



The *PRAXIS*® Study Companion

Elementary Education Assessment (5006)



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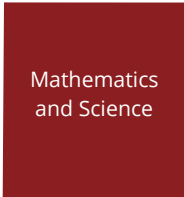
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Elementary Education Assessment (5006)

Test at a Glance

The Elementary Education Assessment test is designed for candidates who possess the knowledge, skills, and abilities in elementary reading and language arts, social studies, math, and science instruction that are important and necessary as they prepare to enter the field of elementary education in the primary through upper elementary school grades.

Test Name	Elementary Education Assessment
Test Code	5006
Time	4.5 hours
Number of Questions	180 selected response questions
Format	The test consists of a variety of selected response questions, where you select one or more answer choices; and other types of questions. You can review the possible question types in Understanding Question Types .
Test Delivery	Computer Delivered

Elementary Education Assessment	Subtests	Subject Test Length (Minutes)	Approximate Number of Questions
 	5007 Reading and Language Arts & Social Studies	150	95
	5008 Mathematics and Science	120	85

About This Test

The Elementary Education Assessment test consists of two subtests—Elementary Education: Reading and Language Arts & Social Studies, and Elementary Education: Mathematics and Science.

The Elementary Education: Reading and Language Arts & Social Studies subtest consists of 95 test questions that are based on *The Standards for the English Language Arts*, published by the National Council of Teachers of English (NCTE) and the International Literacy Association (ILA), and social studies content standards developed by the National Council for the Social Studies (NCSS).

The Elementary Education: Mathematics and Science subtest consists of 85 questions that are based on the National Council of Teachers of Mathematics (NCTM) standards, the National Science Teaching Association (NSTA) standards, and Next Generation Science Standards (NGSS).

An on-screen, four-function calculator is provided for the computer-delivered test. Please consult the web page [Praxis Calculator Use](#) for further information and [review the directions for using the on-screen calculator](#).

This test may contain some questions that will not count toward your score.

Elementary Education: Reading and Language Arts & Social Studies (5007)

Test Code	5007
Time	2.5 hours
Number of Questions	95 selected-response questions
Format	Selected-response questions
Test Delivery	Computer delivered

	Reading and Language Arts & Social Studies Categories	Approximate Number of Questions	Approximate Percentage of Examination
	I. Reading and Language Arts	62	65%
	II. Social Studies	33	35%
<p>Approximately 70 percent of the questions in each subject area assess content applied to a Task of Teaching.</p>			

About This Subtest

The Praxis Elementary Education: Reading and Language Arts & Social Studies subtest is designed for prospective teachers of children in primary through upper elementary school grades. The 95 selected-response questions focus on the broad knowledge of language arts and social studies necessary to be licensed as a beginning teacher at the elementary school level. The assessment is designed and developed through work with practicing elementary teachers, teacher educators, and higher education content specialists familiar with *The Standards for the English Language Arts*, published by the National Council of Teachers of English (NCTE) and the International Literacy Association (ILA), and social studies content standards developed by the National Council for the Social Studies (NCSS).

The test consists of a variety of selected-response questions for which you will select one or more answer choices, and other types of questions. You can review the possible question types in Understanding Question Types.

This test may contain some questions that will not count toward your score.

Content Topics

This list details the topics that may be included on the test. All test questions will cover one or more of these topics.

I. Reading and Language Arts

A. Foundational Skills

1. Print Concepts

Understands features of print

- a. Demonstrates knowledge that written words communicate a message, words are separated by spaces, text is written in a particular direction, and sentences have distinguishing features (e.g., capitalization and punctuation)
- b. Differentiates between the pictures and the printed words on a page

2. Alphabetic Principle

Understands that print is a representation of sound in spoken words

- a. Identifies the alphabet's uppercase and lowercase letter names, letter shapes, and corresponding sounds

- b. Demonstrates understanding that the individual phonemes (the smallest units of sound) they hear in words are represented by graphemes (the alphabetic letters) and that those letter-sound relationships can be analyzed and synthesized in the decoding and encoding process

3. Phonological Awareness

Understands that words are made up of sounds

- a. Demonstrates understanding that speech is composed of various phonological units that vary in size (from phonemes to morphemes and from syllables to words)
- b. Detects and manipulates speech sounds at four levels:
 - parts of compound words (e.g., cow-boy)
 - syllables
 - onset-rime (onset = beginning sound, e.g., /b/ in "ball"; rime = the vowel and everything after it, e.g., /all/)

- phonemes (e.g., /b/, /a/, /t/)
4. Phonics and Word Recognition

Understands how to decode unfamiliar words using grade-appropriate phonics and word analysis skills

 - a. Pronounces unfamiliar words by systematically applying knowledge of letter-sound correspondences and orthographic patterns and by making word analogies (e.g., “bolt” sounds like “colt” but starts with /b/)
 - b. Accurately reads multisyllabic words in and out of context by breaking words into syllables, identifying affixes (i.e., prefixes and suffixes), and using strategies such as word analogy
 - c. Identifies grade-appropriate, high-frequency words by sight
 5. Fluency

Understands how to read text orally and silently with accuracy and automaticity for text comprehension

 - a. Reads grade-level text with accuracy, at an appropriate rate, and with prosody (i.e., resembling natural speech in stress, pitch, phrasing, intonation, and timing)
 - b. Uses context to confirm or self-correct for word recognition and understanding, rereading words and phrases when necessary
 - c. Demonstrates sufficient stamina to finish a reading task
- B. Language**
1. Conventions of Standard Academic English

Knows the academic English—including grammar, capitalization, punctuation, and spelling—that characterizes both oral discourse and a wide range of texts (in addition to having competence in a first language and/or dialect)

 - a. Applies knowledge of the structural rules that govern clauses, phrases, and words, which include conventional use of word tense, parts of speech (e.g., nouns, verbs, and adjectives), subject-verb agreement, and correlative conjunctions (e.g., “either/or” and “neither/nor”)
 - b. Follows capitalization and punctuation conventions, including capitalization of words in titles, appropriate use of commas, and use of underlining, quotation

- marks, or italics to indicate titles of works
 - c. Produces simple, compound, and complex sentences
 - d. Spells grade-appropriate, irregularly spelled words by applying conventional knowledge of alphabetic spelling, common orthographic patterns, syllables and affixes, and derivational suffixes (e.g., “compete” versus “competition”)
2. Vocabulary
- Comprehensively understands a wide variety of words, as shown through listening, speaking, reading, and writing
- a. Demonstrates knowledge of the denotative meanings and the uses of academic words, domain-specific vocabulary, and words central to understanding and writing about topics being studied and demonstrates knowledge of the connotative meanings represented through figurative and idiomatic language
 - b. Takes an active role in analyzing and determining the meanings of unfamiliar words or new uses of familiar words by using key strategies to aid in pronunciation, meaning making, and word usage
 - clarifies the meaning of an unknown word through context clues, using knowledge of words parts (e.g., affixes and roots)
 - makes word associations (e.g., antonyms/ synonyms and cognates) and utilizes external resources (e.g., dictionaries and knowledge of peers)
3. Forms and Functions of Language
- Understands how language and its conventions affect meaning; this understanding supports comprehension (reading and listening) and making effective choices for meaning and style in speaking and writing
- a. Discerns the appropriate level of formal language use across various contexts and analyzes the use of English dialects and registers within and across texts

- b. Reaches beyond conventional appropriateness in speaking and writing and selects words, phrases, and punctuation for effect and precision
- c. Makes choices about how to expand, reduce, and combine sentences in order to infuse writing with meaning, interest, and style

