California's
COMMON CORE
Content Standards
Eighth Grade

California's

COMMON CORE
Content Standards for
ELA and Mathematics
Eighth Grade

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READING STANDARDS

The following standards offer a focus for instruction each year and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades. *Students advancing through the grades are expected to meet each year's gradespecific standards and retain or further develop skills and understandings mastered in preceding grades.*

LITERATURE

Key Ideas and Details

7TH

1. Cite several pieces of textual evidence to support 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.

3. Analyze how particular elements of a story or drama interact (e.g., how setting shapes the characters or plot)

8TH

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, including its relationship to the characters, setting, and plot; provide an objective summary of the text.

3. Analyze how particular lines of dialogue or incidents in a story or drama propel the action, reveal aspects of a character, or provoke adecision.

9TH

1. Cite strong and thorough textual evidence to support 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 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.

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.

Anchor R.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.

Anchor R.2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

Anchor R.3 Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

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.

5. Analyze how a drama's or poem's form or structure (e.g., soliloquy, sonnet) contributes to its meaning.

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.

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.

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).

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.

READING STANDARDS

7TH

6. Analyze how an author develops and contrasts the points of view of different characters or narrators in a text.

8TH

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.

9TH

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.

Anchor R.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.

Anchor R.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.

Anchor R.6   Assess how point of view or purpose shapes the content and style of a text.

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.

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).

8. (Not applicable to literature)

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.

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).

Anchor R.7   Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.[1]

Anchor R.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.

Anchor R.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 & Level of Text Complexity

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.

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.

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

[1] 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.

READING STANDARDS

Key Ideas and Details

7TH	8TH	9TH
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 saysexplicitly 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
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.	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.
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).	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.

Anchor R.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.

Anchor R.2   Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

Anchor R.3   Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

Craft and Structure

7TH	8TH	9TH
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.	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.	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).
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.	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.	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.

READING STANDARDS

7TH

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.

8TH

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.

9TH

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.

Anchor R.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.

Anchor R.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.

Anchor R.6   Assess how point of view or purpose shapes the content and style of a text.

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.

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.

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.

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.

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.

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

Anchor R.7   Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.[2]

Anchor R.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.

Anchor R.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.

[2] 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.

READING STANDARDS

7TH

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.

8TH

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.

9TH

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.

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

WRITING STANDARDS

The following standards for K–5 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, from vocabulary and syntax to the development and organization of ideas, and they should address increasingly demanding content and sources. *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.* The expected growth in student writing ability is reflected both in the standards themselves and in the collection of annotated student writing samples in Appendix C.

WRITING

Text Types & Purposes

7TH

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.
   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.
   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.

8TH

1. Write arguments to support claims with clear reasonsand relevant evidence.
   a. Introduce claim(s), acknowledge and distinguishthe 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.

9TH

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.

WRITING STANDARDS

7TH

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.
   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.

8TH

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.
   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.
   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.

9TH

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.
   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).

WRITING STANDARDS

7TH

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.

8TH

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.

9TH

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.

Anchor W.1   Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.
Anchor W.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.
Anchor W.3   Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.

Production & 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.)

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.

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.

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.

WRITING STANDARDS

7TH

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.

8TH

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.

9TH

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.

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

Research to Build & 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.

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 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.

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 <u>including footnotes and endnotes.</u>

WRITING STANDARDS

7TH

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")..

8TH

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").

9TH

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")

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.

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.

Anchor W.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.

SPEAKING & LISTENING

The following standards 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.*

Comprehension & Collaboration

7TH

1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) 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.

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.

8TH

1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) 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

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.

9TH

1. Initiate and participate effectively in a range of collaborative discussions (one-onone, 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 ffrom 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

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.

SPEAKING & LISTENING

7TH

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.

8TH

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.

9TH

3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Anchor SL.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.
Anchor SL.2   Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
Anchor SL.3   Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge & 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.
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.vocabulary; and provides a strong conclusion.

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.
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.

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.
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.)
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 he desired aesthetic effect. (9th or 10th grade.)

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.

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.

SPEAKING & LISTENING

7TH

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

8TH

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

9TH

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

Anchor SL.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.

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

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

LANGUAGE STANDARDS

The following standards for grades K–5 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 (*).

Conventions of Standard English

7TH

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.*

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.

8TH

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 punctuation (comma, ellipsis, dash) to indicate a pause or break.
   b. Use an ellipsis to indicate an omission.
   c. Spell correctly.

9TH

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 writingor presentations.

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

Anchor L.1   Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
Anchor L.2   Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

LANGUAGE STANDARDS

Knowledge of Language

7TH

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.*

8TH

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).

