORS ENGLISH 10
Prerequisite: Teacher Recommendation, EXCEEDS EXPECTATIONS or high MEETS EXPECTATIONS score on district or state tests.
Students will develop an understanding of the connection between literature and its diverse political, social, historical and cultural background and develop sophisticated reading, writing, speaking and listening skills. The focus of the course is classical Greek and comparative world literature; typical longer works include The House of Atreus, Oedipus Rex, Homer’s Iliad and Odyssey, Julius Caesar, All Quiet on the Western Front, Things Fall Apart and A Doll’s House. Daily homework is required. Summer reading is required.
Meets the UC/CSU “B” or “G” requirement.

ENGLISH 10 College Prep

In this course, students will continue to develop the attitudes, knowledge, and essay writing skills necessary to master the sophisticated structure and conventions of the English language. Longer selections may include titles such as To Kill a Mockingbird, A Separate Peace, Lord of the Flies, Julius Caesar, and Antigone. Daily homework is required.
Meets the UC/CSU "B" or "G" requirement.

ALGEBRA I
Recommended: Placement through diagnostic testing, previous math class grade, benchmark exams, and teacher recommendation.
Algebra is a one year course that covers the Common Core Standards necessary for a High School Diploma.
This course meets the UC/CSU "C" requirement.

GEOMETRY 10-12
Recommended: Successful completion Algebra I, benchmark exams, and final exams.
Geometry will cover topics with an inductive/discovery hands on approach different from the rigorous deductive college prep approach. The intent of the course is to offer a richer second year mathematical experience. Topics covered: Introduction to geometry; reasoning; construction; triangle, polygon, and circle properties; area and volume; similarity and congruence; introductory trigonometry.
This course meets the UC/CSU "C" requirement.

HONORS GEOMETRY 10-11
Prerequisite: Successful completion of Honors Algebra, benchmark exams, and final exams.
Honors Geometry teaches deductive reasoning and organized thinking. Students study postulates, definitions, and theorems to use in formal proofs. Both semesters emphasize using algebraic skills to solve problems. Plane geometry and solid geometry are taught. Students also learn straightedge and compass constructions and transformations.
Meets the UC/CSU "C" requirement.

ALGEBRA 2 10-12
Recommended: Successful completion of Geometry or Honors Geometry, benchmark exams, and final exams.
This is an integrated college preparatory mathematics course covering all eight strands of the California State Mathematics Framework (Functions, Algebra, Geometry, Statistics and Probability, Discrete Mathematics, Measurement, Number, and Language and Logic) with an emphasis on advanced Algebra. This course includes a thorough study of functions (linear, quadratic, polynomial, radical, rational, logarithmic, and exponential). Sequences, series, probability, statistics, transformations, and trigonometry are also covered.
Meets the UC/CSU "C" requirement.

HONORS ALGEBRA 2 10-12
Recommended: Successful completion of Honors Geometry, benchmark exams, and final exams.
This course includes the concepts taught in the third year of the college preparatory sequence (Algebra 2). The depth of study, the creative problem solving, and the additional concepts covered ensure a more challenging course. The expanded study of functions, conics, complex numbers, and trigonometry differentiates Honors Algebra 2 from Algebra 2. Honors Algebra 2 is the third course of a four-year honors mathematics program.
Meets the UC/CSU "C" requirement.

CHEMISTRY (CP) 10
Prerequisite: Completion of Biology (CP) and Algebra or higher math with a grade of "C" or better. Recommended completion or concurrent enrollment in Algebra or higher level math Chemistry(CP) is a laboratory-based course designed to provide students with an understanding of the following topics using critical thinking and application: atomic and molecular structure, chemical bonding, stoichiometry, gases and their properties, acids and bases, solutions, chemical equilibrium, chemical thermodynamics, nuclear processes, reaction rates, and organic and bio-chemistry. This course covers the Chemistry content standards. A minimum of 4 hours of homework a week is expected.

Meets the UC/CSU "D" or "G" requirement.

HONORS CHEMISTRY 10

Prerequisite: Completion of Honors Biology (CP) and Algebra or higher math with a grade of "A" or "B" or teacher recommendation. Completion or concurrent enrollment in Algebra or higher level math. Honors chemistry is a laboratory-based course designed to provide students with an in depth understanding of atomic and molecular structure, nomenclature, chemical bonding, stoichiometry, gases and their properties, acids and bases, solutions, chemical equilibrium and chemical thermodynamics. This STEM based class is designed to motivate students who are planning to seek advanced study in science, engineering, and mathematics. Students will move more quickly though the standardized CP curriculum and thus will have the capability to explore advanced components and applications of chemistry. A minimum of 5 hours of homework a week is expected.
Meets the UC/CSU "D" or "G" requirement.

MODERN WORLD HISTORY 10

Prerequisite: teacher recommendation Modern World History is a study of the major turning points that shaped the modern world from late eighteenth century through the present. Students will develop an understanding of current world issues and relate them to their historical, geographic, political, economic, and cultural (art, music, literature) contents. Competency-based educational objectives will be in compliance with California State Model Curriculum Standards. A minimum of 2-3 hours of homework a week is expected.
Meets the UC/CSU "A" or "G" requirement.