C. Constructing Meaning

1. Key Ideas and Details

Understands how to read closely to determine what a text says explicitly, to make logical inferences, and to cite specific textual evidence in support of conclusions

- a. Asks and answers questions to demonstrate understanding of a text and refers to the text to support answers
- b. Determines central ideas or themes in a text and summarizes/paraphrases the key supporting details, evidence, and ideas
- c. Recounts stories, determines a central message, lesson, or moral and explains how those elements are supported by key details from the text
- d. Identifies relationships within a text between characters/individuals, settings, events, ideas, or concepts based on specific

text information, such as through determining a connection between a theme and a series of events or understanding how characters respond to challenges differently

2. Author's Craft and Text Structure

Knows about the language of written texts as a matter of craft

- a. Analyzes how printed language (such as specific word choice) is used to convey meaning and tone
- b. Describes the overall structure of a text (e.g., cause/effect, problem/solution, and sequence), including how parts of a text (e.g., paragraphs, chapters, scenes, and stanzas) relate to one another
- c. Uses text features (e.g., captions, tables of contents, and diagrams) to locate relevant information efficiently and to support comprehension of a text
- d. Analyzes craft and structure across texts (e.g., in narrative texts, by comparing how authors convey point of view differently for the same event or topic or, in informational texts, by comparing how authors

- convey the structure of an argument)
3. Integration and Application of Knowledge

Knows how to integrate and evaluate information and ideas across various texts, formats, and media

 - a. Understands and critiques the validity of arguments, evaluates the validity of reasoning and the relevance and sufficiency of evidence, and identifies the relationship between evidence and reasoning and a claim
 - b. Integrates information across multiple texts in order to synthesize it, compare different author approaches or ideas, or analyze how various formats contribute to meaning, tone, or beauty of text
 - c. Applies information and ideas to new contexts and problems and integrates information in order to write or speak about a subject knowledgeably
 - d. Tells how illustrations and other visual representations within a text support reader understanding
 4. Text Types

Knows about different text types (e.g., narrative genres, procedural genres, and persuasive genres) and the conventional structures for organizing texts that are related to unique purposes

 - a. Demonstrates knowledge of typical elements of different genres (e.g., narrator, dialogue, description, quotations, concrete facts and details, and examples)
 - b. Uses transitional words, phrases, and clauses to link ideas (e.g., “first,” “next,” “then”; “consequently”; and “specifically”) across all text types
 - c. Uses text structures (e.g., cause/effect, problem/solution, and sequence) for different purposes
 - d. Uses formats for introducing, sequencing, and concluding all types of texts
 - e. Writes narratives that communicate real or imagined experiences or events using techniques such as sensory and descriptive details and clear event sequencing through a narrator, dialogue, and description
 - f. Writes expository texts with a clear introduction to the topic and with supporting facts and

- concrete details logically grouped and organized
5. Production of Written Texts
Knows how to produce effective writing
 - a. Produces clear and coherent writing by adapting the organization and style of written information to the audience, task, and purpose
 - b. Takes a piece of written work through the stages of the writing process (e.g., planning, drafting, revising) and produces first-draft, on-demand, and extended writing
 6. Research to Build and Present Knowledge
Knows how to conduct research to gather relevant information associated with a question, topic, or other form of inquiry
 - a. Locates, selects, gathers, recalls, categorizes, and possibly reorganizes relevant information from different text types to support analysis
 - b. Analyzes and reflects on evidence found in narrative texts (e.g., by comparing and contrasting characters, settings, and events) and in informational texts (e.g., by explaining how an author uses reasons and evidence to support particular points and by identifying the corresponding reasons and evidence)
 7. Discussion and Collaboration
Knows how to prepare for and participate in a range of conversations and collaborations with diverse partners in a variety of contexts
 - a. Uses social knowledge of discourse conventions to communicate clearly and persuasively
 - knows how to enter and hold a conversation (e.g., through taking turns, acknowledging others' comments, clarifying information, and building on others' ideas)
 - knows how to be considerate and respectful of others
 - b. Utilizes group discussions to build knowledge and comprehension
 - c. Asks and answers questions to seek help, gather additional information, or gain a deeper understanding

- d. Paraphrases and summarizes a text or speaker’s main points, reasons, and evidence
 - e. Expresses ideas and feelings and builds on the ideas of others clearly and persuasively
 - f. Integrates and evaluates information by posing and responding to discussion questions and by explaining how evidence, reasoning, and point of view are connected to another’s claim
 - g. Regulates interpretation of texts or sources of information by reflecting on and evaluating others’ perspectives
8. Presentation of Knowledge and Ideas
- Knows how to organize and present information in a style appropriate for the audience and purpose
- a. Sequences ideas logically
 - b. Uses appropriate facts and relevant descriptive details to support main ideas
 - c. Establishes a line of reasoning and organization
 - d. Speaks clearly and at an understandable pace
 - e. Adopts a speaking style, register, and dialect appropriate for the given context
 - f. Uses digital and visual media displays strategically to enhance expression and comprehensibility of ideas

Reading and Language Arts Discussion Questions

- What are the best ways for teachers to reinforce print awareness in the classroom?
- Why is alphabetic principal a key foundational skill?
- Understand word analysis, and recognize activities teachers use to enforce the skill.
- Know how to assess the three components of fluency (accuracy, rate, and prosody).
- How can you tell that students’ lack of fluency is impacting their comprehension?
- How can strategies like repeated reading and choral reading improve students’ fluency?
- Understand the conventions of standard academic English. Know how to use them, and know how to recognize when they are misused.
- What are the common methods used to analyze and determine the meanings of words?
- Know how to recognize common types of figurative language.
- How can a strong command of language enhance student writing?
- What is the difference between a fact and an inference, and how does understanding that difference empower a student’s analysis of a text?
- Why is it important for students to understand the importance of word choice in writing?

- How does analyzing characters, settings, and events help determine the theme of a text?
- What is the difference between informational and narrative text?
- How do text features support student comprehension?
- How do you explain to students that presenting an issue from various points of view adds multiple layers of meaning to a text?
- How does knowledge of the structure of a genre contribute to understanding?
- How can words, phrases, and clauses aid in distinguishing one genre from another?
- What are the five elements of plot structure?
- Know the purposes of the three types of writing that students should be familiar with, and give examples of each.
- How do you explain the steps in the authoring cycle of writing?
- How can students ensure that online resources are credible and unbiased?
- What is the difference between a primary and a secondary source?
- Why is it important to gather information from a variety of sources?
- What elements, both verbal and nonverbal, make for an effective oral presentation?
- How can a teacher both ensure and assess active listening in students?

II. Social Studies

A. History

1. Understands the concept of chronology
2. Understands how various sources provide information about the past and present
3. Understands the contributions of classical civilizations such as China, Africa, Egypt, Greece, and Rome
4. Understands the characteristics of indigenous peoples in North America before European exploration
5. Understands the causes and effects of European exploration and the colonization of North America
6. Understands how conflict between the American colonies and Great Britain led to American independence
7. Understands the development of the United States government
8. Understands political, economic, and social changes that occurred in the United States during the nineteenth century
9. Understands important developments in the United States during the twentieth and twenty-first centuries

B. Government and Citizenship

1. Understands the concepts of family and community
2. Understands the purposes and functions of government
3. Understands the various levels of government
4. Understands the various forms of government
5. Understands important ideas in the Declaration of Independence and in the Constitution, including the Bill of Rights
6. Understands the characteristics of responsible citizenship (e.g., voting, civic duties)

C. Human and Physical Geography

1. Understands the concepts of location, distance, and direction
2. Understands physical characteristics of place and how they affect human activities and settlement patterns
3. Understands human characteristics of place and how humans adapt to variations in the physical environment
4. Understands similarities and differences between and among people

D. Economics

1. Understands how human needs are met
Understands the concepts of goods and services and the roles of producers and consumers
2. Understands the purposes of earning, spending, and saving money
3. Understands the concept of supply and demand
4. Understands types of economies (e.g., command, market, etc.)