9TH

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.

Anchor L.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 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**.
   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.**
   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 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.**
   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.
   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).

LANGUAGE STANDARDS

7TH

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*).

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.

8TH

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 particularv words to better understand each of the words.
   c. Distinguish among the connotationsv (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.

9TH

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.

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

Anchor L.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.

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

Anchor L.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.

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)							
	3	4	5	6	7	8	9–10	11–12
L.3.1f. Ensure subject-verb and pronoun-antecedent agreement.	■	■	■	■	■	■	■	■
L.3.3a. Choose words and phrases for effect.	■	■	■	■	■	■	■	■
L.4.1f. Produce complete sentences, recognizing and correcting inappropriate fragments and run-ons.		■	■	■	■	■	■	■
L.4.1g. Correctly use frequently confused words (e.g., *to/too/two; there/their*).		■	■	■	■	■	■	■
L.4.3a. Choose words and phrases to convey ideas precisely.[1]		■	■	■				
L.4.3b. Choose punctuation for effect.		■	■	■	■	■	■	■
L.5.1d. Recognize and correct inappropriate shifts in verb tense.			■	■	■	■	■	■
L.5.2a. Use punctuation to separate items in a series.[1]			■					
L.6.1c. Recognize and correct inappropriate shifts in pronoun number and person.				■	■	■	■	■
L.6.1d. Recognize and correct vague pronouns (i.e., ones with unclear or ambiguous antecedents).				■	■	■	■	■
L.6.1e. Recognize variations from standard English in their own and others' writing and speaking, and identify and use strategies to improve expression in conventional language.				■	■	■	■	■
L.6.2a. Use punctuation (commas, parentheses, dashes) to set off nonrestrictive/parenthetical elements.				■	■	■	■	■
L.6.3a. Vary sentence patterns for meaning, reader/listener interest, and style.[2]				■	■	■	■	
L.6.3b. Maintain consistency in style and tone.				■	■	■	■	■
L.7.1c. Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers.					■	■	■	■
L.7.3a. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.					■	■	■	■
L.8.1d. Recognize and correct inappropriate shifts in verb voice and mood.						■	■	■
L.9–10.1a. Use parallel structure.							■	■

[1] Subsumed by L.7.3a
[2] Subsumed by L.9–10.1a
[3] Subsumed by L.11–12.3a

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 contained in Appendix A

Qualitative · Quantitative · Reader and Task

Range of Text Types for 6-12

Students in grades 6–12 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 <u>classical through contemporary</u> 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.**	Includes <u>classical through contemporary works and the</u> 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.**	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

TEXT ILLUSTRATING THE COMPLEXITY, QUALITY, AND RANGE OF STUDENT READING 6-12

Literature: Stories, Dramas, Poetry

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)

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)

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)

Informational Texts: Literary Nonfiction

6-8

- "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

- "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

- *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 depth.

MATHEMATICS STANDARDS

INTRODUCTION

Toward greater focus and coherence

Mathematics experiences in early childhood settings should concentrate on (1) number (which includes whole number, operations, and relations) and (2) geometry, spatial relations, and measurement, with more mathematics learning time devoted to number than to other topics. Mathematical process goals should be integrated in these content areas.

—National Research Council, 2009

The composite standards [of Hong Kong, Korea and Singapore] have a number of features that can inform an international benchmarking process for the development of K–6 mathematics standards in the U.S. First, the composite standards concentrate the early learning of mathematics on the number, measurement, and geometry strands with less emphasis on data analysis and little exposure to algebra. The Hong Kong standards for grades 1–3 devote approximately half the targeted time to numbers and almost all the time remaining to geometry and measurement.

— Ginsburg, Leinwand and Decker, 2009

Because the mathematics concepts in [U.S.] textbooks are often weak, the presentation becomes more mechanical than is ideal. We looked at both traditional and non-traditional textbooks used in the US and found this conceptual weakness in both.

— Ginsburg et al., 2005

There are many ways to organize curricula. The challenge, now rarely met, is to avoid those that distort mathematics and turn off students.

— Steen, 2007

For over a decade, research studies of mathematics education in high-performing countries have pointed to the conclusion that the mathematics curriculum in the United States must become substantially more focused and coherent in order to improve mathematics achievement in this country. To deliver on the promise of common standards, the standards must address the problem of a curriculum that is "a mile wide and an inch deep." These Standards are a substantial answer to that challenge.

It is important to recognize that "fewer standards" are no substitute for focused standards. Achieving "fewer standards" would be easy to do by resorting to broad, general statements. Instead, these Standards aim for clarity and specificity.