HONORS MODERN WORLD HISTORY 10

Prerequisite: teacher and department recommendation Honors Modern World History is an intensive study of the modern world, from the late eighteenth century through the present, including the cause and course of both World Wars and the Cold War period. Students also develop an understanding of current world issues and relate them to their historical, geographic, political, economic, and culture (art, music, literature) contents. The standards for the year-long course are taught and learned through eight major themes sequenced chronologically. Competency-based educational objectives will be in compliance with California State Model Curriculum Standards. A minimum of 2-3 hours of homework a week is expected.
Meets the UC/CSU "A" or "G" requirement.

PE 10

Standard 1: Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.
Standard 2: Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.
Standard 3: Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Students in will participate and be evaluated in the following types of activities to meet and exceed the California PE standards:
1. Team Activities
2. Combative Activities
3. Gymnastics and Tumbling
4. Fitness Activities
5. Common Core Literacy and Math Activities

Students will complete the FitnessGram® fitness test in the spring semester. Students will be given a pretest in the fall while marking progress throughout the semester to achieve scores within the Healthy Fitness Zone.

Grade 11

ADVANCED PLACEMENT (AP) ENGLISH LANGUAGE AND COMPOSITION 11

Prerequisite: Teacher Recommendation, Advanced or high Proficient score on district tests. AP Language and Composition is a course comparable to freshman-level collegiate courses. The AP Language and Composition course using Conversations in American Literature will enhance the experience of the junior-level student who is taking Advanced Placement United States History as well. This course is based on the AP English Course Description. This course focuses on nonfiction (though some literature is included), rhetorical styles, and writing for a variety of purposes in a number of different styles. Students examine language closely and critically, scrutinizing the writer's thought, style, purpose. Students examine the context of the writing and judge the writer's validity. Students become more powerful writers themselves by researching, writing and revising their work. Students also learn to cite and document work properly through the employment of MLA method. Students write a multitude of essays. Summer reading is required for this course. Longer works include The Life and Times of Frederick Douglass, Walden, The Grapes of Wrath, and The Things They Carried. Summer reading is required.

Meets the UC/CSU "B" or "G" requirement.

HONORS ENGLISH 11

Prerequisite: Teacher Recommendation, Advanced or high Proficient score on district tests.

Students will develop the attitudes, knowledge and essay writing skills necessary to interpret and evaluate English literature and they will understand the social, political and cultural contributions to that literature. Honors English 11 follows a chronological study of British literature and prepares students for the SAT, AP exams. The yearlong course is divided into three sections: Early English, Shakespeare, and Modern English. The first section includes works from Anglo-Saxon literature to the Renaissance. The Shakespeare Rotation is an intense study of the Bard's works for approximately thirteen weeks. The Modern English rotation focuses on British literature from the Restoration to the Modern period. Longer selections for this course may include such works as Beowulf, Grendel, Everyman, Taming of the Shrew, Midsummer Night's Dream, Merchant of Venice, Hamlet, Othello, She Stoops to Conquer, Strange Case of Dr. Jekyll and Mr. Hyde, Sense and Sensibility, The Importance of Being Earnest, and Brave New World. Daily homework and summer reading are required.

Meets the UC/CSU "B" or "G" requirement.

EARLY AMERICAN LITERATURE 11 College Prep

This college preparatory course offers students a historical overview of American literature from its earliest days to the end of the nineteenth century. Students will take quizzes and tests on their readings, participate in classroom discussions, do projects, and write essays on various topics related to the literature, thereby displaying an understanding of the historical and cultural significance of certain pieces of literature. Students will improve their writing by further understanding proper grammar, and by writing paragraphs and essays of various types. Students will increase their vocabulary through a range of vocabulary activities. They will employ library and research skills, and will further their listening and oral presentation skills. The supplementary texts will be chosen from The Adventures of Huckleberry Finn, The Crucible, Red Badge of Courage, The Scarlet Letter, and Walden. Students will also complete preparatory activities for state testing. Daily homework is required. Note: Reading selections may be challenging for students who need to build reading proficiency; these students should choose Modern American or Multicultural American Literature.

Meets the UC/CSU "B" or "G" requirement

ALGEBRA I

Recommended: Placement through diagnostic testing, previous math class grade, benchmark exams, and teacher recommendation.

Algebra is a one year course that covers the Common Core Standards necessary for a High School Diploma.

This course meets the UC/CSU "C" requirement.

GEOMETRY 10-12

Recommended: Successful completion Algebra I, benchmark exams, and final exams.
Geometry will cover topics with an inductive/discovery hands on approach different from the rigorous deductive college prep approach. The intent of the course is to offer a richer second year mathematical experience. Topics covered: Introduction to geometry; reasoning; construction; triangle, polygon, and circle properties; area and volume; similarity and congruence; introductory trigonometry.
This course meets the UC/CSU "C" requirement.

HONORS GEOMETRY 10-11
Prerequisite: Successful completion of Honors Algebra, benchmark exams, and final exams.
Honors Geometry teaches deductive reasoning and organized thinking. Students study postulates, definitions, and theorems to use in formal proofs. Both semesters emphasize using algebraic skills to solve problems. Plane geometry and solid geometry are taught. Students also learn straightedge and compass constructions and transformations.
Meets the UC/CSU "C" requirement.

