2014

Ohio Aspire ABE/ASE Standards

Aspire
LEARN MORE. EARN MORE.

Prepared by

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The Chancellor of the
Ohio Department of Higher Education

Ohio Aspire ABE/ASE Standards for
English Language Arts and Literacy and Mathematics

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Adopted from
The College and Career Readiness Standards for Adult Education
(U.S. Department of Education, 2013)

Contents

Introduction

In 2014, the Ohio Department of Higher Education's Aspire program adopted the College and Career Readiness (CCR) Standards for Adult Education (U.S. Department of Education, 2013). Following adoption, the process began by adapting the CCR standards for use in Ohio's Aspire programs. The purpose of this document is to introduce the Ohio Department of Higher Education Adult Basic Education (ABE) and Adult Secondary Education (ASE) standards as well as explain the standards within the context of the CCR standards developed at the national level. Starting July 1, 2014, Ohio Aspire programs are expected to begin implementing the ABE/ASE English Language Arts and Literacy (ELA/Literacy) and Mathematics standards.

What are the College and Career Readiness Standards?

To identify a set of CCR standards for adult education, the Office of Career, Technical, and Adult Education (OCTAE) convened two review panels with a wide cross-section of experience and expertise – one each for ELA/Literacy and Mathematics – to look at the Common Core State Standards (CCSS) from the viewpoint of adult education. The goal for these subject matter experts was to decide upon an accepted set of essential college and career readiness standards.

While the selected set of standards reflects the broad goals stated above, they should be recognized for what they *are not* as well as what they are. The CCR standards **are not**:

- an order in which topics are to be taught or a hierarchy of importance.
- directions about how instructors should teach, but define what all students should be expected to know and be able to do to be prepared for postsecondary success.
- a full spectrum of support and interventions for students.
- a curriculum, but allow programs to choose a curricula that aligns with the content and expectations.
- a national or federal set of mandates, but rather provide a framework to strengthen adult education programs around college and career readiness.
- an exhaustive list of what can be taught beyond the fundamentals specified; students depend on a variety of readiness skills and preparation, including habits of mind such as stamina, persistence, punctuality, and time and personal management skills.

However, the CCR standards **are** a model set of evidence-based college and career readiness standards for use by state and local adult education programs (U.S. Department of Education, 2013), available under the publications for 2013 at lincs.ed.gov/publications.

What is the value of the CCR standards?

The integration of CCR standards into adult education programs is intended to provide all adult students with the opportunity to be prepared for postsecondary training without needing remediation. To that end, the CCR standards provide a framework that can be used to strengthen and guide programs in preparing for college and careers (U.S. Department of Education, 2013). The following are benefits of the CCR standards for students, instructors, and programs.

For Students

These standards present a starting point for raising awareness and understanding of the critical skills and knowledge expected and required for success in postsecondary education/training and employment in the 21st century.

For Instructors

Clear standards allow educators to focus their efforts and shape overall instruction. Standards are translated into curriculum and lessons for teaching content to students; while providing the foundation for assessments that help determine whether students are learning the essential skills and knowledge included in the standards. Alignment is desirable for standards, instruction, and assessment.

For Programs

Adoption of the CCR standards brings Ohio one-step closer to alignment and consistency between education systems. Partnerships between Aspire and the kindergarten through 12th grade system will allow us to combine resources to create common tools and materials for assessment, instruction, and professional development opportunities.

What is the numbering system for the Ohio Department of Higher Education ABE/ASE standards?

To understand the revised ELA/Literacy and Mathematics standards it is important to be aware of the numbering system of the standards. The numbering of the standards is a modification of the CCR standards to reflect better Ohio's previous ABE/ASE standards and to follow the National Reporting System (NRS) Educational Functioning Levels (EFLs). Additional information about the number system and related standards structure is presented in the ELA/Literacy and Mathematics sections later in this document.

Content – broad areas of knowledge

The content areas for ELA/Literacy are:
- Reading (R)
- Writing (W)
- Speaking and Listening (S)
- Language (L)

The content areas for Mathematics are:
- Numbers (N)
- Algebra (A)
- Geometry (G)
- Data (D)

EFL – the NRS Educational Functioning Level

There are six NRS EFLs for ABE/ASE.
- Level 1 = Beginning Adult Basic Education Literacy
- Level 2 = Beginning Adult Basic Education
- Level 3 = Low Intermediate Adult Basic Education
- Level 4 = High Intermediate Adult Basic Education
- Level 5 = Low Adult Secondary Education
- Level 6 = High Adult Secondary Education

Benchmarks – describe expected performance at the exit points for each NRS EFL

Each benchmark has a unique identifier.
- The letter indicates the content area. (See the letters in parentheses, above.)
- The first number indicates the educational functioning level.
- The second number indicates the benchmark number.

Here is an example.

Numbers (N)

Numbers and Operations

Understand the place value system.

N.3.1. Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. (5.NBT.1)

N.3.2. Read and write...

> **Content (Numbers)** — **EFL (Level 3)** — **Benchmark Number**
> N.3.2

a. Read and write ... names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + ... (1/100) + 2 × (1/1000). (5.NBT.3a)

b. Compare two decimals to thousand... based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. (5.NBT.3b)

N.3.3. Explain patterns in the number of zeroes of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5.NBT.2)

N.3.4. Use place value understanding to round decimals to any place. (5.NBT.4)

Ohio Department of Higher Education ABE/ASE Standards for English Language Arts and Literacy

What are the key instructional shifts identified in the ELA/Literacy standards?

ELA/Literacy Shifts	
Complexity:	Practicing with complex text and its academic language
Evidence:	Reading, writing, and speaking grounded in evidence from text, both literary and informational
Knowledge:	Building knowledge through content-rich nonfiction

Three key shifts, validated through the standards development process, identify the most significant elements of the standards for ELA/Literacy in history/social studies, science, and technical subjects. At the heart of these shifts is a focus in literacy instruction on the careful examination of the text itself. The shifts outlined below revolve around the texts that students read and the kinds of questions students should address as they write and speak about them. The standards sharpen the focus on the close connection between comprehension of text and acquisition of knowledge (U.S. Department of Education, 2013).

Shift 1 – Complexity: *Practicing with complex text and its academic language*

Underlying the standards is research indicating that the complexity of text that students are able to read is the greatest predictor of success in college and careers (ACT, Inc., 2006). Other research shows that the current gap in complexity between secondary texts and college/career texts is roughly four grade levels (Williamson, 2006). Therefore, the first key shift required by the standards is exposing students to appropriately complex texts in both instruction and assessment. Rather than focusing solely on how students read, the focus also is on the complexity of texts read by students. Closely related to text complexity and inextricably related to reading comprehension, is a focus on frequently encountered academic vocabulary – language common to complex texts across the disciplines of literature, science, history, and the arts (U.S. Department of Education, 2013).

Shift 2 – Evidence: Reading, writing, and speaking grounded in evidence from text, both literary and informational

The second key shift required by the standards is the prioritization of textual evidence across the domains of reading, writing, and speaking and listening – a decision based on national assessment data and input from college faculty indicating that command of evidence is a key college and career readiness skill. For reading, the focus is on students' ability to cite evidence from texts to present careful analyses, well-defended claims, and clear information. For writing, the focus is on analyzing sources and conducting research. For speaking and listening, the focus is on purposeful academic talk, in which students contribute accurate, relevant information about a multitude of ideas they have studied or researched in various domains. The standards require students to answer questions based on their understanding of having read a text, or multiple texts, not entirely relying on prior knowledge or experience (U.S. Department of Education, 2013).

Shift 3 – Knowledge: Building knowledge through content-rich nonfiction

The third key shift is a focus not only on English Language Arts, but also on literacy across the disciplines of science, social studies, and technical subjects. Informational text makes up the vast majority of required reading in college and the workplace. Through an extended focus on literacy in the domains of science, history, and technical subject areas, students can build the knowledge that will prepare them for college and careers. Given that literacy across the disciplines is one of the goals of adult education, the standards place special emphasis on standards for the comprehension of informational text (U.S. Department of Education, 2013).

What are the key features of the ELA/Literacy standards?

The standards contain the range of learning addressed in the Aspire classroom found in the ELA/Literacy content areas of Reading, Writing, Speaking and Listening, and Language. The standards have been aligned to the NRS EFLs of one through six to reflect most closely the levels of learning: Beginning ABE Literacy, Beginning ABE, Low Intermediate ABE, High Intermediate ABE, Low ASE, and High ASE. The foundational skills of **Phonological Awareness**, **Phonics and Word Recognition**, and **Fluency** have been added to the beginning of the reading standards.

The standards define requirements not only for ELA but also for Literacy in history/social studies, science, and technical subjects. The rationale for this interdisciplinary approach is based on extensive research establishing the need for students to be proficient in reading complex informational text independently in a variety of content areas. This also prepares students for the required reading in college and workforce training programs, which is informational in structure and challenging in content.

To be ready for college, workforce training, and life in a technological society, students need the ability to gather, comprehend, evaluate, and synthesize information and ideas; to conduct original research in order to answer questions and solve problems; and to analyze and create an extensive range of print and non-print texts in media forms – old and new. The need to conduct research as well as produce and consume media is embedded into every aspect of today's curriculum. In like fashion, research and media skills are embedded throughout the standards, rather than treated in separate sections.

The standards in the Reading content area place equal emphasis on text complexity and the growth of comprehension. The standard **Read complex text independently and proficiently** defines a staircase of increasing text complexity throughout the levels. Whatever students are reading – literary or informational text – they also must show a steadily growing ability to make full use of text, including making an increasing number of connections among ideas and between texts, considering a wider range of textual evidence, and becoming more sensitive to inconsistencies, ambiguities, and poor reasoning in texts. The associated quantitative measures of text complexity to EFLs are presented on page 11.

How are the ELA/Literacy standards structured?

The **subject** area of English Language Arts and Literacy focuses on the **content** areas of Reading (R), Writing (W), Speaking and Listening (S), and Language (L). One of these letters is also the first identifier in the Ohio Department of Higher Education ABE/ASE standards numbering system. To offer additional specificity, **categories** have been identified to define further the skills and understandings all students must demonstrate.

Each content area contains a set of anchor standards, which are identical across all levels of learning. These **standard statements** provide focus and coherence as the same statements are used for both literary and information texts, including social studies, science, and technical subjects.