Social Studies Discussion Questions

- Given a student work sample such as a historical time line, be able to identify misconceptions and choose an appropriate response to correct the misinformation.
- Given an instructional goal, determine how to best differentiate instruction to help students of different ability levels achieve the goal.
- Make your own time line of United States history, with the centuries beginning with 1400, 1500, 1600, and so on (recognizing, of course, that Native Americans were here for thousands of years before that). Put each of the events listed below your time line in the correct century, and then describe important trends in political, diplomatic, social, religious, artistic, and economic history.

- Given an instructional goal, identify which types of sources (e.g., primary or secondary, newspaper articles or journals, etc.) would best allow students to meet that goal.
- Given a quotation or excerpt and several potential student interpretations, identify which interpretation is most accurate.
- Compare and contrast two representations (e.g., an excerpt or quotation and a secondary source) that reflect the same concept: for example, compare and contrast an excerpt from a Union officer's journal describing a battle in the Civil War and a newspaper article reporting on the same battle.
- What were the weaknesses in the Articles of Confederation that eventually led to its replacement by the Constitution? Why were the Articles written in this way in the first place?
- Name some ways the Constitution affects our lives today.
- How have humans interacted with their environments? How have these interactions affected the environment?
- What characterizes a democracy? What characterizes an autocracy?
- How does scarcity influence the price of a good?
- Write a brief lesson plan to engage students in learning about a historical concept. For example, design a lesson around the signing of the Declaration of Independence.
- Write a plan for scaffolding students' understanding of the American Revolution.
- Design an activity asking students to compare the major features of a democratic government with those of other forms of government. Link this to a discussion of the earliest forms of government in the United States.
- Develop an activity around the following question: How has the United States Constitution influenced the relationship between the federal government and the states (e.g., the Tenth Amendment, the Commerce Clause)?
- Given a student work sample or discussion snippet, provide feedback to increase student comprehension. Then choose an appropriate method to assess student understanding.
- Evaluate a student argument or rationale to determine the student's level of understanding and to determine the strengths and weaknesses to help target instruction.

Tasks of Teaching Reading and Language Arts

Evaluating texts, examples, and graphic representations for their support of particular Reading and Language Arts instructional goals

Creating and modifying texts, examples, and graphic representations to support particular Reading and Language Arts instructional goals, including differentiation for particular learners

Analyzing language and language systems

Explaining, defining, and demonstrating Reading and Language Arts processes and concepts for students

Facilitating class discussions and conversations with individual students to elicit or develop their thinking about particular Reading and Language Arts content

Evaluating instructional strategies and activities to elicit, develop, or assess students' thinking about particular Reading and Language Arts content or to develop or assess their facility with particular Reading and Language Arts processes

Evaluating student reading, writing, speaking, and listening to identify specific strengths and/or areas for improvement or instructional focus

Evaluating student reading, writing, speaking, or listening to classify students' level of literacy development

Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions

Responding to student reading, writing, speaking, or listening to target the particular content issue in need of attention

Tasks of Teaching Social Studies

Anticipating student thinking in relation to social studies content

Selecting, adapting, and creating resources to support particular social studies instructional goals

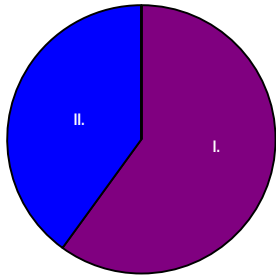
Demonstrating understanding of social studies content in order to apply social studies concepts and skills in instruction

Evaluating student ideas evident in work, talk, actions, and interactions to identify strengths and areas for instructional focus

Designing learning experiences to promote student understanding of social studies content and processes in the school and in the community

Elementary Education: Mathematics and Science (5008)

Test Code	5008
Time	2 hours
Number of Questions	85 selected-response questions
Format	Selected-response questions
Test Delivery	Computer delivered

	Mathematics and Science Categories	Approximate Number of Questions	Approximate Percentage of Examination
	I. Mathematics	51	60%
	II. Science	34	40%

All questions assess content from the above Mathematics and Science domains. Approximately 70 percent of the questions in each subject area assess content applied to a Task of Teaching.

About This Subtest

The Praxis Elementary Education: Mathematics and Science subtest is designed to assess the content knowledge that prospective elementary education teachers must have to support children’s learning in these content areas. The 85 selected-response questions focus on the broad knowledge of mathematics and science necessary for prospective teachers of children in primary through upper elementary school grades. The assessment is designed and developed through work with practicing elementary teachers, teacher educators, and higher education content specialists familiar with the National Council of Teachers of Mathematics (NCTM) standards, the National Science Teaching Association (NSTA) standards, and the Next Generation Science Standards (NGSS).

The test consists of a variety of selected-response questions for which you will select one or more answer choices, and other types of questions. You can review the possible question types in Understanding Question Types.

This test may contain some questions that will not count toward your score.

Content Topics

This list details the topics that may be included on the test. All test questions will cover one or more of these topics.

I. Mathematics

A. Counting and Operations with Whole Numbers

1. Counting
 - a. Counts and skip counts whole numbers between 0 and 1,000
 - b. Connects counting to cardinality
2. Operations with Whole Numbers
 - a. Demonstrates understanding of representations of addition, subtraction, multiplication, and division (including objects such as manipulatives, drawings, and diagrams), and relates these representations of operations to expressions and equations
 - b. Solves mathematical and real-world problems involving the four operations, including solving problems by using properties of operations and Determine the Reasonableness of Results within the context of a given problem

- c. Identifies properties of operations (e.g., commutative, associative, distributive) and uses them to solve abstract and real-world problems
- d. Knows how to use basic concepts of number theory, including prime and composite numbers, factors and multiples.

B. Place Value and Decimals

1. Place Value and Decimals
 - a. Demonstrates a conceptual understanding of the value of the digits in a number
 - b. Compares multidigit and decimal numbers
 - c. Compares, orders, and classifies rational numbers, presented in different representations.
 - d. Rounds multidigit and decimal numbers
 - e. Composes and decomposes multidigit numbers into groupings, and understands why grouping and ungrouping are helpful in performing operations on multidigit and decimal numbers
 - f. Uses drawings and objects such as manipulatives to represent place value, relating these drawings

and objects to numerical equations and written descriptions

different strategies for these operations, and building intuition about how the operations work (e.g., recognizing that multiplying a whole number by a fraction that is less than one makes the product smaller)

C. Fractions, Operations with Fractions, and Ratios

1. Fractions and Operations with Fractions
 - a. Demonstrates understanding of fractions as part-whole relationships, as multiples of unit fractions, as numbers, and as ratios, moving back and forth flexibly among these conceptualizations
 - b. Demonstrates understanding of equipartitioning, and that it is a building block for understanding fractions as part-whole relationships
 - c. Demonstrates understanding of fraction equivalence
 - d. Uses a variety of strategies for comparing fractions to other fractions or decimals numbers, where there are two or more numbers being compared.
 - e. Performs operations such as addition, subtraction, multiplication, and division with fractions as well as with fractions and whole numbers, understanding and using

2. Ratios, Proportions, and Percents
 - a. Understands and applies concept of ratios and unit rates to describe relationships between two quantities and solve problems.
 - b. Uses proportional relationships and percents to solve ratio and percent problems