ALGEBRA 2 10-12
Recommended: Successful completion of Geometry or Honors Geometry, benchmark exams, and final exams.
This is an integrated college preparatory mathematics course covering all eight strands of the California State Mathematics Framework (Functions, Algebra, Geometry, Statistics and Probability, Discrete Mathematics, Measurement, Number, and Language and Logic) with an emphasis on advanced Algebra. This course includes a thorough study of functions (linear, quadratic, polynomial, radical, rational, logarithmic, and exponential). Sequences, series, probability, statistics, transformations, and trigonometry are also covered.
Meets the UC/CSU "C" requirement.

STATISTICS (semester course) 11 - 12
Recommended: Successful completion of CP Algebra 2 or Honors Algebra 2.
Statistics is a semester length study focusing on four areas: Exploring data, sampling and experimentation, anticipating patterns and statistical inference, analyzing sampling methods, effectively analyzing and presenting data in a variety of formats and designing and implementing experiments and surveys. This course was developed as an alternative to the calculus track for students who do not wish to take Pre-Calculus or Calculus but still want a challenging and applicable math course.

PRE-CALCULUS 11-12
Recommended: Successful completion of Algebra 2 or Honors Algebra 2, benchmark exams, and final exams.
Pre-Calculus is a one year math analysis course covering advanced topics of functions, trigonometry, statistics, analytic geometry, and limits.
Meets the UC/CSU "C" or "G" requirement.

PHYSICS (CP) 11
Prerequisite: Completion or concurrent enrollment in Algebra 2 and completion of Chemistry with a grade of "C" or better. Physics is an algebra and laboratory based college preparatory course covering fundamental principles of matter and energy. The primary topics include mechanics, sound and light waves, electricity, magnetism, and thermodynamics. Emphasis is placed on quantitative analysis of data collected in laboratory exercises, and applied problem solving. This course covers Physics content standards. A minimum of 4 hours of homework a week is expected.
Meets the UC/CSU "D" or "G" requirement.

CONCEPTUAL PHYSICS (CP) 11
Prerequisite: Concurrent enrollment in Algebra
Conceptual Physics is the study of the concepts of physics. Investigation of mechanics, properties of matter, heat, sound and light, and electricity and magnetism. Analysis and mathematics are used in

solving problems. This course covers Physics content standards. A minimum of 2 hours of homework a week is expected.
Meets the UC/CSU "G" requirement.

U.S. HISTORY 11
Prerequisite: none U.S. History is a course in which students examine the economic, social, and political development of the United States, concentrating primarily on the twentieth century. Throughout the course students will explore American culture, literature, the arts, and the mass media. Students will demonstrate competency in questioning, critical thinking, research, and writing as it applies to the discipline of history. Competency-based educational objectives will be in compliance with California State Model Curriculum Standards. A minimum of 3 hours of homework a week is expected.
Meets the UC/CSU "A" or "G" requirement.

ADVANCED PLACEMENT U.S. HISTORY 11 Prerequisite: Teacher recommendation Advanced Placement U.S. History is an intensive study of the economic, social, and political development of the United States. During the year certain themes will be emphasized: the expanding role of the federal government and federal courts; the continuing tension between the individual and the state; the emergence of a modern corporate economy; the impact of technology on American society and culture; change in the ethnic composition of American society; the movements toward equal rights for social minorities; and the role of the United States as a major world power. Throughout the course students will explore American culture, literature, the arts, and the mass media. Students will demonstrate competency in questioning, critical thinking, research, and writing as it applies to the discipline of history. Competency-based educational objectives will be in compliance with California State Model Curriculum Standards. Students are required to take the AP Exam administered in the spring. A minimum of 7 hours of homework a week is expected.
Meets the UC/CSU "A" or "G" requirement.

PE 11-12 Elective Course
Standard 1: Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.
Standard 2: Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.
Standard 3: Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Students in PE 10-12 (PE Elective) will participate and be evaluated in the following types of activities to meet and exceed the California PE standards: 1. Team Activities
2. Combative Activities
3. Gymnastics and Tumbling 4. Fitness Activities
5. Common Core Literacy and Math Activities

PE 11-12 (Aerobic, Individual and Dual Activities) Elective Course
Standard 1: Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.
Standard 2: Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.
Standard 3: Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Students in Course 3 will participate and be evaluated in the following types of activities to meet and exceed the California PE standards:
1. Walking
2. Running
3. Yoga
4. Badminton
5. Tennis

6. Two-player Volleyball
7. Golf
8. Racquetball
9. Handball

Athletic PE 11-12 (Weight Training and Fitness) Elective Course
Standard 1: Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.
Standard 2: Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.
Standard 3: Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Students in Course will participate and be evaluated in the following types of activities to meet and exceed the California PE standards:
1. Identify principles of lifting, identify prime mover muscles, antagonistic muscles, and stabilizer muscle and assess muscular strength, muscular endurance, cardiorespiratory endurance, and flexibility.
2. Learn proper lifting techniques
3. Establish a set of personal fitness goals; create a strength-training program.
4. Self and Peer evaluation of performance
5. Write an analysis of performance
6. Demonstrate proper spotting techniques
7. Measure and Assess balance, reaction time, agility, coordination, power, and speed.
8. Safety Equipment

Health 11 or 12
Health is a semester long course. This course will help students make informed decisions, modify behaviors, and change social conditions in ways that are beneficial to one's health. Students will gain literacy in the following topics: Nutrition and Physical Activity, Growth, Development, and Sexual Health, Injury Prevention and Safety, Alcohol, Tobacco, and Other Drugs, Mental, Emotional, and Social Health, Personal and Community Health