The EFL as described by the NRS becomes the second identifier in the progression, while the third identifier is assigned to each discrete benchmark in a progression of numbers throughout the level. Each **benchmark** defines what students should know and be able to do by the end of each level. Below is an example of the Ohio Department of Higher Education ABE/ASE standards structure for ELA/Literacy.

ELA/Literacy benchmarks:
- incrementally increase in difficulty and complexity across the Educational Functioning Levels.   - assume that the student knows and can demonstrate benchmarks presented in previous levels.   - represent the essential (not exhaustive) concepts that students should know and be able to perform independently.   - are written as exit-level statements, meaning that students should be able to demonstrate their mastery of the benchmarks by the end of the level.   - include example lists. These are not the only instances or possible examples of the concepts. A student may master a benchmark without demonstrating the specific examples listed. Likewise, teachers and students may determine a number of additional examples of the benchmark.

Below is an example of the Ohio Department of Higher Education ABE/ASE standards structure.

Subject:	**English Language Arts and Literacy**
EFL:	**Level 4 (4)**
Content:	**Reading (R)**
Category:	**Key Ideas and Details**
Standard Statement:	**Cite evidence.**
Benchmark:	**R.4.1.** Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. (RI/RL.7.1)

How do the ELA/Literacy standards build on the CCSS?

The citation at the end of each benchmark identifies the **CCSS** strand, grade, and standard number (number and letter, where applicable). For example, *RI.4.3* stands for Reading Informational Text fourth grade standard 3. The following are the identifiers for the CCSS standards (NGA, 2010a).

RF:	Reading Foundations
RI:	Reading Informational Text
RL:	Reading Literature
RH:	Reading Historical/Social Studies Text
RST:	Reading Scientific and Technical Text
W:	Writing
WHST:	Writing for History/Social Studies, Scientific, and Technical Subjects
SL:	Speaking and Listening
L:	Language

Where two reading standards are identical in wording, with one relating to literature and the other to informational text, both standard numbers were cited together, but the text of the standard was included just once.

The CCSS identification numbers remain in parenthesis at the end of each benchmark statement to aid instructors in finding Common Core resources already developed by partner organizations.

R.4.1. Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. (RI/RL.7.1)
   a. Cite specific textual evidence to support analysis of primary and secondary sources. (RH.6-8.1)
   b. Cite specific textual evidence to support analysis of science and technical texts. (RST.6-8.1)

Often, a science (RST) or history (RH) reading standard was selected to serve as a specific application of an ELA standard.

All Levels

Text Complexity

Read complex text independently and proficiently.

Apply the associated quantitative measures of text complexity to literal and informational texts.

Associated Quantitative Measures of Text Complexity

EFL Level	ATOS®	Degrees of Reading Power®	Flesch-Kincaid	The Lexile Framework®	Reading Maturity Metric®	SourceRater®
Level 1	< 2.75	< 42	< 1.98	< 420	< 3.53	< 0.05
Level 2	2.75 – 5.14	42 – 54	1.98 – 5.34	420 – 820	3.53 – 6.13	0.05 – 2.48
Level 3	4.97 – 7.03	52 – 60	4.51 – 7.73	740 – 1010	5.42 – 7.92	0.84 – 5.75
Level 4	7.00 – 9.98	57 – 67	6.51 – 10.34	925 – 1185	7.04 – 9.57	4.11 – 10.66
Level 5	9.67 – 12.01	62 – 72	8.32 – 12.12	1050 – 1335	8.41 – 10.81	9.02 – 13.93
Level 6	11.20 – 14.10	67 – 74	10.34 – 14.2	1185 – 1385	9.57 – 12.00	12.30 – 14.50

NOTE: The measures of text complexity for Level 1 are estimates, as ranges prior to second grade were not identified by the CCSS.

Level 1

Reading (R)

Foundational Skills

Demonstrate understanding of phonological awareness.

R.1.1. Demonstrate understanding of spoken words, syllables, and sounds (phonemes).
  a. Recognize and produce rhyming words.
  b. Distinguish long from short vowel sounds in spoken single-syllable words.
  c. Count, pronounce, blend, and segment syllables in spoken words.
  d. Blend and segment onsets and rimes of single-syllable spoken words.
  e. Orally produce single-syllable words by blending sounds (phonemes), including consonant blends.
  f. Segment spoken single-syllable words into their complete sequence of individual sounds (phonemes).
  g. Isolate and pronounce initial, medial vowel, and final sounds (phonemes) in spoken single-syllable words.
  h. Add or substitute individual sounds (phonemes) in simple, one-syllable words to make new words. (RF.K.2 and 1.2 merge)

Apply phonics and word recognition.

R.1.2. Know and apply grade-level phonics and word analysis skills in decoding words.
  a. Demonstrate basic knowledge of one-to-one letter-sound correspondences by producing the primary sound or many of the most frequent sounds for each consonant.
  b. Associate the long and short sounds with common spellings (graphemes) for the five major vowels.
  c. Know the spelling-sound correspondences for common consonant digraphs.
  d. Decode regularly spelled one-syllable words.
  e. Distinguish between similarly spelled words by identifying the sounds of the letters that differ.
  f. Know final -e and common vowel team conventions for representing long vowel sounds.
  g. Use knowledge that every syllable must have a vowel sound to determine the number of syllables in a printed word.
  h. Decode two-syllable words following basic patterns by breaking the words into syllables.
  i. Read words with inflectional endings.
  j. Read common high-frequency words by sight (e.g., *the*, *of*, *to*, *you*, *she*, *my*, *is*, *are*, *do*, *does*).
  k. Recognize and read grade-appropriate irregularly spelled words. (RF.K.3 and 1.3 merge)

Read with accuracy and fluency.

R.1.3. Read with sufficient accuracy and fluency to support comprehension.
  a. Read grade-level text with purpose and understanding.
  b. Read grade-level text orally with accuracy, appropriate rate, and expression on successive readings.

c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary. (RF.K.4 and 1.4 merge)

Key Ideas and Details

Cite evidence.

R.1.4. Ask and answer questions about key details in a text. (RI/RL.1.1)

Determine central ideas.

R.1.5. Identify the main topic and retell key details of a text. (RI.1.2)

Analyze interactions within text.

R.1.6. Describe the connection between two individuals, events, ideas, or pieces of information in a text. (RI.1.3)

Craft and Structure

Interpret vocabulary.

R.1.7. Ask and answer questions to help determine or clarify the meaning of words and phrases in a text. (RI.1.4)

Analyze text structure.

R.1.8. Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text. (RI.1.5)

Integration of Knowledge and Ideas

Integrate and evaluate multimedia.

R.1.9. Use the illustrations and details in a text to describe its key ideas (e.g., maps, charts, photographs, political cartoons, etc.). (RI.1.7)

Evaluate the argument.

R.1.10. Identify the reasons an author gives to support points in a text. (RI.1.8)

Analyze multiple texts.

R.1.11. Identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures). (RI.1.9)

Writing (W)

Text Types and Purposes

Write to explain or inform.

W.1.1. Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. (W.1.2)

Write narratives.

W.1.2. Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure. (W.1.3)

Production and Distribution of Writing

Plan, revise, and rewrite writing.

W.1.3. With guidance and support focus on a topic, respond to questions and suggestions from peers, and add details to strengthen writing as needed. (W.1.5)

Use technology.

W.1.4. With guidance and support, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (W.1.6)

Research to Build and Present Knowledge

Write short research projects.

W.1.5. Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (W.1.7)

Use multiple sources.

W.1.6. With guidance and support, recall information from experiences or gather information from provided sources to answer a question. (W.1.8)

Speaking and Listening (S)

Comprehension and Collaboration

Prepare for participation in a range of conversations.

S.1.1. Participate in collaborative conversations with diverse partners in small and larger groups.
   a. Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).
   b. Build on others' talk in conversations by responding to the comments of others through multiple exchanges.
   c. Ask questions to clear up any confusion about the topics and texts under discussion. (SL.1.1)

Integrate and evaluate information presented in diverse media and formats.

S.1.2. Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood. (SL.K.2)

Evaluate the speaker's point of view.

S.1.3. Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (SL.K.3)

Presentation of Knowledge and Ideas

Present information clearly, and know your audience.

S.1.4. Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly. (SL.1.4)

Adapt speech to context.

S.1.5. Speak audibly and express thoughts, feelings, and ideas clearly. (SL.K.6)

S.1.6. Produce complete sentences when appropriate to task and situation. (SL.1.6)
(See benchmark L.1.1.)

Language (L)

Conventions of Standard English

Demonstrate command of grammar and usage.

L.1.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
   a. Print all upper- and lowercase letters.
   b. Use common, proper, and possessive nouns.
   c. Use singular and plural nouns with matching verbs in basic sentences (e.g., *He hops*; *We hop*).
   d. Use personal, possessive, and indefinite pronouns (e.g., *I*, *me*, *my*; *they*, *them*, *their*; *anyone*, *everything*).
   e. Use verbs to convey a sense of past, present, and future (e.g., *Yesterday I walked home*; *Today I walk home*; *Tomorrow I will walk home*).
   f. Use frequently occurring adjectives.
   g. Use frequently occurring nouns and verbs.
   h. Use frequently occurring conjunctions (e.g., *and*, *but*, *or*, *so*, *because*).
   i. Use determiners (e.g., articles, demonstratives).
   j. Use frequently occurring prepositions (e.g., *during*, *beyond*, *toward*).
   k. Understand and use question words (interrogatives) (e.g., *who*, *what*, *where*, *when*, *why*, *how*).
   l. Produce and expand complete simple and compound declarative, interrogative, imperative, and exclamatory sentences in response to prompts. (L.K.1 and 1.1 merge)

Demonstrate command of punctuation and spelling.

L.1.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
   a. Capitalize the first word in a sentence and the pronoun *I*.
   b. Capitalize dates and names of people.
   c. Recognize and name end punctuation.
   d. Use end punctuation for sentences.
   e. Use commas in dates and to separate single words in a series.
   f. Write a letter or letters for most consonant and short-vowel sounds (phonemes).
   g. Spell simple words phonetically, drawing on knowledge of sound-letter relationships.
   h. Use conventional spelling for words with common spelling patterns and for frequently occurring irregular words.
   i. Spell untaught words phonetically, drawing on phonemic awareness and spelling conventions.

Vocabulary Acquisition and Use

Use context clues.

L.1.3. Determine or clarify the meaning of unknown and multiple-meaning words and phrases, choosing flexibly from an array of strategies.
   a. Use sentence-level context as a clue to the meaning of a word or phrase.
   b. Use frequently occurring affixes as a clue to the meaning of a word.
   c. Identify frequently occurring root words (e.g., *look*) and their inflectional forms (e.g., *looks*, *looked*, *looking*). (L.1.4)

Use figurative language.