D. Early Equations and Expressions, Measurement, and Geometry

1. Early Equations and Expressions
 - a. Demonstrates understanding of what it means for algebraic terms, expressions, and equations to be considered equivalent, how the equal sign is used to represent relational equivalence, and that equations maintain their equivalence status under certain algebraic manipulations

- b. Determines whether equations are true, identifies the missing values that would make them true, solves equations using the four operations, and solves relational statements by substitution
- c. Follows the standard order of operations (including the use of parentheses and the distributive property of multiplication over addition) and uses properties of operations to evaluate and manipulate algebraic expressions, equations, and formulas
- d. Demonstrates awareness of different interpretations of the word “variable,” including the ideas of quantities that are unknown, which underlies understanding of solving equations, and quantities that vary, which can be connected to patterns and will support later understanding of functional relationships
- e. Uses the less-than and greater-than relational symbols ($<$, $>$) to compare quantities

2. Measurement

- a. Recognizes which attributes of objects are measurable and uses common measurable attributes to compare two objects.
- b. Chooses appropriate measurement tools and units of measurement to take measurements
- c. Calculates and estimates perimeter, area, volume, and measurements of angles in mathematical and real-world problems, including composed shapes.
- d. Knows relative sizes of the US customary units and metric units and converts units within each system.
- e. Knows how to represent and interpret data presented in various displays.

3. Geometry

- a. Demonstrates understanding of shapes and their attributes
- b. Demonstrates understanding of lines, line segments, rays, and angles in two-dimensional figures
- c. Identifies and classifies two-dimensional and three-dimensional figures and classifies two-dimensional figures based on properties

- d. Knows the components of the coordinate plane and how to graph ordered pairs on the plane

Mathematics Discussion Questions

- What are some counting tasks that can be used to assess students' understanding of the following key ideas in counting: one-to-one correspondence, counting out a smaller quantity from a larger quantity, cardinality, conservation of cardinality, and ordinality?
- What are some ways students might demonstrate evidence of understanding (or of not understanding) any of the key ideas in counting listed in the preceding question?
- What are some examples of word problems that can be answered using addition or subtraction that have a join structure, a separate structure, a part-part-whole structure, or a comparison structure? What are some examples of word problems that can be answered using addition or subtraction for which the result is unknown, the initial amount is unknown, or the amount of change is unknown?
- Write several word problems that use different models of division (i.e. measurement and partitive) and differing interpretations of the remainder (e.g., discarding the remainder or forcing the answer to the next-highest whole number).
- Review the take-away and comparison interpretations of subtraction and various strategies for adding and subtracting (compensation, shifting the problem, etc.). How could you use moves on a number line to represent solutions to addition and subtraction problems using combinations of these interpretations and strategies?
- Review some common strategies for multiplication, including finding partial products. How would you use various area models to represent these strategies?
- Think of a two-digit multiplication problem. What are strategies to solve the problem that use the commutative property, the associative property, the distributive property, or the place value of the numbers in the problem?
- Look at some different strategies students have used to multiply whole numbers. Which strategies work no matter what whole numbers are being multiplied? Which strategies work only for some whole numbers, and what are those whole numbers? Do the same for addition, subtraction, and division strategies.
- Think of errors students might make when adding, subtracting, multiplying, or dividing whole numbers. How would you describe these errors? Now focus on a particular error. How is a student who makes this error likely to answer another question that requires performing the same operation on other whole numbers?
- What are the advantages of using base-10 numerals rather than another notation for numbers (such as Roman numerals or tally marks)? Why is it important that students know how to convert between standard base-10 numerals and expanded form?

- What are some different strategies students might use to compare multidigit whole numbers or decimal numbers? Which strategies are mathematically valid?
- What are different ways that the number 3.4 could be represented using base-10 blocks?
- Think of errors that students might make when rounding, comparing, adding, or subtracting decimals. What are some examples of problems where the error would be evident, and what are some examples of problems where the error would not be evident?
- How are fractions related to decimals? How are fractions related to remainders in whole number division?
- Choose some common algorithms for working with fractions (e.g., butterfly/cross-multiply for comparing fractions and invert and multiply for dividing fractions). Then explain why each algorithm is mathematically valid.
- Choose two fractions to multiply. Then explain how you could use an area model to represent the product of the two fractions.
- Consider some key concepts of fractions (e.g., fractions arise from partitioning a whole into equal parts; the same quantity can be represented by equivalent fractions). What wording must be included in an explanation to correctly address the concept? Why are unit fractions important?
- What are some observations students might make about patterns they see when comparing, multiplying, or dividing fractions (e.g., “The fraction with the bigger numerator is always the bigger fraction” and “When you divide a number by a fraction, the answer is always bigger than the original number”)? For what types of fractions will the pattern hold?
- What are different ways to name a fraction (e.g., seven tenths, seven divided by ten, seven to ten)? What mathematical meaning is emphasized by each way to name the fraction?
- What is the relationship between fractions and ratios? Between fractions and percents?
- How can benchmark numbers be used when comparing fractions or performing operations with fractions?
- Look up some word problems involving addition, subtraction, or multiplication of fractions. How could each problem be represented using an area model, a number line, or a tape diagram?
- Look at some samples of student work that shows how to compare or add fractions. What strategies or abilities are demonstrated in the student work? What lack of understanding, if any, is demonstrated in the student work?
- Look at different strategies students have used to compare, multiply, or divide fractions. Determine whether the strategy will work no matter what fractions are in the problem, and if not, determine what the limitations are.
- Think of different incorrect answers students give when using an area model to represent a fraction or to compare fractions. What misconceptions might underlie those incorrect answers?
- Think of a fraction addition problem. What are some errors students might make when solving the problem? Now focus on a particular error. How is a student who makes this error likely to

- solve a different addition problem? Do the same for subtraction, multiplication, and division problems with fractions.
- Look at some samples of student explanations of properties of operations (e.g., commutative property, associative property, distributive property) or properties of numbers (e.g., odd, even, divisible by 5). For each explanation, does the student merely assume that the property is true without showing why, only give examples to show that the property is true, or actually show that the property is true in general?
 - Think of different ways that the number of squares in the outside border of a square grid can be found without counting. Can you write an expression to represent each method?
 - What is the order of operations and why is it used?
 - Think of a two-step equation. What are some errors students might make when solving the equation? Now focus on a particular error. How is a student who makes this error likely to solve a different two-step equation? Do the same for one-step equations.
 - What are some activities that can be used when introducing students to measurement? What measurement concepts are related to these activities?
 - Identify the examples that illustrate a measurement concept (e.g., direct measurement versus indirect measurement and standard units versus informal units).
 - Look at some samples of student work on or student responses to measurement problems (e.g., measuring length with a ruler; finding area, perimeter, or volume; converting between measurement units). What does each sample tell you about the students' understanding of the concepts assessed in the problem?
 - What kinds of data are appropriate for students to represent and display? What kinds of information might students find in their data?
 - Look at different sets of quadrilaterals and identify a characteristic that the quadrilaterals have in common. What is the most comprehensive set of quadrilaterals that will still have the characteristic in common?
 - Think of different classifications of quadrilaterals (e.g., parallelogram, trapezoid, rectangle). What are some assumptions students might make about the characteristics of all quadrilaterals in a certain classification? What, if any, are examples that would demonstrate that those assumptions are incorrect?