Standard 1: Essential Health Concepts - All students will comprehend essential concepts related to enhancing health.
Standard 2: Analyzing Health Influences - All students will demonstrate the ability to analyze internal and external influences that affect health.
Standard 3: Accessing Valid Health Information - All students will demonstrate the ability to access and analyze health information, products, and services.
Standard 4: Interpersonal Communication - All students will demonstrate the ability to use interpersonal communication skills to enhance health. Standard 5: Decision Making - All students will demonstrate the ability to use decision-making skills to enhance health.
Standard 6: Goal Setting - All students will demonstrate the ability to use goal-setting skills to enhance health.
Standard 7: Practicing Health-Enhancing Behaviors - All students will demonstrate the ability to practice behaviors that reduce risk and promote health. Standard 8: Health Promotion - All students will demonstrate the ability to promote and support personal, family, and community health.

Grade 12

ADVANCED PLACEMENT ENGLISH LITERATURE 12
Prerequisite: Teacher and Department Recommendation based on past performance and district test scores.
In this College Board-approved course, students will develop the knowledge, analytic skills, and compositional abilities necessary for collegiate-level analysis of works of recognized literary merit (British, American, and comparative literature). Students will also prepare for the skills-based AP Literature examination given in May; students receiving a qualifying score may receive up to one full year of college English credit. Students will conduct intensive poetry study; typical

longer selections include but are not limited to 1984, All My Sons, Medea, Daisy Miller, Summer, An Ideal Husband, Ethan Frome, Heart of Darkness, Hedda Gabler, The Loved One, King Lear, The Scarlet Letter, Tartuffe, The Stranger, Wuthering Heights, and Antigone. Daily homework is required. Summer reading is required.
Meets the UC/CSU "B" or "G" requirement.

ADVANCED PLACEMENT LANGUAGE & COMPOSITION 12
Prerequisite: Teacher and Department Recommendation based on past performance and district test scores.
In this College Board-approved course, students will develop the knowledge, analytic skills, and compositional abilities necessary for collegiate-level analysis of nonfiction works of recognized literary merit. Students will also prepare for the skills-based AP English Language and Composition examination given in May; students receiving a qualifying score may receive up to one full year of college English credit. This course is different from AP Literature in that the focus is on nonfiction, rhetorical styles, and writing for a variety of purposes in a number of different styles. Students examine language closely and critically, scrutinizing the writer's thought, style, purpose. Students examine the context of the writing and judge the writer's validity. Students become more powerful writers themselves by writing a wide range of essays in a wide range of modes. Typical longer works include Black Boy, Into the Wild, The Things They Carried, and 1984. Daily homework is required. Summer reading is required.
Meets the UC/CSU "B" or "G" requirement.

HONORS ENGLISH LITERATURE 12
Prerequisite: a grade of "B" or better in last English class or teacher and departmental recommendation based on district test scores.
This course features an exploration of big ideas in classic works of early and modern English literature. Typical longer selections may include such works as Beowulf, Macbeth, A Midsummer Night's Dream, Frankenstein, Strange Case of Jekyll and Hyde, The Importance of Being Earnest, and Brave New World. Daily homework is required.
Meets the UC/CSU "B" or "G" requirement.

EXPOSITORY READING AND WRITING 12 College Prep
In this yearlong course, students will progress through a series of thematic modules designed to develop expository, analytical, and argumentative reading and writing skills necessary for success in college and the world of work (CP). Course texts include contemporary essays, newspaper and magazine articles, editorials, reports, and other nonfiction texts. The course materials also include modules on full-length works, including Krakauer's Into the Wild, Orwell's 1984, and Huxley's Brave New World. This course is paced to support students who have not yet demonstrated mastery of academic literacy standards. Daily homework is required.
Meets the UC/CSU "B" or "G" requirement.

GEOMETRY 10-12
Recommended: Successful completion Algebra I, benchmark exams, and final exams.
Geometry will cover topics with an inductive/discovery hands on approach different from the rigorous deductive college prep approach. The intent of the course is to offer a richer second year mathematical experience. Topics covered: Introduction to geometry; reasoning; construction; triangle, polygon, and circle properties; area and volume; similarity and congruence; introductory trigonometry.
This course meets the UC/CSU "C" requirement.

ALGEBRA 2 10-12
Recommended: Successful completion of Geometry or Honors Geometry, benchmark exams, and final exams.
This is an integrated college preparatory mathematics course covering all eight strands of the California State Mathematics Framework (Functions, Algebra, Geometry, Statistics and Probability, Discrete Mathematics, Measurement, Number, and Language and Logic) with an emphasis on advanced Algebra. This course includes a thorough study of functions (linear, quadratic, polynomial, radical, rational, logarithmic, and exponential). Sequences, series, probability, statistics, transformations, and trigonometry are also covered.

Meets the UC/CSU “C” requirement.

STATISTICS (semester course) 11 - 12
Recommended: Successful completion of CP Algebra 2 or Honors Algebra 2.
Statistics is a semester length study focusing on four areas: Exploring data, sampling and experimentation, anticipating patterns and statistical inference, analyzing sampling methods, effectively analyzing and presenting data in a variety of formats and designing and implementing experiments and surveys. This course was developed as an alternative to the calculus track for students who do not wish to take Pre-Calculus or Calculus but still want a challenging and applicable math course.