L.1.4. With guidance and support, demonstrate understanding of word relationships and nuances in word meanings.
   a. Sort words into categories (e.g., colors, clothing) to gain a sense of the concepts the categories represent.
   b. Define words by category and by one or more key attributes (e.g., a *duck* is a bird that swims; a *tiger* is a large cat with stripes).
   c. Identify real-life connections between words and their use (e.g., note places at home that are *cozy*).
   d. Distinguish shades of meaning among verbs differing in manner (e.g., *look*, *peek*, *glance*, *stare*, *glare*, *scowl*) and adjectives differing in intensity (e.g., *large*, *gigantic*) by defining or choosing them or by acting out the meanings. (L.1.5)

Use academic language.

L.1.5. Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using frequently occurring conjunctions to signal simple relationships (e.g., *because*). (L.1.6)

Level 2

Reading (R)

Foundational Skills

Apply phonics and word recognition.

R.2.1. Know and apply grade-level phonics and word analysis skills in decoding words.
   a. Distinguish long and short vowels when reading regularly spelled one-syllable words.
   b. Know spelling-sound correspondences for additional common vowel teams.
   c. Identify and know the meaning of the most common prefixes and derivational suffixes.
   d. Identify words with inconsistent but common spelling-sound correspondences.
   e. Identify words with inconsistent but common spelling-sound correspondences.
   f. Decode words with common Latin suffixes.
   g. Decode multisyllable words.
   h. Recognize and read grade-appropriate irregularly spelled words. (RF.2.3 and 3.3 merge)

Read with accuracy and fluency.

R.2.2. Read with sufficient accuracy and fluency to support comprehension.
   a. Read grade-level text with purpose and understanding.
   b. Read grade-level prose and poetry orally with accuracy, appropriate rate, and expression on successive readings.
   c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary. (RF.2.4 and 3.4 merge)

Key Ideas and Details

Cite evidence.

R.2.3. Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text. (RI/RL.2.1)

Determine central ideas.

R.2.4. Determine the main idea of a text; recount the key details and explain how they support the main idea. (RI.3.2)

Analyze interactions within text.

R.2.5. Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (RI.3.3)

Craft and Structure

Interpret vocabulary.

R.2.6. Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a topic or subject area. (RI.3.4)

Analyze text structure.

R.2.7. Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently. (RI.2.5)

R.2.8. Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently. (RI.3.5)

Assess purpose and point of view.

R.2.9. Identify the main purpose of a text, including what the author wants to answer, explain, or describe. (RI.2.6)

R.2.10. Distinguish their own point of view from that of the author of a text. (RI.3.6)

Integration of Knowledge and Ideas

Integrate and evaluate multimedia.

R.2.11. Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (RI.3.7)

R.2.12. Explain how specific aspects of a text's illustrations contribute to what is conveyed by the words in a story (e.g., create mood, emphasize aspects of a character or setting). (RL.3.7)

Evaluate the argument.

R.2.13. Describe how reasons support specific points the author makes in a text. (RI.2.8)

Analyze multiple texts.

R.2.14. Compare and contrast the most important points and key details presented in two texts on the same topic. (RI.3.9)

Writing (W)

Text Types and Purposes

Write arguments.

W.2.1. Write opinion pieces on topics or texts, supporting a point of view with reasons.
   a. Introduce the topic or text they are writing about, state an opinion, and create an organizational structure that lists reasons.
   b. Provide reasons that support the opinion.
   c. Use linking words and phrases (e.g., *because, therefore*, *since*, *for example*) to connect opinion and reasons.
   d. Provide a concluding statement or section. (W.3.1)

Write to explain or inform.

W.2.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
   a. Introduce a topic and group related information together; include illustrations when useful to aiding comprehension.
   b. Develop the topic with facts, definitions, and details.
   c. Use linking words and phrases (e.g., *also*, *another*, *and*, *more*, *but*) to connect ideas within categories of information.
   d. Provide a concluding statement or section. (W.3.2)

Write narratives.

W.2.3. Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure. (W.2.3)

Production and Distribution of Writing

Write with coherence.

W.2.4. Produce writing in which the development and organization are appropriate to task and purpose. (W.3.4)

Plan, revise, and rewrite writing.

W.2.5. With guidance and support from peers and others, develop and strengthen writing as needed by planning, revising, and editing. (W.3.5) *(Editing for conventions should demonstrate command of benchmarks L.2.1., L.2.2., and L.2.3.)*

Use technology.

W.2.6. With guidance and support, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others. (W.3.6)

Research to Build and Present Knowledge

Write short research projects.

W.2.7. Conduct short research projects that build knowledge about a topic. (W.3.7)

Use multiple sources.

W.2.8. Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (W.3.8)

Speaking and Listening (S)

Comprehension and Collaboration

Prepare for participation in a range of conversations.

S.2.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners, building on others' ideas and expressing their own clearly.8
  a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
  b. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
  c. Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.
  d. Explain their own ideas and understanding in light of the discussion. (SL.3.1)

Integrate and evaluate information presented in diverse media and formats.

S.2.2. Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally. (SL.3.2)

Evaluate the speaker's point of view.

S.2.3. Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. (SL.3.3)

Presentation of Knowledge and Ideas

Present information clearly, and know your audience.

S.2.4. Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (SL.3.4)

Adapt speech to context.

S.2.5. Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification. (SL.3.6) *(See benchmarks L.2.1. and L.2.3.)*

Language (L)

Conventions of Standard English

Demonstrate command of grammar and usage.

L.2.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
   a. Use collective nouns (e.g., *group*).
   b. Explain the function of nouns, pronouns, verbs, adjectives, and adverbs in general and their functions in particular sentences.
   c. Form and use regular and irregular plural nouns.
   d. Use reflexive pronouns (e.g., *myself*, *ourselves*).
   e. Form and use the past tense of frequently occurring irregular verbs (e.g., *sat*, *hid*, *told*).
   f. Use abstract nouns (e.g., *childhood*).
   g. Form and use regular and irregular verbs.
   h. Form and use the simple (e.g., *I walked*; *I walk*; *I will walk*) verb tenses.
   i. Ensure subject-verb and pronoun-antecedent agreement.
   j. Form and use comparative and superlative adjectives and adverbs, and choose between them depending on what is to be modified.
   k. Use coordinating and subordinating conjunctions.
   l. Produce simple, compound, and complex sentences.
   m. Produce, expand, and rearrange complete simple and compound sentences (e.g., *The boy watched the movie*; *The little boy watched the movie*; *The action movie was watched by the little boy*). (L.2.1 and 3.1 merge)

Demonstrate command of punctuation and spelling.

L.2.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
   a. Capitalize holidays, product names, and geographic names.
   b. Capitalize appropriate words in titles.

c. Use commas in greetings and closings of letters.
d. Use commas in addresses.
e. Use commas and quotation marks in dialogue.
f. Use an apostrophe to form contractions and frequently occurring possessives.
g. Form and use possessives.
h. Use conventional spelling for high-frequency and other studied words and for adding suffixes to base words (e.g., *sitting*, *smiled*, *cries*, *happiness*).
i. Generalize learned spelling patterns when writing words (e.g., *cage → badge*; *boy → boil*).
j. Use spelling patterns and generalizations (e.g., word families, position-based spellings, syllable patterns, ending rules, meaningful word parts) in writing words.
k. Consult reference materials, including beginning dictionaries, as needed to check and correct spellings. (L.2.2 and 3.2 merge)

Knowledge of Language

Use knowledge of language.

L.2.3. Use knowledge of language and its conventions when writing, speaking, reading, or listening.
a. Choose words and phrases for effect.
b. Recognize and observe differences between the conventions of spoken and written standard English. (L.3.3)

Vocabulary Acquisition and Use

Use context clues.

L.2.4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases, choosing flexibly from an array of strategies.
a. Use sentence-level context as a clue to the meaning of a word or phrase.
b. Determine the meaning of the new word formed when a known prefix is added to a known word (e.g., *happy*/*unhappy*, *tell*/*retell*).
c. Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., *addition*, *additional*).
d. Use knowledge of the meaning of individual words to predict the meaning of compound words (e.g., *birdhouse*, *lighthouse*, *housefly*; *bookshelf*, *notebook*, *bookmark*).
e. Use glossaries and beginning dictionaries, both print and digital, to determine or clarify the meaning of words and phrases. (L.2.4)

Use figurative language.

L.2.5. Demonstrate understanding of word relationships and nuances in word meanings.
a. Distinguish the literal and non-literal meanings of words and phrases in context (e.g., *take steps*).
b. Identify real-life connections between words and their use (e.g., describe people who are *friendly* or *helpful*).
c. Distinguish shades of meaning among related words that describe states of mind or degrees of certainty (e.g., *knew*, *believed*, *suspected*, *heard*, *wondered*). (L.3.5)

Use academic language.

L.2.6. Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using adjectives and adverbs to describe (e.g., *When other people are happy that makes me happy*). (L.2.6)

L.2.7. Acquire and use accurately level-appropriate conversational, general academic, and domain-specific words and phrases, including those that signal spatial and temporal relationships (e.g., *After dinner that night we went looking for them*). (L.3.6)

Level 3

Reading (R)

Foundational Skills

Apply phonics and word recognition.

R.3.1. Know and apply grade-level phonics and word analysis skills in decoding words.
   a. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context. (RF.4.3 and 5.3 merge)

Read with accuracy and fluency.

R.3.2 Read with sufficient accuracy and fluency to support comprehension.
   a. Read grade-level text with purpose and understanding.
   b. Read grade-level prose and poetry orally with accuracy, appropriate rate, and expression on successive readings.
   c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary. (RF.4.4 and 5.4 merge)

Key Ideas and Details

Cite evidence.

R.3.3. Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (RI/RL.4.1)

R.3.4. Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (RI/RL.5.1)

Determine central ideas.

R.3.5. Determine the main idea of a text and explain how it is supported by key details; summarize the text. (RI.4.2)

R.3.6. Determine a theme of a story, drama, or poem from details in the text; summarize the text. (RL.4.2)

Analyze interactions within text.

R.3.7. Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (RI.4.3)

Craft and Structure

Interpret vocabulary.

R.3.8. Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a topic or subject area. (RI.5.4)

R.3.9. Determine the meaning of words and phrases as they are used in a text, including figurative language such as metaphors and similes. (RL.5.4)

Analyze text structure.