Assessing the coherence of a set of standards is more difficult than assessing their focus. William Schmidt and Richard Houang (2002) have said that content standards and curricula are coherent if they are:

> *articulated over time as a sequence of topics and performances that are logical and reflect, where appropriate, the sequential or hierarchical nature of the disciplinary content from which the subject matter derives. That is, what and how students are taught should reflect not only the topics that fall within a certain academic discipline,* ***but also the key ideas*** *that determine how knowledge is organized and generated within that discipline. This implies that "to be coherent," a set of content standards must evolve from particulars (e.g., the meaning and operations of whole numbers, including simple math facts and routine computational procedures associated with whole numbers and fractions) to deeper structures inherent in the discipline. These deeper structures then serve as a means for connecting the particulars (such as an understanding of the rational number system and its properties). (emphasis added)*

These Standards endeavor to follow such a design, not only by stressing conceptual understanding of key ideas, but also by continually returning to organizing principles such as place value or the laws of arithmetic to structure those ideas.

In addition, the "sequence of topics and performances" that is outlined in a body of mathematics standards must also respect what is known about how students learn. As Confrey (2007) points out, developing "sequenced obstacles and challenges for students…absent the insights about meaning that derive from careful study of learning, would be unfortunate and unwise." In recognition of this, the development of these Standards began with research-based learning progressions detailing what is known today about how students' mathematical knowledge, skill, and understanding develop over time.

MATHEMATICS STANDARDS

MATHEMATICAL PRACTICE

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report Adding It Up: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1 Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2 Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4 Model with mathematics.

 Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5 Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6 Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7 Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8 Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction. The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices. In this respect, those content standards which set an expectation of understanding are potential "points of intersection" between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

MATHEMATICS STANDARDS

Understanding mathematics

These Standards define what students should understand and be able to do in their study of mathematics. Asking a student to understand something means asking a teacher to assess whether the student has understood it. But what does mathematical understanding look like? One hallmark of mathematical understanding is the ability to justify, in a way appropriate to the student's mathematical maturity, why a particular mathematical statement is true or where a mathematical rule comes from. There is a world of difference between a student who can summon a mnemonic device to expand a product such as $(a + b)(x + y)$ and a student who can explain where the mnemonic comes from. The student who can explain the rule understands the mathematics, and may have a better chance to succeed at a less familiar task such as expanding $(a + b + c)(x + y)$. Mathematical understanding and procedural skill are equally important, and both are assessable using mathematical tasks of sufficient richness.

The Standards set grade-specific standards but do not define the intervention methods or materials necessary to support students who are well below or well above grade-level expectations. It is also beyond the scope of the Standards to define the full range of supports appropriate for English language learners and for students with special needs. At the same time, all students must have the opportunity to learn and meet the same high standards if they are to access the knowledge and skills necessary in their post-school lives. The Standards should be read as allowing for the widest possible range of students to participate fully from the outset, along with appropriate accommodations to ensure maximum participaton of students with special education needs. For example, for students with disabilities reading should allow for use of Braille, screen reader technology, or other assistive devices, while writing should include the use of a scribe, computer, or speech-to-text technology. In a similar vein, speaking and listening should be interpreted broadly to include sign language. No set of grade-specific standards can fully reflect the great variety in abilities, needs, learning rates, and achievement levels of students in any given classroom. However, the Standards do provide clear signposts along the way to the goal of college and career readiness for all students.

K	1	2	3	4	5	6	7	8	HS
Counting & Cardinality									
Number & Operations Base Ten						Ratios & Proportional Relationships			Number & Quantity
			Number & Operations Fractions			The Number System			
Operations & Algebraic Thinking						Expressions & Equations			Algebra
								Functions	Functions
Geometry									Geometry
Measurement & Data						Statistics & Probability			Statistics & Probability

Findell & Foughty (2011)

College and Career-Readiness through the Common Core State Standards for Mathematics

MATHEMATICS STANDARDS

GRADE 8 - OVERVIEW

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 vs. 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.

MATHEMATICS STANDARDS

MATHEMATICS - GRADE 8

The California State Board of Education acknowledges that the goal for 8th grade students is Algebra I. However, they also recognize that not all 8th grade students have the necessary prerequisite skills for Algebra I. Consequently, the State Board of Education adopted two sets of standards for 8th grade. The first set describes standards for Algebra I. The second set of standards is from the 8th grade Common Core document published June 2, 2010. These standards are for 8th grade students who do not have the necessary prerequisite skills for Algebra I. The goal of the 8th grade Common Core is to finalize the mathematics preparation for students in high school. There is some duplication of standards between grades and courses that will be resolved in the frameworks/instructional materials development process.