PRE-CALCULUS 11-12
Recommended: Successful completion of Algebra 2 or Honors Algebra 2, benchmark exams, and final exams.
Pre-Calculus is a one year math analysis course covering advanced topics of functions, trigonometry, statistics, analytic geometry, and limits.
Meets the UC/CSU “C” or “G” requirement.

ADVANCED PLACEMENT CALCULUS-AB 12
Recommended: Successful completion of Pre-Calculus (CP) or teacher recommendation.
This course is a college-level class for students who have completed the equivalent of 4 years of college preparatory mathematics. Students will receive little or no review. Topics include derivatives, differentials, integrations, and applications. Many problems are atypical and require students to synthesize new solutions. A graphing calculator is required. The course is designed to prepare students to take the Advanced Placement Exam for Calculus AB.
Meets the UC/CSU “C” or “G” requirement.

ZOOLOGY (CP) (semester course) 12
Prerequisite: A grade of “B” or better in Biology (CP) Zoology is a more in-depth study of the animal kingdom than is possible in Biology. Each of ten major animal groups (phyla) will be studied starting with an emphasis on vertebrates. Many aspects of their anatomy, physiology, and natural history will be covered in lecture and laboratories. Live animal labs emphasizing ecology and evolution, using student observation and analysis skills are the major laboratory skills. A minimum of 4 hours of homework a week is expected.
Meets the UC/CSU "G" requirement.

AMERICAN GOVERNMENT 12 (semester)
Prerequisite: none American Government covers topics such as voting, elections, Congress and the Presidency, bureaucracy, national courts, Bill of Rights, and state and local governments. A minimum of 2 hours of homework a week is expected.
Meets the UC/CSU "A" or "G" requirement.

ECONOMICS 12 (semester)
Prerequisite: none Economics covers topics such as fundamental economic concepts, microeconomics, comparative economics systems, and international economic concepts. A minimum of 2 hours of homework a week is expected.
Meets the UC/CSU "G" requirement.

ADVANCED PLACEMENT AMERICAN GOVERNMENT (CP) 12 (semester)
Prerequisite: Teacher recommendation
An intensive study of American government. Students are required to take the AP exam in spring. A minimum of 7 hours of homework a week is expected.
Meets the UC/CSU "A" or "G" requirement.

ADVANCED PLACEMENT ECONOMICS AND MACRO ECONOMICS 12 (semester)
Prerequisite: Teacher recommendation First semester is an intensive study of microeconomics. Second semester is the intensive study of

macroeconomics. Students are required to take the AP exam in spring. A minimum of 7 hours of homework a week is expected.
Meets the UC/CSU "G" requirement.

PE 11-12 Elective Course
Standard 1: Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.
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Standard 3: Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Students in PE 10-12 (PE Elective) will participate and be evaluated in the following types of activities to meet and exceed the California PE standards: 1. Team Activities
2. Combative Activities
3. Gymnastics and Tumbling 4. Fitness Activities
5. Common Core Literacy and Math Activities

PE 11-12 (Aerobic, Individual and Dual Activities) Elective Course
Standard 1: Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.
Standard 2: Students achieve a level of physical fitness for health and performance while demonstrating knowledge of fitness concepts, principles, and strategies.
Standard 3: Students demonstrate knowledge of psychological and sociological concepts, principles, and strategies that apply to the learning and performance of physical activity.

Students in Course 3 will participate and be evaluated in the following types of activities to meet and exceed the California PE standards:
1. Walking
2. Running
3. Yoga
4. Badminton
5. Tennis
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7. Golf
8. Racquetball
9. Handball

Athletic PE 11-12 (Weight Training and Fitness) Elective Course
Standard 1: Students demonstrate knowledge of and competency in motor skills, movement patterns, and strategies needed to perform a variety of physical activities.
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Students in Course will participate and be evaluated in the following types of activities to meet and exceed the California PE standards:
1. Identify principles of lifting, identify prime mover muscles, antagonistic muscles, and stabilizer muscle and assess muscular strength, muscular endurance, cardiorespiratory endurance, and flexibility.
2. Learn proper lifting techniques
3. Establish a set of personal fitness goals; create a strength-training program.
4. Self and Peer evaluation of performance
5. Write an analysis of performance
6. Demonstrate proper spotting techniques
7. Measure and Assess balance, reaction time, agility, coordination, power, and speed.
8. Safety Equipment

Health 11 or 12

Health is a semester long course. This course will help students make informed decisions, modify behaviors, and change social conditions in ways that are beneficial to one's health. Students will gain literacy in the following topics: Nutrition and Physical Activity, Growth, Development, and Sexual Health, Injury Prevention and Safety, Alcohol, Tobacco, and Other Drugs, Mental, Emotional, and Social Health, Personal and Community Health

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Standard 4: Interpersonal Communication - All students will demonstrate the ability to use interpersonal communication skills to enhance health.
Standard 5: Decision Making - All students will demonstrate the ability to use decision-making skills to enhance health.
Standard 6: Goal Setting - All students will demonstrate the ability to use goal-setting skills to enhance health.
Standard 7: Practicing Health-Enhancing Behaviors - All students will demonstrate the ability to practice behaviors that reduce risk and promote health. Standard 8: Health Promotion - All students will demonstrate the ability to promote and support personal, family, and community health.