R.3.10. Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text. (RI.4.5)

R.3.11. Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts. (RI.5.5)

Assess purpose and point of view.

R.3.12. Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent. (RI.5.6)

R.3.13. Describe how a narrator's or speaker's point of view influences how events are described. (RL.5.6)

Integration of Knowledge and Ideas

Integrate and evaluate multimedia.

R.3.14. Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (RI.4.7)

R.3.15. Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (RI.5.7)

Evaluate the argument.

R.3.16. Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). (RI.5.8)

Analyze multiple texts.

R.3.17. Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (RI.5.9)

Writing (W)

Text Types and Purposes

Write arguments.

W.3.1. Write opinion pieces on topics or texts, supporting a point of view with reasons and information.
   a. Introduce a topic or text clearly, state an opinion, and create an organizational structure in which ideas are logically grouped to support the writer's purpose.
   b. Provide logically ordered reasons that are supported by facts and details.
   c. Link opinion and reasons using words, phrases, and clauses (e.g., *consequently*, *specifically*).
   d. Provide a concluding statement or section related to the opinion presented. (W.5.1)

Write to explain or inform.

W.3.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

> **a.** Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.
>
> **b.** Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.
>
> **c.** Link ideas within categories of information using words and phrases (e.g., *another*, *for example*, *also*, *because*).
>
> **d.** Use precise language and domain-specific vocabulary to inform about or explain the topic.
>
> **e.** Provide a concluding statement or section related to the information or explanation presented. (W.4.2)

Production and Distribution of Writing

Write with coherence.

W.3.3. Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (W.5.4)

Plan, revise, and rewrite writing.

W.3.4. With guidance and support from peers and others, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (W.5.5)
(Editing for conventions should demonstrate command of benchmarks L.3.1., L.3.2., and L.3.3.)

Use technology.

W.3.5. With some guidance and support, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting. (W.4.6)

Research to Build and Present Knowledge

Write short research projects.

W.3.6. Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (W.5.7)

Use multiple sources.

W.3.7. Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (W.5.8)

Use text evidence.

W.3.8. Draw evidence from literary or informational texts to support analysis, reflection, and research.

> **a.** Apply Reading standards from this level to literature (e.g., "Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text").

b. Apply Reading standards from this level to informational text (e.g., "Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s)"). (W.5.9)

Speaking and Listening (S)

Comprehension and Collaboration

Prepare for participation in a range of conversations.

S.3.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners, building on others' ideas and expressing their own clearly.
   a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
   b. Follow agreed-upon rules for discussions and carry out assigned roles.
   c. Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
   d. Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions. (SL.5.1)

Integrate and evaluate information presented in diverse media and formats.

S.3.2. Paraphrase portions of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally. (SL.4.2)

S.3.3. Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally. (SL.5.2)

Evaluate the speaker's point of view.

S.3.4. Summarize the points a speaker makes and explain how each claim is supported by reasons and evidence. (SL.5.3)

Presentation of Knowledge and Ideas

Present information clearly, and know your audience.

S.3.5. Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace. (SL.5.4)

Use digital media.

S.3.6. Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (SL.5.5)

Adapt speech to context.

S.3.7. Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion); use formal English when appropriate to task and situation. (SL.4.6)
(See benchmarks L.3.1. and L.3.3.)

Language (L)

Conventions of Standard English

Demonstrate command of grammar and usage.

L.3.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

    a. Explain the function of conjunctions, prepositions, and interjections in general and their function in particular sentences.

    b. Use relative pronouns (*who*, *whose*, *whom*, *which*, *that*) and relative adverbs (*where*, *when*, *why*).

    c. Form and use the progressive (e.g., *I was walking*; *I am walking*; *I will be walking*) verb tenses.

    d. Use modal auxiliaries (e.g., *can*, *may*, *must*) to convey various conditions.

    e. Form and use the perfect (e.g., *I had walked*; *I have walked*; *I will have walked*) verb tenses.

    f. Use verb tense to convey various times, sequences, states, and conditions.

    g. Recognize and correct inappropriate shifts in verb tense.

    h. Order adjectives within sentences according to conventional patterns (e.g., *a small red bag* rather than *a red small bag*).

    i. Form and use prepositional phrases.

    j. Use correlative conjunctions (e.g., *either/or*, *neither/nor*).

    k. Produce complete sentences, recognizing and correcting inappropriate fragments and run-ons.

    l. Correctly use frequently confused words (e.g., *to, too, two; there, their*).
    (L.4.1 and 5.1 merge)

Demonstrate command of punctuation and spelling.

L.3.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

    a. Use correct capitalization.

    b. Use commas and quotation marks to mark direct speech and quotations from a text.

    c. Use punctuation to separate items in a series.

    d. Use a comma to separate an introductory element from the rest of the sentence.

    e. Use a comma to set off the words *yes* and *no* (e.g., *Yes, thank you*), to set off a tag question from the rest of the sentence (e.g., *It's true, isn't it?*), and to indicate direct address (e.g., *Is that you, Steve?*).

    f. Use underlining, quotation marks, or italics to indicate titles of works.

    g. Use a comma before a coordinating conjunction in a compound sentence.

    h. Spell grade-appropriate words correctly, consulting references as needed.
    (L.4.2 and 5.2 merge)

Knowledge of Language

Use knowledge of language.

L.3.3. Use knowledge of language and its conventions when writing, speaking, reading, or listening.

    a. Choose words and phrases to convey ideas precisely.

    b. Choose punctuation for effect.

c. Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion).

d. Expand, combine, and reduce sentences for meaning, reader/listener interest, and style.

e. Compare and contrast the varieties of English (e.g., dialects, registers) used in stories, dramas, or poems. (L.4.3 and 5.3 merge)

Vocabulary Acquisition and Use

Use context clues.

L.3.4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases, choosing flexibly from a range of strategies.

a. Use context (e.g., definitions, examples, restatements, cause/effect relationships and comparisons in text) as a clue to the meaning of a word or phrase.

b. Use common, grade-appropriate Greek and Latin affixes and roots as clues to the meaning of a word (e.g., *telegraph, autograph, photograph*, *photosynthesis*).

c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases. (L.4.4 and 5.4 merge)

Use figurative language.

L.3.5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

a. Interpret figurative language, including similes and metaphors, in context.

b. Recognize and explain the meaning of common idioms, adages, and proverbs.

c. Use the relationship between particular words (e.g., synonyms, antonyms, homographs) to better understand each of the words. (L.5.5)

Use academic language.

L.3.6. Acquire and use accurately level-appropriate general academic and domain-specific words and phrases, including those that: signal precise actions, emotions, or states of being (e.g., *quizzed*, *whined*, *stammered*); are basic to a particular topic (e.g., *wildlife*, *conservation*, and *endangered* when discussing animal preservation); or signal contrast, addition, and other logical relationships (e.g., *however*, *although*, *nevertheless*, *similarly*, *moreover*, *in addition*). (L.4.6 and 5.6 merge).

Level 4

Reading (R)

Key Ideas and Details

Cite evidence.

R.4.1. Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. (RI/RL.7.1)
   a. Cite specific textual evidence to support analysis of primary and secondary sources. (RH.6-8.1)
   b. Cite specific textual evidence to support analysis of science and technical texts. (RST.6-8.1)

Determine central ideas.

R.4.2. Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. (RI/RL.6.2)
   a. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (RST.6-8.2)

Analyze interactions within text.

R.4.3. Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories). (RI.8.3)
   a. Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered). (RH.6-8.3)

R.4.4. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (RST.6-8.3)

Craft and Structure

Interpret vocabulary.

R.4.5. 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. (RI/RL.6.4)

Analyze text structure.

R.4.6. Analyze how a particular sentence, paragraph, chapter, or section fits into the overall structure of a text and contributes to the development of the ideas. (RI.6.5)

R.4.7. 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. (RI.7.5)

Assess purpose and point of view.

R.4.8. Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints. (RI.8.6)

R.4.9. Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts). (RH.6-8.6)

Integration of Knowledge and Ideas

Integrate and evaluate multimedia.

R.4.10. Integrate information presented in different media or formats (e.g., in charts, graphs, photographs, videos, or maps) as well as in words to develop a coherent understanding of a topic or issue. (RI.6.7)

R.4.11. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (RST.6-8.7)

Evaluate the argument.

R.4.12. 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. (RI.8.8)

Analyze multiple texts.

R.4.13. 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. (RI.8.9)

Writing (W)

Text Types and Purposes

Write arguments.

W.4.1. Write arguments to support claims with clear reasons and relevant evidence.
   a. Introduce claim(s), acknowledge 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), reasons, and evidence.
   d. Establish and maintain a formal style.
   e. Provide a concluding statement or section that follows from and supports the argument presented. (W.7.1)

Write to explain or inform.

W.4.2. Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. *[This includes the narration of historical events, scientific procedures/experiments, or technical processes.]*
   a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information, 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. (W/WHST.6-8.2)

Production and Distribution of Writing

Write with coherence.

W.4.3 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (W/WHST.6-8.4)

Plan, revise, and rewrite writing.

W.4.4. With some guidance and support from peers and others, 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. (W/WHST.6-8.5) *(Editing for conventions should demonstrate command of benchmarks L.4.1., L.4.2., and L.4.3.)*

Use technology.

W.4.5. 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. (W.7.6)

Research to Build and Present Knowledge

Write short research projects.

W.4.6. Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation. (W.7.7)

Use multiple sources.

W.4.7. 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. (W/WHST.6-8.8)

Use text evidence.

W.4.8. Draw evidence from literary or informational texts to support analysis, reflection, and research.
a. Apply Reading standards from this level to literature (e.g., "Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments").
b. Apply Reading standards from this level to literary nonfiction (e.g., "Analyze how a text makes connections among and distinctions between individuals' ideas or events"). (W/WHST.6-8.9)

Speaking and Listening (S)

Comprehension and Collaboration

Prepare for participation in a range of conversations.

S.4.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners, building on others' ideas and expressing their own clearly.
  a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
  b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
  c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
  d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented. (SL.8.1)

Integrate and evaluate information presented in diverse media and formats.

S.4.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. (SL.8.2)

Evaluate the speaker's point of view.

S.4.3. 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. (SL.8.3)

Presentation of Knowledge and Ideas

Present information clearly, and know your audience.

S.4.4. Present claims and findings, 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. (SL.8.4)

Use digital media.

S.4.5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (SL.8.5)

Adapt speech to context.