ALGEBRA 1

NUMBER & QUANTITY

THE REAL NUMBER SYSTEM

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 $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5. (Common Core Standard N-RN-1)

2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. (Common Core Standard N-RN-2)

USE PROPERTIES OF RATIONAL AND IRRATIONAL NUMBERS.

3. Understand informally that 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. (Common Core Standard N-RN-3)

QUANTITIES

QUANTITIES

4. Define appropriate quantities for the purpose of descriptive modeling. (Common Core Standard NQ-2)

ALGEBRA 1

ALGEBRA

EXPRESSIONS & EQUATIONS

WORK WITH RADICALS AND EXPONENTS.

1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$. (Common Core Standard 8EE-1)

2. 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. (Common Core Standard N-RN-2)

UNDERSTAND THE CONNECTIONS BETWEEN PROPORTIONAL RELATIONSHIPS, LINES, AND LINEAR EQUATIONS.

3. 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. (Common Core Standard N-RN-3)

4. 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. (Common Core Standard 8EE-6)

ANALYZE AND SOLVE LINEAR EQUATIONS AND PAIRS OF SIMULTANEOUS LINEAR EQUATIONS.

5. Solve linear equations in one variable. (Common Core Standard 8EE-7)
    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). (Common Core Standard 8EE-7a)
    b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. (Common Core Standard 8EE-7b)

6. Analyze and solve pairs of simultaneous linear equations. (Common Core Standard 8EE-8)
    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 Updated 10/18/10 37 satisfy both equations simultaneously. (Common Core Standard 8EE-8a)
    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. (Common Core Standard 8EE-8b)
    c. Solve real-world and mathematical problems leading to two 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.(Common Core Standard 8EE-8c)

ALGEBRA 1

SEEING STRUCTURE IN EXPRESSIONS

INTERPRET THE STRUCTURE OF EXPRESSIONS

7. Interpret expressions that represent a quantity in terms of its context.* (Common Core Standard A-SSE-1)
   a. Interpret parts of an expression, such as terms, factors, and coefficients. (Common Core Standard A-SSE-1a)
   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. (Common Core Standard A-SSE-1b)

8. Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. (Common Core Standard A-SSE-2)

WRITE EXPRESSIONS IN EQUIVALENT FORMS TO SOLVE PROBLEMS

9. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*(Common Core Standard A-SSE-3)
   a. Factor a quadratic expression to reveal the zeros of the function it defines. (Common Core Standard A-SSE-3a)
   b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. (Common Core Standard A-SSE-3b)

ARITHMETIC WITH POLYNOMIALS & RATIONAL EXPRESSIONS

PERFORM ARITHMETIC OPERATIONS ON POLYNOMIALS

10. 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, and divide polynomials by monomials. Solve problems in and out of context. (Common Core Standard A-APR-1)

CREATING EQUATIONS

PERFORM ARITHMETIC OPERATIONS ON POLYNOMIALS

11. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.

12. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales (limit to linear and quadratic). (Common Core Standard A-CED-2)

ALGEBRA 1

CREATING EQUATIONS

13. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. (Common Core Standard A-CED-3)

14. 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. (Common Core Standard A-CED-4)

REASONING WITH EQUATIONS & INEQUALITIES

SOLVE EQUATIONS AND INEQUALITIES IN ONE VARIABLE

15. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. (Common Core Standard A-REI-3)

16. Solve quadratic equations in one variable. (Common Core Standard A-REI-4)
    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. (Common Core Standard A-REI-4a) 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 $a \pm bi$ for real numbers a and b. (Common Core Standard A-REI-4b)

SOLVE SYSTEMS OF EQUATIONS

17. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. (Common Core Standard A-REI-6)

REPRESENT AND SOLVE EQUATIONS AND INEQUALITIES GRAPHICALLY

18. 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). (Common Core Standard AREI-10)

19. 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. (Common Core Standard AREI-12)

ALGEBRA 1

FUNCTIONS

FUNCTIONS

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.[1] (Common Core Standard 8F-1)

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. (Common Core Standard8F-2)

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 $A = s^2$ 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. (Common Core Standard 8F-3)

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. (Common Core Standard 8F-4)

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. (Common CoreStandard 8F-5)

INTERPRETING FUNCTIONS

INTERPRET FUNCTIONS THAT ARISE IN APPLICATIONS IN TERMS OF THE CONTEXT

6. 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 aUpdated 10/18/10 39 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.* (Common Core Standard F-IF-4)

7. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) 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.* (Common Core Standard F-IF-5)