Textbooks:

English Language Arts
Reading, Grammar and Spelling: Collections, Houghton Mifflin Harcourt Publishing
Grammar and Writing: 7-12 Write Source, K–12 Textbook Programs for Writing

Mathematics, by Holt McDougal (Houghton Mifflin Harcourt)
Grade 7: Pre-Algebra
Grade 8: Algebra I
Grade 9: Geometry
Grade 10: Algebra II
Grade 11: Pre-Calculus
Grade 12: Probability and Statistics

Science, Houghton Mifflin Harcourt Dimensions™ Next Generation
Science Standards
Grade 7: Life Science
Grade 8: Physical Science
Grade 9: Biology
Grade 10: Chemistry
Grade 11: Physics
Grade 12: Zoology

Social Studies, Holt McDougal (Houghton Mifflin Harcourt)
Grade 7: Ancient Civilizations
Grade 8: The United States
Grade 9: Geography
Grade 10: World History
Grade 11: US History
Grade 12: American Government and Economics

Lifetime Health, Holt (Grade 11 or 12, 1 semester)
Physical Education 7-12, SPARKS Curriculum

Course Descriptions for Non-Core Classes (Electives Descriptions)

CREATIVE WRITING
Semester (10-12)
PREREQUISITES: None

The first semester course will teach the basic skills in writing creatively whether it be a short story, a poem, a play, a script, or an article for the magazine market. Students will explore all facets of writing: plot, characterization, tone, point of view, pace, and slant. Emphasis will be placed on developing students' immediate interests and skills by helping them participate in a variety of local and national writing contests. Literature will be read and studied as they relate to the creative writing mode.

INTERSCHOLASTIC SPEECH AND DEBATE
Year (9-12)
PREREQUISITES: None

In this course students will be prepared to engage in competitive speech and debate. Students will have the opportunity to learn the various skills and techniques for competitive forensics and will be given the opportunity to compete in a variety of forensic events in the classroom setting. An in-depth study of the different types of speeches, debates, logic and argumentation will be the course of study. Students will exhibit their acquired skills in performance-based assessments, which require them to develop and utilize their presentation and argumentation skills and which afford them the opportunity to exercise and develop their intellectual and verbal skills. In addition, this course will promote the development of research skills, will require frequent writing of all types of expository and persuasive prose, will require the interpretive performance of dramatic and humorous literature, will require in depth study and will require the study of both foreign and domestic political and policy issues. Students may involve themselves in off-campus extracurricular tournament events.

JOURNALISM 1
Semester (9-12)
PREREQUISITES: None

In this course students will practice writing expository prose compositions, news articles, editorials, and personal essays. Students will also learn interview skills, press laws and ethics, and page design and layout. Students will read a substantial amount of literature to meet the outcomes of this course. This course will provide students with practical experience in print media and offer a wide range of writing opportunities as preparation for business, industry, and more advanced research and composition courses. The course will be taught as a prerequisite to Journalism 2 and Yearbook.

JOURNALISM 2
Year (9-12)
PREREQUISITES: Journalism 1 with a grade of "B" or better AND successful completion of a staff selection process conducted by the teacher.

In this course students will continue their practice in expository prose compositions, news articles, editorials, and personal essays. Students will also be publishing the ACIS International School Paper while learning the higher levels of interviewing, press laws and ethics, page design and layout. Students will read a substantial amount of literature to meet the outcomes of this course. This course will give students practical experience in print media and offer a wide range of writing opportunities as preparation for business, industry, and more advanced research and composition courses. This course will be taught in preparation for advanced English courses and a possible profession in journalism.

DIGITAL MULTIMEDIA DESIGN (YEARBOOK)
Year (10-12)
PREREQUISITES: Successfully complete staff selection process the spring before enrollment
RECOMMENDATION: Journalism 1 with a grade of "C" or better. Course may be repeated for a maximum of twenty credits counted toward the 230-credit graduation requirement.

Digital Multimedia Design is a course designed for students who are interested in exploring the real-world applications of the arts. The course focuses on design and how it pertains to a variety of creative techniques, including digital photography, desk top publishing, and the digital darkroom. Students develop skills in technology-based programs, problem solving, communication, and time management that contribute to lifelong learning and career skills. Students ultimately publish a book.

Under the direction of student editors and the faculty advisor, students will carry out the design, writing, photography, layout and production of the school yearbook, an annual written and pictorial record of the year at ACIS International School. Communications law, ethics and standards, interviewing techniques, writing, visual design, computer layout, photography, meeting deadlines, organizational skills, planning and working cooperatively in a fast-paced professional setting are integral parts of this class. The course will follow the Visual and Performing Arts course standards. Meets the UC/CSU "F" requirement.

NEWSWRITING
Semester (10-12)
Prerequisite: Approval of advisor. A grade of “B” or better in English

Newswriting students will be required to submit weekly writings of some length for publication in the school paper or magazine. A minimum of 2000 words will be written per semester, which will demonstrate the students’ understanding of story guidelines and the principles of writing for a publication, including style and terminology. Students will meet story, layout, photo and/or page deadlines, and be required to learn the computer programs that the Newswriting staff utilizes to produce its publications. Does not give English credit for graduation. Daily homework required. Ninth graders may submit an application. Meets the UC/CSU "G" requirement.

ASB LEADERSHIP
Year (9-12)
Prerequisite: Must have been elected or appointed to the ASB cabinet or class office. Must maintain a 2.5 GPA as a required by the ASB constitution

ASB Leadership is a one year course for the elected and appointed officers of the Associated Student Body. The course provides officers with skills and knowledge necessary to lead an effective student government. A minimum of 5 hours of homework a week is expected.