II. Science

A. Earth and Space Sciences

1. Earth's Place in the Universe
 - a. Motion of the Earth, Moon, Sun and stars (e.g., Earth's rotation on its axis, Earth's orbit around the Sun)
 - b. Observable changes in the length and direction of daily shadows, the amount of daylight throughout the year and the seasonal appearance of some stars in the night sky
2. Earth Systems
 - a. Earth Materials and Systems
 - Evidence of change in rock formations and fossils in rock layers
 - Effects of weathering or the rate of erosion by water, ice, wind, or vegetation
 - Interaction(s) of the geosphere, biosphere, hydrosphere, and/or atmosphere
 - Distribution of water on Earth including the percentages of salt water and freshwater in various reservoirs
 - Basic patterns of features shown on maps (e.g., mountains, volcanoes, ocean trenches)

- Local weather conditions and typical conditions expected during a season
 - Climates in different regions of the world
- b. Earth and Human Activity
 - Relationship between the needs of plants and animals (including humans) and the places they live
 - Natural hazards (e.g., flooding, earthquakes, fire)
 - Environmental impact of human activity (e.g., the use of renewable and nonrenewable energy sources)
 - Use of science ideas to protect Earth's resources and environment

B. Life Sciences

1. Organisms
 - a. Structures and Processes
 - How plants and animals use internal and external structures for survival, growth, reproduction, and processing information
 - b. Growth and Development
 - Unique life cycles of plants and animals with common stages (birth, growth, reproduction, death)

- Behavior of parents and offspring that help offspring survive (e.g., forming groups)
 - Traits inherited from parents versus those traits influenced by the environment
 - Trait variations that help an organism to survive, find a mate, and reproduce in a particular environment
2. Ecosystems
 - a. Interdependent Relationships and Environmental Change
 - Models depicting the movement of matter/energy among plants, animals, decomposers, and the environment (e.g., food webs, energy pyramids)
 - Methods of seed dispersal and pollination
 - Impact of environmental change on the plants and animals within an ecosystem
 - b. Matter and Energy Flow
 - Survival needs of plants and animals (including humans)
 - Sun's role as the original source of energy in animals' food

C. Physical Sciences

1. Matter and Interactions
 - a. Structure and Properties of Matter
 - Understanding that all matter consists of particles too small to be seen
 - Physical properties of matter (e.g., mass, volume, color, texture, hardness)
 - Identification of materials based on their properties
 - b. Physical and Chemical Changes
 - Changes (reversible and irreversible) resulting from heating, cooling, or mixing substances
 - Understanding that the total mass of matter always stays the same when undergoing a physical or chemical change
 - Determining whether the mixing of two or more substances results in a new substance
2. Forces, Energy, and Waves
 - a. Forces and Motion
 - Effects of push and pull forces (balanced and unbalanced) on the motion of an object

- Using an object's motion to predict the future motion of an object
 - Electric or magnetic forces between two objects (e.g., attraction/repulsion)
 - Earth's gravitational force exerted on objects in a downward direction
- b. Energy and Waves
- Conservation of energy
 - Relationship between the speed and energy of an object
 - Transfer of energy from place to place by sound, light, heat, and electric currents
 - Changes in energy that occur when objects collide
 - Simple diagrams or models of how light, water, and sound waves behave (includes properties such as wavelength, pitch, amplitude, vibration)

Science Discussion Questions

- How might a teacher help students learn and use science process skills?
- What is the inquiry method as it relates to science?
- What is a scientific hypothesis?
- What concepts cut across the scientific disciplines?
- What are some examples of measuring instruments?
- What graphical method would be most suitable for illustrating the relative amounts of solid waste that are recycled, incinerated, and disposed of in landfills?
- Give examples of how an event, such as the clear-cutting of the tropical rain forests, has had both positive and negative impacts on humans and the environment.
- Compare the pros and cons of the following sources of power: geothermal, nuclear, hydroelectric, solar, and fossil fuel.
- What are some of the signs that a chemical reaction took place when two substances are mixed?
- What is an example of a change of state?
- Is concrete one substance or a mixture?
- What is an example of a device that converts chemical energy into light?
- Does air take up space?
- What causes an object in motion to accelerate or slow down?
- What is the difference between weight and mass?
- Describe various ways in which an object can have several forces acting on it and still be at rest.

- How are visible light waves similar and different from sound waves and water waves?
- What is an example of light bending?
- What are some examples of attractive forces?
- How does a compass work?
- How is the energy of a rock sitting on the top of a hill different from the energy of a rock sitting at the bottom of the same hill?
- What is the inside of Earth like?
- What is the difference between rocks and minerals?
- What are fossils and how are they formed?
- What causes a volcano to erupt?
- What causes earthquakes?
- What causes tides? What do “low tide” and “high tide” mean?
- How do oceans affect climate?
- What causes the seasons on Earth?
- How does a lunar eclipse occur?
- How are the inner planets of the solar system different from the outer planets?
- How are stars different from planets?
- Why do the coldest temperatures in the Northern Hemisphere occur during the month of January even though Earth is closer to the Sun in January than it is in July?
- What do microscopes show us about cells?
- Why are roots, stems, and leaves important to plants?
- What are the major components of the human circulatory system?
- How does the human digestive system work?
- What are dominant and recessive traits?
- How can two parents with brown eyes have a child with blue eyes?

- How does the human body maintain a constant temperature?
- What happens if certain kinds of organisms, such as edible plants, are introduced or removed from a food chain?
- What are the roles of producers and decomposers in a food web?

Tasks of Teaching Mathematics

Explanations (includes justifications and reasoning)

Comparing explanations to determine which is valid, generalizable, or complete

Critiquing the validity, generalizability, or explanatory power of mathematical explanations

Critiquing an explanation for the purpose of determining how it could be mathematically improved for completeness, validity, or generalizability.

Writing mathematically valid explanations for a process, conjecture, relationship, etc.

Conjectures

Determining whether a student conjecture is valid and/or generalizable and for what domain.

Making a conjecture based on mathematical evidence

Mathematical language and definitions

Identifying mathematical language that is precise and supports key mathematical ideas

Evaluating mathematical definitions for precision, generalizability, how well they support a particular mathematical idea or instructional goal, validity, or usefulness in a context

Creating mathematical definitions

Restating a conjecture, explanation, definition, etc. using more precise mathematical language

Mathematical structure

Determining or posing problems with the same (or different) mathematical structure

Determining which student strategies or ideas are most closely connected with respect to mathematical structure

Matching word problems with a given mathematical structure

Examples, non-examples, and counter-examples

Selecting or evaluating examples for a mathematical purpose (e.g., highlighting mathematical ideas or relationships; introducing a concept; illustrating an idea; illustrating the appropriateness of a strategy, procedure, or practice; addressing particular student questions, misconceptions, or partial conceptions)

Generating or identifying a non-example for a particular purpose (e.g., highlight a mathematical distinction)

Generating or identifying a counter-example for an incorrect or partially incorrect student conjecture

Mathematical problems

Evaluating whether a particular problem matches a particular purpose (e.g., elicit a particular mathematical idea, support the use of a particular solution strategy or mathematical practice, or address the same concept/idea as a given problem)

Selecting one or more problems that will assess particular student conceptions or errors

Mathematical goals and topics

Choosing which mathematical topics are most closely related to a particular mathematical goal (e.g., the mathematics a teacher wants to teach)

Determining a mathematical reason for a content progression in a particular topic area

Representations and Manipulatives

Selecting, creating, or evaluating representations or manipulatives for a mathematical purpose or to show a particular mathematical idea (e.g., to support a particular way of understanding content, validity, generalizability, match to a concept, completeness, usability)

Critiquing how representations or manipulatives have been used to show particular mathematical ideas, relationships between ideas, mathematical processes, or strategies in a text, talk, or written work.