S.4.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (SL.8.6)
(See benchmarks L.4.1. and L.4.3. for specific expectations.)

Language (L)

Conventions of Standard English

Demonstrate command of grammar and usage.

L.4.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
   a. Ensure that pronouns are in the proper case (subjective, objective, possessive).
   b. Use intensive pronouns.
   c. Recognize and correct inappropriate shifts in pronoun number and person.
   d. Recognize and correct vague or unclear pronouns.
   e. Recognize variations from standard English in their own and others' writing and speaking, and identify and use strategies to improve expression in conventional language.
   f. Explain the function of verbals (gerunds, participles, infinitives) in general and their function in particular sentences.
   g. Form and use verbs in the active and passive voice.
   h. Form and use verbs in the indicative, imperative, interrogative, conditional, and subjunctive mood.
   i. Recognize and correct inappropriate shifts in verb voice and mood.
   j. Explain the function of phrases and clauses in general and their function in specific sentences.
   k. Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas.
   l. Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers. (L.6.1 through 8.1 merge)

Demonstrate command of punctuation and spelling.

L.4.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
   a. Use punctuation (commas, parentheses, ellipsis, dashes) to set off nonrestrictive/parenthetical elements.
   b. Use a comma to separate coordinate adjectives (e.g., *It was a fascinating, enjoyable movie* but not *He wore an old[,] green shirt*).
   c. Use an ellipsis to indicate an omission.
   d. Spell correctly. (L.6.2 through 8.2 merge)

Knowledge of Language

Use knowledge of language.

L.4.3. Use knowledge of language and its conventions when writing, speaking, reading, or listening.
   a. Vary sentence patterns for meaning, reader/listener interest, and style.
   b. Maintain consistency in style and tone.
   c. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy. (L.6.3 and 7.3 merge)

Vocabulary Acquisition and Use

Use context clues.

L.4.4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases, 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., *audience*, *auditory*, *audible*).
- **c.** Consult 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.
- **d.** Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary). (L.6.4)

Use figurative language.

L.4.5. Acquire and use accurately level-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. (L.8.6)

Reading (R)

Key Ideas and Details

Cite evidence.

R.5.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. (RI/RL.9-10.1)
   a. Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information. (RH.9-10.1)
   b. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (RST.9-10.1)

Determine central ideas.

R.5.2. 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. (RI/RL.9-10.2)

Analyze interactions within text.

R.5.3. Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them. (RH.9-10.3)

R.5.4. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. (RST.9-10.3)

Craft and Structure

Interpret vocabulary.

R.5.5. 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). (RI/RL.9-10.4)
   a. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context. (RST.9-10.4)

Analyze text structure.

R.5.6. 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). (RI.9-10.5)

Assess purpose and point of view.

R.5.7. 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. (RI.9-10.6)
   a. 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. (RL.9-10.6)

R.5.8. Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts. (RH.9-10.6)

Integration of Knowledge and Ideas

Integrate and evaluate multimedia.

R.5.9. Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text. (RH.9-10.7)

R.5.10. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. (RST.9-10.7)

Evaluate the argument.

R.5.11. 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. (RI.9-10.8)

Analyze multiple texts.

R.5.12. 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. (RI.9-10.9)

R.5.13. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. (RST.9-10.9)
   a. Compare and contrast treatments of the same topic in several primary and secondary sources. (RH.9-10.9)

Writing (W)

Text Types and Purposes

Write arguments.

W.5.1. 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 the 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. (W/WHST.9-10.1)

Write to explain or inform.

W.5.2. 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. *[This includes the narration of historical events, scientific procedures/experiments, or technical processes.]*

   a. Introduce a topic and 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). (W/WHST.9-10.2)

Production and Distribution of Writing

Use technology.

W.5.3. 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. (W.9-10.6)

Research to Build and Present Knowledge

Use multiple sources.

W.5.4. 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. (W/WHST.9-10.8)

Speaking and Listening (S)

Comprehension and Collaboration

Prepare for participation in a range of conversations.

S.5.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

   a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

   b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.

   c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

   d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented. (SL.9-10.1)

Presentation of Knowledge and Ideas

Present information clearly, and know your audience.

S.5.2. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. (SL.9-10.4)

Language (L)

Conventions of Standard English

Demonstrate command of grammar and usage.

L.5.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
   a. Use parallel structure.
   b. Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations. (L.9-10.1)

Demonstrate command of punctuation and spelling.

L.5.2. 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. (L.9-10.2)

Level 6

Reading (R)

Key Ideas and Details

Determine central ideas.

R.6.1. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. (RST.11-12.2)

Analyze interactions within text.

R.6.2. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text. (RI.11-12.3)

Craft and Structure

Analyze text structure.

R.6.3. Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging. (RI.11-12.5)

Assess purpose and point of view.

R.6.4. Analyze a case in which grasping point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement). (RL.11-12.6)

Integration of Knowledge and Ideas

Integrate and evaluate multimedia.

R.6.5. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. (RI.11-12.7)

Analyze multiple texts.

R.6.6. Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of Independence, the Preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) for their themes, purposes, and rhetorical features. (RI.11-12.9)

Writing (W)

Production and Distribution of Writing

Write with coherence.

W.6.1. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (W/WHST.11-12.4)

Plan, revise, and rewrite writing.

W.6.2. 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. (W.11-12.5) *(Editing for conventions should demonstrate command of benchmarks L.5.1, L.5.2, and L.4.3.)*

Research to Build and Present Knowledge

Write short research projects.

W.6.3. 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. (W/WHST.11-12.7)

Use text evidence.

W.6.4. Draw evidence from literary or informational texts to support analysis, reflection, and research.
   a. Apply Reading standards from this level to literature (e.g., "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").
   b. Apply Reading standards from this level to literary nonfiction (e.g., "Integrate quantitative or technical analysis with qualitative analysis in print or digital text"). (W/WHST.11-12.9)

Speaking and Listening (S)

Comprehension and Collaboration

Integrate and evaluate information presented in diverse media and formats.

S.6.1. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. (SL.11-12.2)

Evaluate the speaker's point of view.

S.6.2. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. (SL.11-12.3)

Presentation of Knowledge and Ideas

Use digital media.

S.6.3. 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. (SL.11-12.5)

Adapt speech to context.

S.6.4. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (SL.11-12.6)
   (See benchmarks L.5.1. and L.4.3. for specific expectations.)

Language (L)

Vocabulary Acquisition and Use

Use context clues.

L.6.1. Determine or clarify the meaning of unknown and multiple-meaning words and phrases, choosing flexibly from a range of strategies.
  a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.
  b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., conceive, conception, conceivable).
  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, its part of speech, or its etymology or its standard usage.
  d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary). (L.11-12.4)

Use academic language.

L.6.2. 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. (L.11-12.6)

Ohio Department of Higher Education ABE/ASE Standards for Mathematics

What are the key instructional shifts identified in the Mathematics standards?

Mathematics Shifts	
Focus:	Focusing strongly where the standards focus
Coherence:	Designing learning around coherent progressions level to level
Rigor:	Pursuing conceptual understanding, procedural skill and fluency, and application – all with equal intensity

Three key shifts, validated through the standards development process, identify the most significant elements of the standards for Mathematics. At the heart of these shifts is a focus in mathematics instruction on delving deeply into the key processes and ideas upon which mathematical thinking relies. The shifts below, therefore, center on the knowledge and skills students must master to be adept at understanding and applying mathematical ideas (U.S. Department of Education, 2013).

Shift 1 – Focus: *Focusing strongly where the standards focus*

In general, instructors should narrow significantly and deepen the manner in which they teach mathematics. Focusing deeply on the major work of each level will allow students to secure the mathematical foundations, conceptual understanding, procedural skill and fluency, and ability to apply the math they have learned to solve all kinds of problems – inside and outside the classroom. One example is the focus on place value and its connection to operations in the early levels. The emphasis on numeracy in early levels leads to a deeper understanding of the properties of operations at subsequent levels, encouraging fluency in the application of those properties, eventually for all operations with all number systems in a variety of situations (U.S. Department of Education, 2013).

Shift 2 – Coherence: *Designing learning around coherent progressions level to level*

The second key shift required by the standards is to create coherent progressions in the content within and across levels, so that students can build new understanding onto previous foundations. That way, instructors can count on students having conceptual understanding of core content. Instead of each standard signaling a new concept or idea, standards at higher levels become extensions of previous learning. The focus on understanding numbers and their properties through the levels also exemplifies the progression from number to expressions and equations and then to algebraic thinking. This is seen in standards within and across the levels. For example, an emphasis on understanding place value, as indicated above for shift one, progresses to using place value to add and subtract two-digit numbers to fluency in addition and subtraction of whole numbers to 1000 (including a requirement to explain why the strategies for addition and subtraction work). An understanding of both the numbers and their operations grows from the emphasis on place value and follows a progression extending beyond

operations with numbers to include algebraic expressions and equations and ultimately to a deep understanding of functions. These connections can be exemplified further in applications related to other domains within and across the levels, such as the connection between properties of operations (e.g., multiplication) and geometric applications (e.g., area) (U.S. Department of Education, 2013).

Shift 3 – Rigor: *Pursuing conceptual understanding, procedural skill and fluency, and application – all with equal intensity*

The third key shift is equal measures of conceptual understanding of key ideas, procedural skill and fluency, and rigorous application of mathematics in real-world contexts. Students with a solid conceptual understanding see mathematics as more than just a set of procedures. They know more than how to get the answer and can employ concepts from several perspectives. Students should be able to use appropriate concepts and procedures, even when not prompted, and in content areas outside of mathematics. The standards reflect key concepts used in a variety of contexts, such as place value, ratios and proportional relationships, and linear algebra. They call for speed and accuracy in calculations using all number systems as well as standards providing opportunities for students to apply math in context, such as calculations related to geometric figures involving rational number measures; calculation of probabilities as fractions, decimals, or percent; and statistical analysis of rational data (U.S. Department of Education, 2013).

What are the key features of the Mathematics standards?

The standards contain the range of learning addressed in the Aspire classroom found in the mathematics content areas of Numbers, Algebra, Geometry, and Data. The standards have been aligned to the NRS EFLs of one through six to reflect most closely the adult education levels of learning: Beginning ABE Literacy, Beginning ABE, Low Intermediate ABE, High Intermediate ABE, Low ASE, and High ASE.