BUSINESS MANAGEMENT and BUSINESS LAW
Year (10-12)
PREREQUISITES: None

Business Management is the study of the economic and social environment of business, students will learn about entrepreneurship, the three basic types of business ownership, marketing, finance, management functions, and human resources. The students will also apply business management principles in analyzing and solving real world problems presented in projects, case problems and class discussion questions. Business Law is the study of the basic legal concepts relating to business transactions. The students learn how law applies to society, the consumer, minors, citizens, and business. The students also learn about crimes, torts, contracts, the court system, bailments, credit, renting and owning real property, and insurance. These courses provide an excellent background for those students who plan to major in business at the college or technical school level or enter the work force after high school graduation.

MATHEMATICS FOR BUSINESS 1 and 2
Semester (10-12)
PREREQUISITES: None

This course helps students become mathematically literate and self-confident by applying basic mathematics skills (adding, subtracting, multiplying, dividing, fractions, and percent's) and problem-solving strategies plus algebra concepts. The course includes such topics as checking and savings accounts, charge accounts, credit cards, loans, housing costs, and automobile costs. Second semester, students continue to apply basic mathematics skills and problem solving strategies. The course includes such topics as purchasing, sales, marketing, accounting, records, and financial management.

ACCOUNTING
Year (11-12)
PREREQUISITES: None

This course is recommended for business majors and other students interested in the subject for personal use. It is an excellent background course for students planning to major in business at the college level. The basic bookkeeping cycle is presented and then expanded to include analyzing business transactions, journalizing and posting, preparing and analyzing financial reports, maintaining accurate business and personal records, and reconciling bank statements. Computers are integrated into the course through accounting software. Second semester this course is the study of payroll procedures, depreciation of fixed assets, notes receivable and notes payable, and purchases and sales returns and allowances.

ACTING
Year (9-12)
PREREQUISITES: None

This course includes the study of acting methods, improvisation, dramatic movement, and fundamentals of characterization. With a strong emphasis on team work and responsibility, the course provides students with a greater knowledge of drama and its universal appeal in order that they may better enjoy and appreciate the performing arts. Students will perform selected scenes from a variety of sources in class. Second semester students will explore different periods of dramatic literature, such as Greek drama, Shakespeare, Chekhov, Restoration and Theatre of the Absurd, through production of scenes and projects. The course will conclude with the production of a one-act play or the equivalent in extended scenes from full-length plays. The course may include a public performance of class pieces.

ART 1
Semester (9-12)
Prerequisite: None

Development of basic fine art theory, exploration of media and skills related to good design. Emphasis placed on using and recognizing the Elements of Art. Meets the Fine Arts graduation requirement. Meets the UC/CSU "F" requirement.

ART 2
Semester (9-12)
Prerequisite: Completion of Art 1 with a grade of "D" or better.

Continued development of basic art theory, exploration of media and skills related to good design. Emphasis placed on using and recognizing the Principles of Art. Meets the Fine Arts graduation requirement. Meets the UC/CSU "F" requirement.

DRAWING 1&2
Semester (10-12)
Prerequisite: Completion of Art 1 & 2 or consent of teacher.

Drawing techniques employing many mediums, styles, and genres in order to develop more advanced composition skills and sophisticated concepts. Meets the UC/CSU "F" requirement.

DRAWING 3&4
Semester (10-12)
Prerequisite: Grade of “C” or better in Drawing 1 & 2 or consent of teacher.

Continued exploration of drawing concepts with use of traditional and non-traditional drawing techniques and media. Introduction to working in a conceptual series for portfolio building. Meets the Fine Arts graduation requirement. Meets the UC/CSU "F" or “G” requirement.

DRAWING 5&6
Semester courses (11-12)
Prerequisite: Grade of “B” or better in Drawing 3 & 4 or consent of teacher.

Advanced exploration of drawing concepts with use of traditional and non-traditional drawing techniques and media. Continuation of working in a conceptual series for portfolio building. Meets the Fine Arts graduation requirement. Meets the UC/CSU "F" or “G” requirement.

PAINTING 1&2
Semester (10-12)
Prerequisite: Completion of Art 1&2, or Drawing 1, or consent of teacher.

Painting techniques employing many mediums, styles, and genres in order to develop more advanced composition skills and sophisticated concepts. Meets the Fine Arts graduation requirement. Meets the UC/CSU "F" requirement.

PAINTING 3&4
Semester (11-12)
Prerequisite: Grade of “C” or better in Painting 1 & 2 or consent of teacher.

Continued exploration of painting concepts with use of traditional and non-traditional drawing techniques and media. Introduction to working in a conceptual series for portfolio building. Meets the Fine Arts graduation requirement. Meets the UC/CSU "F" or “G” requirement.

PAINTING 5&6
Semester (11-12)
Prerequisite: Grade of “B” or better in Painting 3 & 4 or consent of teacher.

Advanced exploration of painting concepts with use of traditional and non-traditional drawing techniques and media. Continuation of working in a conceptual series for portfolio building. Meets the Fine Arts graduation requirement. Meets the UC/CSU "F" or “G” requirement.