Explaining how a representation or manipulative can be used to demonstrate a particular mathematical concept

Connecting or matching representations

Strategies (procedural strategies & mathematical approaches)

Determining whether written work demonstrates use of a particular mathematical idea or strategy

Determining whether a strategy is mathematically valid or generalizable

Identifying which students are using the same correct strategy in written work

Errors and incorrect thinking

Anticipating how a student error would replicate across similar problems

Choosing which student work samples represent the same error

Interpreting a mathematical error

Identifying tasks or situations where student work or talk that seems mathematically valid might mask incorrect thinking

Tasks of Teaching Science

Scientific Instructional Goals, Big Ideas, and Topics

Selecting or sequencing age-appropriate, grade-level instructional goals or big ideas for a topic

Identifying the big idea or instructional goal of an instructional activity

Choosing which science ideas or instructional activities are most closely related to a particular instructional goal

Linking science ideas to one another and to particular activities, models, and representations within and across lessons

Scientific Investigations and Demonstrations

Selecting investigations or demonstrations that facilitate understanding of disciplinary core ideas, scientific practices, or crosscutting concepts

Evaluating investigation questions for quality (e.g., testable, empirical)

Determining the variables, techniques, or tools that are appropriate for use by students to address a specific investigation question

Critiquing scientific procedures, data, observations, or results for their quality, accuracy, or appropriateness

Evaluating and selecting media for engaging students in virtual investigations not possible in firsthand situations

Supporting students in generating questions for investigation or identifying patterns in data and observations

Scientific Resources (texts, curriculum materials, journals, and other print and media-based resources)

Evaluating instructional materials and other resources for their ability to sufficiently address scientific concepts; engage students with relevant phenomena; develop and use scientific ideas; promote students' thinking about phenomena, experiences, and knowledge; provide a sense of purpose; take account of students' ideas; and assess student progress

Choosing resources that support the selection of accurate, valid, and age-appropriate goals for science learning

Student Ideas (including common misconceptions, alternate conceptions, and partial conceptions)

Analyzing student ideas for common misconceptions regarding intended scientific learning

Selecting diagnostic items and eliciting student thinking about scientific ideas and practices to identify common student misconceptions and the basis for those misconceptions

Developing or selecting instructional moves, approaches, or representations that provide evidence about common student misconceptions and help students move

toward a better understanding of the idea, concept, or practice

Identifying the connections between students' talk and work and scientists' talk and work

Scientific Language, Discourse, Vocabulary, and Definitions

Selecting scientific language that is precise, accurate, grade-appropriate, and illustrates key scientific concepts

Anticipating scientific language and vocabulary that may be difficult for students

Supporting and critiquing students' participation in and use of verbal and written scientific discourse and argumentation

Modeling the use of appropriate verbal and written scientific language in critiquing arguments or explanations, in describing observations, or in using evidence to support a claim, etc.

Scientific Explanations (includes claim, evidence, and reasoning)

Critiquing student-generated explanations or descriptions for their generalizability, accuracy, precision, or consistency with scientific evidence

Selecting explanations of natural phenomena that are accurate and accessible to students

Scientific models and representations (analogies, similes, metaphors, simulations, illustrations, diagrams, data tables, performances, videos, animations, graphs, and examples)

Evaluating or selecting scientific models and representations that predict or explain scientific phenomena or address instructional goals

Engaging students in using, modifying, creating, and critiquing scientific models and representations that are matched to an instructional goal

Evaluating student models or representations for evidence of scientific understanding

Generating or selecting diagnostic questions to evaluate student understanding of specific models or representations

Evaluating student ideas about what makes for good scientific models and representations

Reading and Language Arts & Social Studies (5007): Sample Test Questions

The sample questions that follow are examples of the kinds of questions that are on the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with rationales follow the questions.

Directions: Select the best answer or answers for each question below.

Reading and Language Arts Sample Test Questions

1. The following is a student's first draft of a paragraph.

(1) My dog, Bandito, is always making my family laugh. (2) He jumps on the couch. (3) He falls asleep on the couch and starts snoring. (4) Bandito even likes to swim in our pool. (5) Once while we were out he tore up a pillow and got stuffing everywhere. (6) We couldn't find him when we got home because he was hiding. (7) Bandito is a pretty funny dog

Which of the following revisions would most strengthen the structure of the paragraph?

- (A) Omit sentence 1.
- (B) Combine sentences 2 and 3.
- (C) Break sentence 6 into two sentences.
- (D) Omit sentence 7.

2. **Questions 2 and 3 refer to the following passage.**

These days, eyeglasses can look pretty cool. Still, the day may come when your son or daughter asks you for contact lenses. There are pros to consider—and cons. The U.S. Food and Drug Administration regulates contact lenses and certain contact lens care products as medical devices. Contact lenses have benefits, says Bernard P. Lepri, O.D., M.S., M.Ed., an FDA optometrist in the agency's Contact Lens and Retinal Devices Branch. "They can be better for sports activities, because they don't break as frames and the lenses of glasses can. And they provide better peripheral vision for sports, or driving, if your teen is of driving age," Lepri explains. Moreover, in some cases, contact lenses improve the quality of vision in comparison to eyeglasses, especially when a child is very nearsighted, says Lepri. "On the other hand, you have to remember that contact lenses are medical devices, not cosmetics," Lepri says. "Like any medical device, contact lenses should be used only if they can be used safely and responsibly. And only under the supervision of your eye care professional." Serious injury to the eye can result, particularly if the contact lenses are not removed at the first hint of a problem.

—Food and Drug Administration, from "What to Know if Your Child Wants Contact Lenses"

Which of the following inferences is best supported by the passage?

- (A) Wearing glasses has become a more popular trend for children in recent years.
- (B) Older children may be better suited to wearing contact lenses than younger children.
- (C) Wearing contact lenses is a safer choice for children than wearing glasses.
- (D) Contact lenses may assist children in daily activities more effectively than glasses.

3. **Questions 2 and 3 refer to the following passage.**

These days, eyeglasses can look pretty cool. Still, the day may come when your son or daughter asks you for contact lenses. There are pros to consider—and cons. The U.S. Food and Drug Administration regulates contact lenses and certain contact lens care products as medical devices. Contact lenses have benefits, says Bernard P. Lepri, O.D., M.S., M.Ed., an FDA optometrist in the agency's Contact Lens and Retinal Devices Branch. "They can be better for sports activities, because they don't break as frames and the lenses of glasses can. And they provide better peripheral vision for sports, or driving, if your teen is of driving age," Lepri explains. Moreover, in some cases, contact lenses improve the quality of vision in comparison to eyeglasses, especially when a child is very nearsighted, says Lepri. "On the other hand, you have to remember that contact lenses are medical devices, not cosmetics," Lepri says. "Like any medical device, contact lenses should be used only if they can be used safely and responsibly. And only under the supervision of your eye care professional." Serious injury to the eye can result, particularly if the contact lenses are not removed at the first hint of a problem.

—Food and Drug Administration, from "What to Know if Your Child Wants Contact Lenses"

Which **TWO** of the following sentences from the passage best suggest its overall structure?

- (A) "These days, eyeglasses can look pretty cool."
 - (B) "Still the day may come when your son or daughter asks you for contact lenses."
 - (C) "They can be better for sports activities, because they don't break as frames and the lenses of glasses can."
 - (D) "Moreover, in some cases, contact lenses improve the quality of vision in comparison to eyeglasses, especially when a child is very nearsighted, says Lepri."
 - (E) "Serious injury to the eye can result, particularly if the contact lenses are not removed at the first hint of a problem."
4. Which of the following words would a student working on short vowel sounds most likely decode easily?
- (A) Farm
 - (B) Was
 - (C) Pig
 - (D) The

5. A teacher shows the word “chip” along with a picture of a potato chip.

Teacher: If we want to sound out the word “chip,” we would say /k/ /h/ /i/ /p/.