The standards divide the mathematical standards into two central parts: the Standards for Mathematical Practice and the Standards for Mathematical Content. The content standards provide a balanced combination of procedural fluency and conceptual understanding intended to be connected to the Standards for Mathematical Practice across content areas and levels. The Standards for Mathematical Practice, listed below, are the processes and proficiencies that guide instruction and describe ways in which students should engage mathematics as they develop their skills within each level and across content areas.

- Make sense of problems and persevere in solving them. (MP.1)
- Reason abstractly and quantitatively. (MP.2)
- Construct viable arguments and critique the reasoning of others. (MP.3)
- Model with mathematics. (MP.4)
- Use appropriate tools strategically. (MP.5)
- Attend to precision. (MP.6)
- Look for and make use of structure. (MP.7)
- Look for and express regularity in repeated reasoning. (MP.8)

The Standards for Mathematical Practice should be used at each level to provide deeper learning that can be extended to the next level and an understanding of how to apply what they have learned to real-world experiences. Once students are prepared to model their mathematical understanding, the modeling Standards for Mathematical Practice (**MP.4.** Model with mathematics.) can be applied with the content standards. Modeling is best understood in relation to the content and the context, so the benchmarks addressing mathematical modeling have been indicated by an asterisk (*) within levels five and six.

How are the Mathematics standards structured?

The **subject** area of Mathematics focuses on the **content** areas of Numbers (N), Geometry (G), Algebra (A), and Data (D). One of these letters is also the first identifier in the Ohio Aspire ABE/ASE standards numbering system. To offer additional specificity, **categories** have been identified to define further the skills and understandings all students must demonstrate. Each content area contains a set of domains, which vary across levels of learning. These **standard statements** provide focus within a level and coherence and rigor across levels, as standards build on what was addressed in previous levels.

The EFL as described by the NRS becomes the second identifier in the progression, while the third identifier is assigned to each discrete benchmark in a progression of numbers throughout the level. Each **benchmark** defines what students should know and be able to do by the end of each level. Similar to previous versions of Ohio Department of Higher Education ABE/ASE standards, the benchmarks contain the following features.

Mathematics benchmarks:
- incrementally increase in difficulty and complexity across the Educational Functioning Levels.   - assume that the student knows and can demonstrate benchmarks presented in previous levels.   - represent the essential (not exhaustive) concepts that students should know and be able to perform independently.   - are written as exit-level statements, meaning that students should be able to demonstrate their mastery of the benchmarks by the end of the level.   - include example lists. These are not the only instances or possible examples of the concepts. A student may master a benchmark without demonstrating the specific examples listed. Likewise, teachers and students may determine a number of additional examples of the benchmark.

Below is an example of the Ohio Department of Higher Education ABE/ASE standards structure.

<div align="center">

Subject: **Mathematics**

EFL: **Level 3 (3)**

Content: **Numbers (N)**

Category: **Numbers and Operations**

Standard Statement: **Understand the place value system.**

Benchmark: **N.3.2.** Read, write, and compare decimals to thousandths. (5.NBT.3)

</div>

How do the CCR standards for Mathematics build on the CCSS?

The citation at the end of each benchmark identifies the **CCSS** grade, domain, and standard number (number and letter, where applicable). For example, *5.NBT.3a* stands for fifth grade Number and Operations in Base Ten standard 3a. No grade is listed for the high school standards, so *G.MG.2* stands for Geometry: Modeling with Geometry, standard 2. The following are the identifiers for the CCSS standards (NGA, 2010b).

CCSS domains for EFL one through four (kindergarten through eighth grade)

NBT:	Number and Operations in Base Ten	**EE:**	Expressions and Equations
NS:	The Number System	**F:**	Functions
NF:	Number and Operations – Fractions	**G:**	Geometry
RP:	Ratios and Proportional Relationships	**MD:**	Measurement and Data
OA:	Operations and Algebraic Thinking	**SP:**	Statistics and Probability

CCSS domains for EFL five through six (ninth through 12th grade)

N.RN:	The Real Number System	**F.LE:**	Functions: Linear, Quadratic, and Exponential Models
N.Q:	Number and Quantity		
A.SSE:	Algebra: Seeing Structure in Expressions	**G.CO:**	Geometry: Congruence
		G.SRT:	Geometry: Similarity, Right Triangles, and Trigonometry
A.APR:	Algebra: Arithmetic with Polynomials and Rational Expressions	**G.GMD:**	Geometry: Geometric Measurement and Dimension
A.CED:	Algebra: Creating Equations	**G.MG:**	Geometry: Modeling with Geometry
A.REI:	Algebra: Reasoning with Equations and Inequalities	**S.ID:**	Statistics and Probability: Interpreting Categorical and Quantitative Data
F.IF:	Functions: Interpreting Functions		
F.BF:	Functions: Building Functions		

N.3.2. Read, write, and compare decimals to thousandths. (5.NBT.3)
   a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$. (5.NBT.3a)
   b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. (5.NBT.3b)

The CCSS identification numbers remain in parenthesis at the end of each benchmark statement to aid instructors in finding Common Core resources already developed by partner organizations.

All Levels

Standards for Mathematical Practice

Make sense of problems and persevere in solving them. (MP.1)

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. 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. Less experienced 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.

Reason abstractly and quantitatively. (MP.2)

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.

Construct viable arguments and critique the reasoning of others. (MP.3)

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. Less experienced 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. Later, students learn to determine domains to which an argument applies. Students at all levels can listen to or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics. (MP.4)

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. This might be as simple as writing an addition equation to describe a situation. A student might apply proportional reasoning to plan a school event or analyze a problem in the community. 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.

Use appropriate tools strategically. (MP.5)

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 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 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 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.

Attend to precision. (MP.6)

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. Less experienced 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.

Look for and make use of structure. (MP.7)

Mathematically proficient students look closely to discern a pattern or structure. 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 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, 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.

Look for and express regularity in repeated reasoning. (MP.8)

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Early on, 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, 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.

Level 1

Numbers (N)

Numbers and Operations

Understand place value.

N.1.1. Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases.
   a. 10 can be thought of as a bundle of ten ones — called a "ten."
   b. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones)*.*
   c. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. (1.NBT.2)

N.1.2. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <. (1.NBT.3)

Use place value understanding and the properties of operations to add and subtract.

N.1.3. Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. (1.NBT.4)

N.1.4. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. (1.NBT.5)

N.1.5. Subtract multiples of 10 in the range 10–90 from multiples of 10 in the range 10–90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. (1.NBT.6)

Algebra (A)

Operations and Algebraic Thinking

Represent and solve problems involving addition and subtraction.

A.1.1. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. (1.OA.2)

Understand and apply properties of operations and the relationship between addition and subtraction.

A.1.2. Apply properties of operations as strategies to add and subtract. *Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)* (1.OA.3)

A.1.3. Understand subtraction as an unknown-addend problem. *For example, subtract 10 – 8 by finding the number that makes 10 when added to 8.* (1.OA.4)

Add and subtract within 20.

A.1.4. Relate counting to addition and subtraction (e.g., by counting on 2 to add 2). (1.OA.5)

A.1.5. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. *Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).* (1.OA.6)

Work with addition and subtraction.

A.1.6. Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. *For example, which of the following equations are true and which are false? 6 = 6, 7 = 8, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.* (1.OA.7)

A.1.7. Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = ▯ – 3, 6 + 6 = ▯.* (1.OA.8)

Geometry (G)

Geometric Shapes and Figures

Analyze, compare, create, and compose shapes.

G.1.1. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length). (K.G.4)

Reason with shapes and their attributes.

G.1.2. Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape. (1.G.2)

Data (D)

Measurement and Data

Measure lengths indirectly and by iterating length units.

D.1.1. Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.* (1.MD.2)

Represent and interpret data.

D.1.2. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another. (1.MD.4)

Level 2

Numbers (N)

Numbers and Operations

Understand place value.

N.2.1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases.
   a. 100 can be thought of as a bundle of ten tens — called a "hundred."
   b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones). (2.NBT.1)

N.2.2. Count within 1000; skip-count by 5s, 10s, and 100s. (2.NBT.2)

N.2.3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. (2.NBT.3)

N.2.4. Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons. (2.NBT.4)

Use place value understanding and the properties of operations to add and subtract.

N.2.5. Add up to four two-digit numbers using strategies based on place value and properties of operations. (2.NBT.6)

N.2.6. Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds. (2.NBT.7)

N.2.7. Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900. (2.NBT.8)

N.2.8. Explain why addition and subtraction strategies work, using place value and the properties of operations. (2.NBT.9)

Use place value understanding and properties of operations to perform multi-digit arithmetic.

N.2.9. Use place value understanding to round whole numbers to the nearest 10 or 100. (3.NBT.1)

N.2.10. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. (3.NBT.2)

N.2.11. Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80, 5×60) using strategies based on place value and properties of operations. (3.NBT.3)

Develop understanding of fractions as numbers.

N.2.12. Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a/b* as the quantity formed by a parts of size 1/*b*. (3.NF.1)

N.2.13. Understand a fraction as a number on the number line; represent fractions on a number line diagram. (3.NF.2)
   a. Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line. (3.NF.2a)
   b. Represent a fraction *a/b* on a number line diagram by marking off a length 1/*b* from 0. Recognize that the resulting interval has size *a/b* and that its endpoint locates the number *a/b* on the number line. (3.NF.2b)

N.2.14. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. (3.NF.3)
   a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. (3.NF.3a)
   b. Recognize and generate simple equivalent fractions (e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent, e.g., by using a visual fraction mode). (3.NF.3b)
   c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.* (3.NF.3c)
   d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. (3.NF.3d)

Algebra (A)

Operations and Algebraic Thinking

Represent and solve problems involving addition and subtraction.

A.2.1. Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. (2.OA.1)

Understand properties of multiplication and the relationship between multiplication and division.

A.2.2. Apply properties of operations as strategies to multiply and divide. *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2). (Distributive property.)* (3.OA.5)

A.2.3. Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.* (3.OA.6)

Add and subtract within 20.

A.2.4. Fluently add and subtract within 20 using mental strategies. Know from memory all sums of two one-digit numbers. (2.OA.2)

Represent and solve problems involving multiplication and division.

A.2.5. Interpret products of whole numbers, e.g., interpret 5 x 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 x 7.* (3.OA.1)

A.2.6. Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.* (3.OA.2)

A.2.7. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. (3.OA.3)

A.2.8. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 x ? = 48, 5 = □ ÷ 3, 6 x 6 = ?.* (3.OA.4)

Multiply and divide within 100.