COMPUTER GRAPHIC ARTS
Year (10-12)
PREREQUISITE: Completion of the computer requirement for graduation. Completion of both semesters of Visual Art with a grade of “C” or better is recommended but not required.

The first semester will introduce the interested student to graphic design, the visual communication of art through the computer medium and the combination of images and print. During second semester, students will create complex visual images, learn the basics of web design, develop a digital portfolio, and create a variety of publication projects. The computer is the artistic tool for today and the future for the creation of design, illustrations, and publications.

MUSIC APPRECIATION
Year (9-12)
PREREQUISITES: None

This course is designed to be an introduction to western and non-western musical styles. Students will learn how music affects their

culture and other cultures from around the world through the study of musical history, how to recognize music in written and aural form, and how music is used in a myriad of situations from communication to mood setting. The course is based on the California standards for music and will include significant reading, writing and listening**.**

HISTORY OF ROCK AND ROLL
Year (9-12)
PREREQUISITES: None

This course focuses on the roots and development of rock and roll music throughout the twentieth century. Students will develop an understanding of basic music theory as it pertains to rock and roll along with special attention given to the manner in which sociological, political and economic conditions affected the evolution of the genre and its culture. The course is based on State visual and performing arts standards.

JAZZ BAND
Semester (9-12)
PREREQUISITES: Audition or teacher recommendation. Course may be repeated for credit.

This course is designed to provide accomplished musicians with the opportunity of playing music with an emphasis on Jazz and Rock in a "Big Band" setting. A performance will be required each semester. Other performances and festivals may be included.

CONCERT CHOIR
Year (9-12)
PREREQUISITES: Audition/teacher recommendation. Course may be repeated for credit.

This is the advanced choir at ACIS International High School. This concert choir will perform at festivals, concerts, and community activities. This group performs a wide variety of choral music, ranging from Renaissance to contemporary styles. Excellent basic vocal training and study of music fundamentals is included.

INTRODUCTION TO EDUCATION
Year (11-12)
PREREQUISITES: 3.0 GPA or higher, completion of Geometry 2 with a B or higher, and counselor recommendation. Course may be repeated for credit.

This course is designed for students who are interested in pursuing a career in education. Students will study the history of education in the U.S. The course will cover such topics as the sociological factors affecting education and educational systems, social and personality development, cognitive development in children and young adults, lesson planning, and curriculum design. Students will work as a tutor under the supervision of a certificated teacher.

STUDENT AIDE
Semester (10-12)
PREREQUISITES: Application/good grades, behavior, attendance Course may be repeated for a maximum of TEN credits towards the 230-credit graduation requirement.

Student aides serve teachers and other staff to provide clerical and routine instructional tasks. Students will work on a regular scheduled daily basis under teacher or staff direction. Grade will be pass/fail.

COMPUTER SCIENCE
Year (9-12)
PREREQUISITES: Enrollment in Geometry or higher. This is for students who plan on majoring in computer science or a related IT field in college.

This yearlong course introduces students to the basic structures of computer hardware, software and the internet. Students will learn to use conditional statements, loops, and other fundamental structures to

understand and write code. Additionally, students will understand the benefits and utility of Object-Oriented Programming and use it individually and as part of a programming team. Students will become familiar with several higher-level programming languages and demonstrate early proficiency in Java. Students will also use programming as a tool to create practical solutions to problems.

COMPUTER SCIENCE II
Year (11 - 12)
PREREQUISITES: Completion of Computer Science with a "B" or better, or passing score on a Computer Science Diagnostic test.

This yearlong course provides a detailed study of the following topics: systems lifecycle and software development, program construction in Java, and computing system fundamentals. Students will gain and understanding of the tasks that a systems analyst would perform when considering a situation that may be computerized and will learn to analyze and solve problems, not just to write programs. Students will also learn how to trace, evaluate, and construct algorithms in Java as well as study computer systems (their hardware and software) and how they interact.

COMPUTER SCIENCE III
Year (11-12)
PREREQUISITES: Completion of Computer Science II with a "B" or better.

This yearlong course is designed primarily for students in grades 11-12 wishing to complete a comprehensive course in many aspects of computer science. At the end of the course, students will devote many weeks to creating an extensive Programming Dossier consisting of a practical application of skills through the development of a product with the associated documentation.

SAT TEST PREPARATION
Year (11-12)

Our mission is to provide a free, world-class education to anyone, anywhere.
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Most students take the SAT for the first time in the spring of their junior year. After more coursework and practice, students increase their skills and test again in the fall of their senior year.

https://www.khanacademy.org/test-prep/sat

WOOD I 9-12 Prerequisite: none
Wood I involves the use of basic hand tools and the demonstration and use of woodworking machines. Emphasis is placed on safety and experimental learning. The course includes the introduction to hand tools (handling, care, and function), planning a project (sketching, reading scales, assembly), and introduction and use of power equipment. A minimum number of projects is required during the semester, normally students find time to do an individual project near the end of the semester.

WOOD II 10-12 Prerequisite: a grade of "C" or better in Wood I

Wood II involves multiple woodworking projects encompassing: various wood species, measuring and marking, basic cuts and joints, drilling holes and driving screws, sanding, scraping, clamping, using hand tools, routing, finishing and using the stationary power equipment. Students will be required to pass and correct the safety exam following the safety training. Meets the Fine Arts graduation requirement.

WOOD III 11-12 Prerequisite: a grade of "C" or better in Wood II
Advanced project construction.

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