ALGEBRA 1

8. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* (Common Core Standard F-IF-7)
    a. Graph linear and quadratic functions and show intercepts, maxima, and minima. (Common Core Standard F-IF-7a)

9. different properties of the function. (Common Core Standard F-IF-8) 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. (Common Core Standard F-IF-8a)

BUILDING FUNCTIONS

BUILD A FUNCTION THAT MODELS A RELATIONSHIP BETWEEN TWO QUANTITIES

10. Write a function that describes a relationship between two quantities.*(Common Core Standard F-BF-1)
    a. Determine an explicit expression, a recursive process, or steps for calculation from a context. (Common Core Standard F-BF-1a)

BUILD NEW FUNCTIONS FROM EXISTING FUNCTIONS

11. Identify the effect on the graph of replacing f(x) by f(x) + k, k f(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 withcases 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. (Common Core Standard F-BF-3)

LINEAR, QUADRATIC, & EXPONENTIAL MODELS

INTERPRET EXPRESSIONS FOR FUNCTIONS IN TERMS OF THE SITUATION THEY MODEL

12. Interpret the parameters in a linear or exponential function in terms of a context. (Common Core Standard F-LE-5)

13. Apply quadratic equations to physical problems, such as the motion of an object under the force of gravity. (CA Standard A-23)

GEOMETRY

GEOMETRY

UNDERSTAND CONGRUENCE AND SIMILARITY USING PHYSICAL MODELS, TRANSPARENCIES, OR GEOMETRY SOFTWARE.

1. Verify experimentally the properties of rotations, reflections, and translations: (Common Core Standard 8G-1)
   a. Lines are taken to lines, and line segments to line segments of the same length. (Common Core Standard 8G-1a)
   b. Angles are taken to angles of the same measure. (Common Core Standard 8G-1b)
   c. Parallel lines are taken to parallel lines. (Common Core Standard 8G-1c)

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. (Common Core Standard 8G-2)

3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. (Common Core Standard 8G-3)

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 twoUpdated 10/18/10 40 dimensional figures, describe a sequence that exhibits the similarity between them. (Common Core Standard 8G-4)

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. (Common Core Standard 8G-5)

UNDERSTAND AND APPLY THE PYTHAGOREAN THEOREM.

6. Explain a proof of the Pythagorean Theorem and its converse. (Common Core Standard 8G-6)

7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (Common Core Standard 8G-7)

8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. (Common Core Standard 8G-8)

EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS

USE COORDINATES TO PROVE SIMPLE GEOMETRIC THEOREMS ALGEBRAICALLY

9. 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). (Common Core Standard G-GPE-5)

ALGEBRA 1

STATISTICS & PROBABILITY

STATISTICS & PROBABILITY

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 ornegative association, linear association, and nonlinear association. (Common Core Standard 8SP-1)

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. (Common Core Standard 8SP-2)

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. (Common Core Standard 8SP-3)

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 twoway 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? (Common Core Standard 8SP-4)

CONSTRUCTING VIABLE ARGUMENTS

CONSTRUCTING VIABLE ARGUMENTS

1. Use and know simple aspects of a logical argument. (California Algebra I, Standard 24.0)
   a. Use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion. (California Algebra I, Standard 24.3)

2. Use properties of the number system to judge the validity of results, to justify each step of a procedure, and to prove or disprove statements: (California Algebra I, Standard 25.0)
   a. Use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate counterexamples to, claimed assertions. (California Algebra I, Standard25.1)
   b. Judge the validity of an argument according to whether the properties of the real number system and the order of operations have been applied correctly at each step. (California Algebra I, Standard 25.2)
   c. Given a specific algebraic statement involving linear, quadratic, or absolute value expressions or equations or inequalities, determine whether the statement is true sometimes, always, or never. (California Algebra I, Standard 25.3)

MATHEMATICS STANDARDS

MATHEMATICS - GRADE 8

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THE NUMBER SYSTEM

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 $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

MATHEMATICS STANDARDS

EXPRESSIONS & EQUATIONS

WORK WITH RADICALS AND INTEGER EXPONENTS.

1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.

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 $\sqrt{2}$ 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 3×10^8 and the population of the world as 7×10^9, 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 distancetime 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 nonvertical 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 two 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.

MATHEMATICS STANDARDS

FUNCTIONS

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.[1]

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 $A = s^2$ 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.

MATHEMATICS STANDARDS

GEOMETRY

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.

MATHEMATICS STANDARDS

STATISTICS & PROBABLITY

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. Forscatter 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?

[1]Function notation is not required in Grade 8.