A.2.9. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. Know from memory all products of two one-digit numbers. (3.OA.7)

Solve problems involving the four operations, and identify and explain patterns in arithmetic.

A.2.10. Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding. (3.OA.8)

A.2.11. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.* (3.OA.9)

Geometry (G)

Geometric Shapes and Figures

Reason with shapes and their attributes.

G.2.1. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes. (2.G.1)

G.2.2. Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words *halves, thirds, half of, a third of,* etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape. (2.G.3)

G.2.3. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories. (3.G.1)

G.2.4. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.* (3.G.2)

Data (D)

Measurement and Data

Measure and estimate lengths in standard units.

D.2.1. Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. (2.MD.2)

D.2.2. Estimate lengths using units of inches, feet, centimeters, and meters. (2.MD.3)

D.2.3. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit. (2.MD.4)

Represent and interpret data.

D.2.4. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (2.MD.10)

D.2.5. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.* (3.MD.3)

D.2.6. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. (3.MD.4)

Relate addition and subtraction to length.

D.2.7. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram. (2.MD.6)

Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

D.2.8. Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram. (3.MD.1)

D.2.9. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3.MD.2)

Understand concepts of area and relate to area of multiplication and addition.

D.2.10. Recognize area as an attribute of plane figures and understand concepts of area measurement.
  a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.
  b. A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units. (3.MD.5)

D.2.11. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units). (3.MD.6)

D.2.12. Relate area to the operations of multiplication and addition. (3.MD.7)
  a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. (3.MD.7a)
  b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real-world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. (3.MD.7b)
  c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning. (3.MD.7c)
  d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real-world problems. (3.MD.7d)

Recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

D.2.13. Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters. (3.MD.8)

Level 3

Numbers (N)

Numbers and Operations

Understand the place value system.

N.3.1. Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. (5.NBT.1)

N.3.2. Read, write, and compare decimals to thousandths. (5.NBT.3)
   a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000). (5.NBT.3a)
   b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. (5.NBT.3b)

N.3.3. Explain patterns in the number of zeroes of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5.NBT.2)

N.3.4. Use place value understanding to round decimals to any place. (5.NBT.4)

Generalize place value understanding for multi-digit whole numbers.

N.3.5. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.* (4.NBT.1)

N.3.6. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. (4.NBT.2)

N.3.7. Use place value understanding to round multi-digit whole numbers to any place. (4.NBT.3)

Use place value understanding and properties of operations to perform multi-digit arithmetic.

N.3.8. Fluently add and subtract multi-digit whole numbers using the standard algorithm. (4.NBT.4)

N.3.9. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. (4.NBT.5)

N.3.10. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. (4.NBT.6)

Perform operations with multi-digit whole numbers and with decimals to hundredths.

N.3.11. Fluently multiply multi-digit whole numbers using the standard algorithm. (5.NBT.5)

N.3.12. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. (5.NBT.6)

N.3.13. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. (5.NBT.7) [Note from CCR panel: Applications involving financial literacy should be used.]

Extend understanding of fraction equivalence and ordering.

N.3.14. Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions. (4.NF.1)

N.3.15. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. (4.NF.2)

Build fractions from unit fractions by applying and extending previous understanding of operations on whole numbers.

N.3.16. Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. (4.NF.3)
   a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. (4.NF.3a)
   b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8; 3/8 = 1/8 + 2/8; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.* (4.NF.3b)
   c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. (4.NF.3c)
   d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. (4.NF.3d)

N.3.17. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. (4.NF.4)
   a. Understand a fraction a/b as a multiple of $1/b$. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).* (4.NF.4a)

b. Understand a multiple of *a*/*b* as a multiple of 1/*b*, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general,* n × (a/b) = (n × a)/b) (4.NF.4b)

c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?* (4.NF.4c)

Understand decimal notation for fractions, and compare decimal fractions.

N.3.18. Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.* (4.NF.6)

N.3.19. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model. (4.NF.7)

Use equivalent fractions as strategy to add and subtract fractions.

N.3.20. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general,* a/b + c/d = (ad + bc)/bd.) (5.NF.1)

N.3.21. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 + 3/7, by observing that 3/7 < 1/2.* (5.NF.2)

Apply and extend previous understanding of multiplication and division to multiply and divide fractions.

N.3.22. Interpret a fraction as division of the numerator by the denominator (*a*/*b* = *a* ÷ *b*). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?* (5.NF.3)

N.3.23. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. (5.NF.4)

N.3.24. Interpret multiplication as scaling (resizing), by: comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication; and explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1. (5.NF.5)

N.3.25. Solve real-world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. (5.NF.6)

N.3.26. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5.NF.7)
   a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.* (5.NF.7a)
   b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.* (5.NF.7b)
   c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?* (5.NF.7c)

The Number System

Compute fluently with multi-digit numbers and find common factors and multiples.

N.3.27. Fluently divide multi-digit numbers using the standard algorithm. (6.NS.2)

N.3.28. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. (6.NS.3)

N.3.29. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 × (9 + 2).* (6.NS.4)

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

N.3.30. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mile and area 1/2 square mile?* (6.NS.1)

Ratios and Proportional Relationships

Understand ratio concepts and use ratio reasoning to solve problems.

N.3.31. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* (6.RP.1)

N.3.32. Understand the concept of a unit rate a/b associated with a ratio a:b with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* (6.RP.2)

Algebra (A)

Operations and Algebraic Thinking

Use the four operations with whole numbers to solve problems.

A.3.1. Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4.OA.1)

A.3.2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. (4.OA.2)

A.3.3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies, including rounding. (4.OA.3)

Generate and analyze patterns.

A.3.4. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.* (4.OA.5)

Gain familiarity with factors and multiples.

A.3.5. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite. (4.OA.4)

Write and interpret numerical expressions.

A.3.6. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. (5.OA.1)

A.3.7. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (2100 + 425) is three times as large as the 2100 + 425, without having to calculate the indicated sum or product.* (5.OA.2)

Expressions and Equations

Apply and extend previous understandings of arithmetic to algebraic expressions.

A.3.8. Write and evaluate numerical expressions involving whole-number exponents. (6.EE.1)

A.3.9. Write, read, and evaluate expressions in which letters stand for numbers. (6.EE.2)
   a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.* (6.EE.2a)
   b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.* (6.EE.2b)
   c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length s = 1/2.* (6.EE.2c)

A.3.10. Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6(4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.* (6.EE.3)

A.3.11. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.* (6.EE.4)

Reason about and solve one-variable equations and inequalities.

A.3.12. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. (6.EE.5)

A.3.13. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (6.EE.6)

A.3.14. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, $q,$ and x are all nonnegative rational numbers. (6.EE.7)

A.3.15. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams. (6.EE.8)

Represent and analyze quantitative relationships between dependent and independent variables.

A.3.16. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation* $d = 65t$ *to represent the relationship between distance and time.* (6.EE.9)

Geometry (G)

Geometric Shapes and Figures

Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

G.3.1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4.G.1)

Classify two-dimensional figures into categories based on their properties.

G.3.2. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.* (5.G.3)

Graph points on the coordinate plane to solve real-world and mathematical problems.

G.3.3. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate). (5.G.1)

G.3.4. Represent real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5.G.2)

Solve real-world and mathematical problems involving area, surface area, and volume.

G.3.5. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. (6.G.1)

G.3.6. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. (6.G.3)

G.3.7. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems. (6.G.4)

Data (D)

Measurement and Data

Represent and interpret data.

D.3.1. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this level to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.* (5.MD.2) [Note from CCR panel: Plots of numbers other than measurements also should be encouraged.]

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

D.3.2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (4.MD.2)

D.3.3. Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.* (4.MD.3)

Understand concepts of angle and measure angles.

D.3.4. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement.
   a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.

   b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees. (4.MD.5)

D.3.5. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. (4.MD.6)

D.3.6. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure. (4.MD.7)

Convert like measurement units within a given measurement system.

D.3.7. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. (5.MD.1)

Understand concepts of volume and relate volume to multiplication and to addition.

D.3.8. Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
   a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.
   b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units. (5.MD.3)

D.3.9. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5.MD.4)

D.3.10. Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume. (5.MD.5)
   a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. (5.MD.5a)
   b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems. (5.MD.5b)
   c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems. (5.MD.5c)

Statistics and Probability

Develop understanding of statistical variability.

D.3.11. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* (6.SP.1)

D.3.12. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (6.SP.2)

D.3.13. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. (6.SP.3)

Summarize and describe distributions.

D.3.14. Display numerical data in plots on a number line, including dot plots, histograms, and box plots. (6.SP.4) [Also see CCSS S.ID.1]

Level 4

Numbers (N)

The Number System

Apply and extend previous understandings of numbers to the system of rational numbers.

N.4.1. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (6.NS.5)

N.4.2. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous levels to represent points on the line and in the plane with negative number coordinates. (6.NS.6)
  a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g.,-(-3) = 3, and that 0 is its own opposite. (6.NS.6a)
  b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. (6.NS.6b)
  c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. (6.NS.6c)

N.4.3. Understand ordering and absolute value of rational numbers. (6.NS.7)
  a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret -3 > -7 as a statement that -3 is located to the right of -7 on a number line oriented from left to right.* (6.NS.7a)
  b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write -3 ºC > -7 ºC to express the fact that -3ºC is warmer than -7ºC.* (6.NS.7b)
  c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of -30 dollars, write |-30| to describe the size of the debt in dollars.* (6.NS.7c)
  d. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.* (6.NS.7d)

N.4.4. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. (6.NS.8)

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

N.4.5. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. (7.NS.1)

  a. Describe situations in which opposite quantities combine to make 0. *For example, if a check is written for the same amount as a deposit, made to the same checking account, the result is a zero increase or decrease in the account balance.* (7.NS.1a)

  b. Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. (7.NS.1b)

  c. Understand subtraction of rational numbers as adding the additive inverse, $p − q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. (7.NS.1c)

  d. Apply properties of operations as strategies to add and subtract rational numbers. (7.NS.1d)

N.4.6. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. (7.NS.2)

  a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. (7.NS.2a)

  b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts. (7.NS.2b)

  c. Apply properties of operations as strategies to multiply and divide rational numbers. (7.NS.2c)

  d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. (7.NS.2d)

N.4.7. Solve real-world and mathematical problems involving the four operations with rational numbers. (7.NS.3)

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

N.4.8. 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.* (8.NS.2)

Ratios and Proportional Relationships

Understand ratio concepts and use ratio reasoning to solve problems.