Student: No, that doesn’t sound right.

Teacher: You are correct. Instead of saying the /k/ and /h/ sounds, we say the special sound /ch/ at the beginning of the word.

Which of the following skills is the teacher introducing?

- (A) Consonant diagraph
- (B) Consonant blend
- (C) Vowel diagraph
- (D) Vowel diphthong

6. A teacher gives students a set of cards, which are represented in the following table.

C	AT
P	OT
R	AT
P	IG
B	UG
TW	IG

Which **TWO** of the following activities will the cards best help students complete?

- (A) Identifying rimes
- (B) Identifying onsets
- (C) Forming rhyming words
- (D) Forming multisyllabic words
- (E) Breaking words into individual phonemes

7. Which of the following words contains a vowel, consonant, e syllabication pattern?
- (A) Whale
 - (B) Pumpkin
 - (C) Title
 - (D) Puzzle
8. In the word “restructure,” the word part “struct” is its
- (A) suffix
 - (B) prefix
 - (C) root
 - (D) rime
9. Which **TWO** of the following are functions of a suffix when it is added to a verb?
- (A) To alter the tense of the verb
 - (B) To give the verb an opposite meaning
 - (C) To change the verb to a different part of speech
 - (D) To change the emphasis of the verb’s pronunciation
 - (E) To describe the verb’s relationship with other words in a sentence
10. Which of the following student behaviors best signals a need for more instruction in accuracy?
- (A) The student shows no interest in reading the text.
 - (B) The student reads the text in a monotone voice.
 - (C) The student misreads several words in the text.
 - (D) The student reads the text very slowly.

11. A teacher uses the following sentence when discussing parts of speech.

The cat hid under the towel.

In the sentence, the word “under” is functioning as

- (A) an adjective
- (B) an article
- (C) an adverb
- (D) a preposition

12. The following is an excerpt from a student’s narrative essay.

Rushing home, Zach tripped up the front steps. He threw his backpack onto the chair as the door slammed behind him. He thought, “How could I forget about Zoe?” As he grabbed the leash from the hook on the wall, he heard Zoe whining. He ran quickly towards the kitchen, shouting, “Don’t worry, girl, I’m here! I will never forget about you again.”

In the excerpt, Zach is best described as which of the following?

- (A) Remorseful
- (B) Exhausted
- (C) Enthusiastic
- (D) Timid

13. Which of the following sources would be considered most reliable for use during a research project on endangered species?

- (A) A newspaper article about a biologist’s endangered species research
- (B) An online article on the 100 most common endangered species
- (C) A blog post about ways people harm endangered species
- (D) An individual’s Web site identifying well-known endangered species

14. A kindergarten teacher shows students a page from a book with one line of text and asks the following questions.

Can you show me with your finger which way I go as I read the page?

Can you show me the word I should read first?

What is this called or used for? [teacher points to question mark]

The activity will best help to reinforce which of the following skills?

- (A) Phonological awareness
- (B) Alphabetic principle
- (C) Concepts of print
- (D) Phonics

15. A teacher is using the following sentence to demonstrate figurative language.

While running through the field of flowers, Fiona saw five finches flying through the air toward their nest.

The sentence includes an example of which of the following?

- (A) Hyperbole
- (B) Simile
- (C) Onomatopoeia
- (D) Alliteration

16. How many phonemes are in the word "ball"?

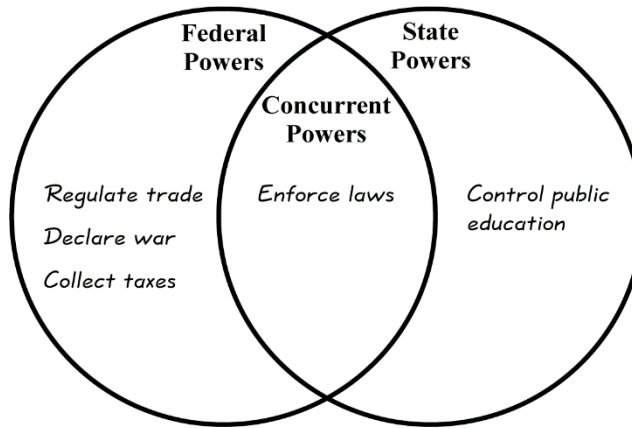
- (A) 1
- (B) 2
- (C) 3
- (D) 4

Social Studies Sample Test Questions

17. During a unit on the early United States government, students should explore the role of the Articles of Confederation in which **TWO** historical developments?

- (A) The establishment of the Plymouth colony
- (B) The American Revolution
- (C) Shays' Rebellion
- (D) The Northwest Ordinance
- (E) The French and Indian War
- (F) Bacon's Rebellion

18. After a lesson on the levels of the United States government, students are assigned to fill in a Venn diagram. The following diagram was produced by a student.



The completed diagram indicates that the student could benefit from instructional focus on which of the following concepts of governmental powers?

- (A) The federal and state governments can both collect taxes.
- (B) Only state governments can enforce laws.
- (C) The federal and state governments can both regulate trade.
- (D) Only the federal government can control public education.

19. During a civics unit, students identify several safety concerns about their community playground. The teacher asks the students to write a letter to a government official asking them to address the safety issues. To be most effective, which of the following government officials should the letters be addressed to?
- (A) The chairperson of the state board of education
 - (B) The chief of police
 - (C) The district’s representative in Congress
 - (D) The neighborhood’s representative on the city council
20. Which of the following social studies learning objectives is best supported by assigning students to read secondary source documents?
- (A) Exploring and comparing multiple points of view about a historical event
 - (B) Developing knowledge about a historical event before completing a critical thinking activity
 - (C) Developing an understanding of how to read and interpret timelines
 - (D) Completing authentic learning experiences to exercise problem-solving skills
21. Indicate in the following chart whether each classroom activity is a formative assessment or a summative assessment.

For each row, select **ONE** choice.

	Formative Assessment	Summative Assessment
Students work in small groups to create a map featuring community landmarks before a lesson on relative location.		
Students complete a multiple-choice assessment after finishing a geography unit.		
Students briefly respond to a vocabulary question before the start of each class.		

22. Indicate in the following chart whether each statement best characterizes a democracy, an autocracy, or an oligarchy.

For each row, select **ONE** choice.

	Democracy	Autocracy	Oligarchy
Supreme authority is concentrated in a single person and is passed down through hereditary succession.			
Government power rests with a small group of people distinguished by nobility, wealth, or military rank.			
Citizens elect representatives to form a governing body.			

23. A history teacher wants students to understand how sources can often support multiple interpretations of information, events, or concepts. Which of the following sources best serves as an example?

- (A) A Census Bureau graph showing the total United States population in 2000
- (B) A transcript of the majority and dissenting opinions from a Supreme Court case
- (C) A time line of events that occurred during the Civil War
- (D) A textbook chapter on the regions in which Native American groups settled

24. After a geography lesson on the causes and effects of human migration, a fourth-grade teacher leads a discussion with students about reasons why different groups of people came to the United States in the early 1900s nineteenth century. The discussion is most likely to provide which **TWO** of the following instructional opportunities?

- (A) Evaluating student arguments for use of appropriate social studies processes
- (B) Observing student mastery of United States demographic trends
- (C) Determining student misconceptions about details or concepts from the lesson
- (D) Activating student interest through their lived experiences
- (E) Developing student research and document-analysis skills

25. Anthony has a total of \$85.00 in savings. His school district does not provide transportation because he lives less than two miles from school. He would like to purchase a bike so he does not have to walk to school. He also would like to purchase a video game so that he can play with his friends after school and on weekends. The bicycle and the video game cost \$80.00 each at a local store, so Anthony can purchase only one or the other.