N.4.9. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. (6.RP.3)
   a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. (6.RP.3a)
   b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?* (6.RP.3b)
   c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. (6.RP.3c)
   d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. (6.RP.3d)

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

N.4.10. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $^{1/2}/_{1/4}$ miles per hour, equivalently 2 miles per hour.* (7.RP.1)

N.4.11. Recognize and represent proportional relationships between quantities. (7.RP.2)
   a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. (7.RP.2a)
   b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. (7.RP.2b) [Also see CCSS 8.EE.5]
   c. Represent proportional relationships by equations. *For example, if total cost* t *is proportional to the number* n *of items purchased at a constant price* p*, the relationship between the total cost and the number of items can be expressed as* t = pn*.* (7.RP.2c)
   d. Explain what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r*) where *r* is the unit rate. (7.RP.2d)

N.4.12. Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.* (7.RP.3) [Also see CCSS 7.G.1 and G.MG.2]

Algebra (A)

Expressions and Equations

Use properties of operations to generate equivalent expressions.

A.4.1. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example,* a + *0.05*a = *1.05*a *means that "increase by 5%" is the same as "multiply by 1.05."* (7.EE.2) [Also see CCSS A.SSE.2, A.SSE.3, A.SSE.3a, A.CED.4]

A.4.2. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. (7.EE.1)

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

A.4.3. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (7.EE.4) [Also see CCSS A.CED.1 and A.REI.3]
  a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q)$ r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?* (7.EE.4a) [Also see CCSS A.CED.1 and A.REI.3]
  b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.* (7.EE.4b) [Also see CCSS A.CED.1 and A.REI.3]

A.4.4. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.* (7.EE.3)

Work with radicals and integer exponents.

A.4.5. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{(-5)} = 3^{(-3)} = (1/3)^3 = 1/27$.* (8.EE.1) [Also see CCSS F.IF.8b]

A.4.6. 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. (8.EE.2) [Also see CCSS A.REI.2]

A.4.7. 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.* (8.EE.3)

A.4.8. 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. (8.EE.4) [Also see CCSS N.Q.3]

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

A.4.9. 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.* (8.EE.5) [Also see CCSS 7.RP.2b]

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

A.4.10. Solve linear equations in one variable. (8.EE.7) [Also see CCSS A.REI.3]
   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). (8.EE.7a)
   b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. (8.EE.7b)

A.4.11. Analyze and solve pairs of simultaneous linear equations. (8.EE.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 satisfy both equations simultaneously. (8.EE.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.* (8.EE.8b) [Also see CCSS A.REI.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.* (8.EE.8c)

Functions

Define, evaluate, and compare functions.

A.4.12. 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. (8.F.1) [Also see CCSS F.IF.1]

A.4.13. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function A = s² giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4), and (3,9), which are not on a straight line.* (8.F.3)

Use functions to model relationships between quantities.

A.4.14. 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. (8.F.4) [Also see CCSS F.BF.1 and F.LE.5]

A.4.15. 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. (8.F.5) [Also see CCSS A.REI.10 and F.IF.7]

Geometry (G)

Geometric Shapes and Figures

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

G.4.1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. (7.G.1) [Also see CCSS 7.RP.3]

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

G.4.2. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. (7.G.4)

G.4.3. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. (7.G.5)

G.4.4. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. (7.G.6) [Also see CCSS G.GMD.3]

Congruence

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

G.4.5. 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. (8.G.2) [Also see CCSS G.SRT.5]

G.4.6. 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. (8.G.4) [Also see CCSS G.SRT.5]

G.4.7. 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.* (8.G.5)

Similarity, Right Triangles, and Trigonometry

Understand and apply the Pythagorean Theorem.

G.4.8. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (8.G.7)

G.4.9. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. (8.G.8)

Data (D)

Statistics and Probability

Summarize and describe distributions.

D.4.1. Summarize numerical data sets in relation to their context, such as by: reporting the number of observations; describing the nature of the attribute under investigation, including how it was measured and its units of measurement; giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered; and relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. (6.SP.5)

Use random sampling to draw inferences about a population.

D.4.2. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. (7.SP.1)

D.4.3. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.* (7.SP.2)

Draw informal comparative inferences about two populations.

D.4.4. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.* (7.SP.3)

D.4.5. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in one chapter of a science book are generally longer or shorter than the words in another chapter of a lower level science book.* (7.SP.4) [Also see CCSS S.ID.3]

Investigate chance processes and develop, use, and evaluate probability models.

D.4.6. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. (7.SP.5)

D.4.7. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.* (7.SP.6)

D.4.8. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. (7.SP.7)
   a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.* (7.SP.7a)
   b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?* (7.SP.7b)

D.4.9. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. (7.SP.8a)

D.4.10. Represent sample spaces for compound events using methods such as organized lists, tables, and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event. (7.SP.8b)

Investigate patterns of association in bivariate data.

D.4.11. 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. (8.SP.1) [Also see CCSS S.ID.1]

D.4.12. 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. (8.SP.2)

D.4.13. 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.* (8.SP.3) [Also see CCSS S.ID.7]

D.4.14. 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 like to cook and whether they participate actively in a sport. Is there evidence that those who like to cook also tend to play sports?* (8.SP.4) [Also see CCSS S.ID.5]

Level 5

Numbers (N)

Number and Quantity

Extend the properties of exponents to rational exponents.

N.5.1. Rewrite expressions involving radicals and rational exponents using the properties of exponents. (N.RN.2)

Algebra (A)

Expressions and Equations

Interpret the structure of expressions.

A.5.1. Interpret expressions that represent a quantity in terms of its context.* (A.SSE.1)
    a. Interpret parts of an expression, such as terms, factors, and coefficients.* (A.SSE.1a)

A.5.2. 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 $(x^2 - y^2)(x^2 + y^2)$.* (A.SSE.2) [Also see CCSS 7.EE.2]

Write expressions in equivalent forms to solve problems.

A.5.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* (A.SSE.3) [Also see CCSS 7.EE.2]
    a. Factor a quadratic expression to reveal the zeros of the function it defines.* (A.SSE.3a) [Also see CCSS 7.EE.2]

Rewrite rational expressions.

A.5.4. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r x$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system. (A.APR.6)

Create equations that describe numbers or relationships.

A.5.5. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.** (A.CED.1) [Also see CCSS 7.EE.4, 7.EE.4a, and 7.EE.4b]

A.5.6. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.* (A.CED.2)

A.5.7. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.** (A.CED.3)

A.5.8. 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.* (A.CED.4) [Also see CCSS 7.EE.2]

Solve equations and inequalities in one equation.

A.5.9. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. (A.REI.3)
[Also see CCSS 7.EE.4, 7.EE.4a, 7.EE.4b, and 8.EE.7]

A.5.10. Solve quadratic equations in one variable. (A.REI.4)

Functions

Understand the concept of a function and use function notation.

A.5.11. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f*(*x*). (F.IF.1)
[Also see CCSS 8.F.1]

A.5.12. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. (F.IF.2)

Build a function that models a relationship between two quantities.

A.5.13. Write a function that describes a relationship between two quantities.* (F.BF.1)
[Also see CCSS 8.F.4]

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

A.5.14. Distinguish between situations that can be modeled with linear functions and with exponential functions.* (F.LE.1)
   a. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.* (F.LE.1b)
   b. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.* (F.LE.1c)

Geometry (G)

Congruence

Experiment with transformations in the plane.

G.5.1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. (G.CO.1)

Geometric Measurement and Dimension

Explain volume formulas and use them to solve problems.

G.5.2. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.* (G.GMD.3) [Also see CCSS 7.G.6]

Data (D)

Statistics and Probability

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

D.5.1. Represent data with plots on the real number line (dot plots, histograms, and box plots). (S.ID.1) [Also see CCSS 6.SP.4 and 8.SP.1]

D.5.2. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). (S.ID.3) [Also see CCSS 7.SP.4]

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

D.5.3. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. (S.ID.5) [Also see CCSS 8.SP.4]

NOTE: Making mathematical models is a Standard for Mathematical Practice (MP.4), and specific modeling standards appear throughout the high school standards indicated by an asterisk (*).

Level 6

Numbers (N)

Number and Quantity

Reason quantitatively and use units to solve problems.

N.6.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.* (N.Q.1)

N.6.2. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.* (N.Q.3) [Also see CCSS 8.EE.4]

Algebra (A)

Expressions and Equations

Perform arithmetic operations on polynomials.

A.6.1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. (A.APR.1)
[Note from CCR panel: Emphasis should be on operations with polynomials.]

Understand solving equations as a process of reasoning and explain the reasoning.

A.6.2. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. (A.REI.1)

A.6.3. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. (A.REI.2) [Also see CCSS 8.EE.2]

Solve systems of equations.

A.6.4. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. (A.REI.6) [Also see CCSS 8.EE.8b]

Represent and solve equations and inequalities graphically.

A.6.5. 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). (A.REI.10) [Also see CCSS 8.F.5]

Functions

Interpret functions that arise in applications in terms of the context.

A.6.6. 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 a verbal description of the relationship. *For example, for a quadratic function modeling a projectile in motion, interpret the intercepts and the vertex of the function in the context of the problem.* * (F.IF.4) [*Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*]

A.6.7. 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.** (F.IF.5)

A.6.8. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.* (F.IF.6) [NOTE: See conceptual modeling categories.]

Analyze functions using different representations.

A.6.9. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* (F.IF.7) [Also see CCSS 8.F.5]

A.6.10. Use properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in an exponential function and then classify it as representing exponential growth or decay.* (F.IF.8b) [Also see CCSS 8.EE.1]

A.6.11. 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.* (F.IF.9)

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

A.6.12. Interpret the parameters in a linear or exponential function in terms of a context.* (F.LE.5) [Also see CCSS 8.F.4]

Geometry (G)

Similarity, Right Triangles, and Trigonometry

Prove theorems involving similarity.

G.6.1. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. (G.SRT.5) [Also see CCSS 8.G.2 and 8.G.4]

Modeling with Geometry

Apply geometric concepts in modeling situations.

G.6.2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).* (G.MG.2) [Also see CCSS 7.RP.3]

Data (D)

Statistics and Probability

Interpret linear models.

D.6.1. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. (S.ID.7) [Also see CCSS 8.SP.3]

D.6.2. Distinguish between correlation and causation. (S.ID.9)

NOTE: Making mathematical models is a Standard for Mathematical Practice (MP.4), and specific modeling standards appear throughout the high school standards indicated by an asterisk (*).

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