Anthony's scenario can be used in a lesson on which of the following economic concepts?

- (A) Surplus
- (B) Price elasticity
- (C) Competition
- (D) Opportunity cost

26. In the United States, the division of power between the national and state governments demonstrates the principle of

- (A) checks and balances
- (B) federalism
- (C) separation of powers
- (D) the rule of law

Reading and Language Arts & Social Studies Answers

1. The correct answer is (B). Sentences 2 and 3 from the student's paragraph are choppy as written, but they can be easily combined by introducing a compound predicate.
2. The correct answer is (B). The passage offers supporting evidence that responsibility plays a key role for those wearing contacts, and thus older children would generally be better suited to wearing contacts than younger ones would be.
3. The correct answers are (C) and (D). In choice (C) the sentence clues the reader that the passage is organized in a compare and contrast structure through the direct compare and contrast of contact lenses and eyeglasses. In choice (D) the sentence uses the phrases "Moreover" and "in comparison," making an obvious suggestion about the compare and contrast text structure.
4. The correct answer is (C). The short vowel sounds match 1 to 1 (p-i-g), so the word is easily decodable.
5. The correct answer is (A). A diagraph contains two consonants and only one sound such as /ch/.
6. The correct answers are (A) and (B). (A) is correct because the cards divide the words into onsets and rimes, and the second column contains the rimes. (B) is correct because the first column contains the onsets.
7. The correct answer is (A). "Whale" exhibits the vowel, consonant, e pattern in "ale."
8. The correct answer is (C). "Struct," meaning to build, is the root word or base of the word "restructure."
9. The correct answers are (A) and (C). (A) is correct because a suffix is a group of letters placed after the root of a word in order to change its tense. (C) is correct because adding certain suffixes such as "-ment" or "-ion" to a root word can change it from a verb to a noun. For example, adding "-ment" to the verb "excite" creates the noun "excitement," and adding "-ion" to the verb "locate" creates the noun "location."
10. The correct answer is (C). Reading with mistakes indicates the need for more instruction in reading accuracy.
11. The correct answer is (D). A preposition is used to show location or relationship between a noun and another noun or verb in a sentence. In the sample sentence, "under" is used to show that the cat is located under the towel.
12. The correct answer is (A). Good descriptive writing uses precise language. Remorse is shown through the use of the phrases "How could I forget about Zoe?" and "I will never forget about you again." as well as through the use of the word showing Zach's speed to get home: "rushing."

13. The correct answer is (A). Out of the possible choices, the newspaper article would be the most reliable because newspapers contain good, factual information.
14. The correct answer is (C). Concepts of print refers to the knowledge of how print works. In this case, the teacher can assess the students' awareness of directionality, concept of word, and punctuation.
15. The correct answer is (D). In the sentence the phrase ". . . field of flowers, Fiona saw five finches flying . . ." is alliteration because it contains repeated consonant sounds at the beginning of words in the phrase.
16. The correct answer is (C). The word structure is /b/ /a/ /l/. "ll" is a digraph that makes only one sound.
17. The correct answers are (C) and (D). The Articles of Confederation were ratified in 1781 and established rules for how the newly created United States would govern. Shays' Rebellion is often taught as a way to understand how the federal government under the Articles of Confederation was unable to finance a military force to address a violent insurrection in Massachusetts. The Northwest Ordinance is often cited as a success of the Articles of Confederation in establishing a process to admit new territories to the union.
18. The correct answer is (A). The completed Venn diagram incorrectly suggests that only the federal government can collect taxes. The teacher should provide instruction that taxation is a concurrent power, shared by both federal and state governments.
19. The correct answer is (D). The neighborhood's city council representative is the official most likely to be able to effect change regarding a local playground safety issue.
20. The correct answer is (B). Secondary sources provide a layer of interpretation or analysis about a topic and can be used to develop a general understanding about a historical event and provide a general background about a historical event.
21. The first and third responses in the chart are examples of formative assessments. The goal of formative assessments is to monitor student learning to inform further instruction, identify areas for improvement, or to determine previous knowledge about a content area. Creating a map before a lesson on relative location and having students respond to brief vocabulary questions before each class can provide such feedback. The second response in the chart is an example of a summative assessment. Summative assessments evaluate student learning at the end of an instructional unit.
22. The first response is an example of an autocracy. A government in which all power is concentrated in a single person, often through hereditary succession, characterizes an autocracy. The second response is an example of an oligarchy. A

government in which a small group of people distinguished by nobility, wealth, military rank, and other sociopolitical statuses characterizes an oligarchy. The third response is an example of a democracy. A government in which citizens elect a representative governing body to legislate in the interest of the people characterizes a democracy.

23. The correct answer is (B). The role of a Supreme Court justice is to interpret the constitutionality of laws. In Supreme Court decisions, the majority and dissenting opinions of the justices are based on their interpretations of the Constitution. (A) is incorrect because a single number such as a population total is not likely to allow for multiple interpretations. (C) is incorrect because a time line of events shows only chronological information, which is not likely to be used to generate differing opinions. (D) is incorrect because a textbook chapter most likely reflects a general consensus about how events have been interpreted.
24. The correct answers are (A) and (C). The classroom discussion serves as a formative assessment for students to review the content about human migration. Holding the discussion about immigration in the early 1900s provides interdisciplinary opportunities for students to practice and demonstrate using critical thinking skills, applying the new geography content knowledge, and making persuasive arguments. The activity also provides the teacher with an opportunity to

observe where students may have developed misconceptions about the lesson, or areas on which the teacher should focus the next lesson. (B) is incorrect because a formative assessment such as a classroom discussion relating geographic concepts to a topic in United States history may not provide enough of an opportunity for students to demonstrate mastery on either of the subjects. (D) is incorrect because while some students may have lived experiences about immigrating to the United States, it is not likely that the discussion will activate the same interest for every student. (E) is incorrect because the classroom discussion is meant to be a formative assessment and will not likely involve performing research on the topic or document analysis.

25. The correct answer is (D). Opportunity cost refers to the true cost of making an economic decision. In the scenario Anthony must choose between two products. If he chooses to buy the bicycle, he loses the opportunity to buy the video game he wants, along with the \$80.00 that the bicycle costs. By considering the opportunity cost of buying one product over the other, Anthony is making a decision about which product is more important to him. (A) is incorrect. Surplus describes an excess in profits, capital, or goods. Anthony does not have a surplus in income to afford both of the goods, and there is no indication that the store is overstocked with bicycles and video games. (B) is incorrect. Price elasticity is a measure of the

responsiveness of consumer demand to a change in the price of a good. Anthony's decision to purchase either the bicycle or the video game is not being affected by a change in price. (C) is incorrect. Competition encourages firms to produce similar goods efficiently and keep prices low to ensure that consumers buy their products. The products that Anthony is considering are not likely to be produced by the same firms and are priced similarly.

26. The correct answer is (B). Federalism is the division of power between a central government and constituent governments, called states in the United States. Checks and balances refers to the constitutional arrangement of powers that prevents one branch of the government from becoming too powerful. Separation of powers refers to the division of power among the three branches of the United States government. The rule of law is the principle which holds that no person is above the law.

Mathematics and Science (5008): Sample Test Questions

The sample questions that follow are examples of the kinds of questions that are on the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with rationales follow the questions.

Directions: Select the best answer or answers for each question below.

Mathematics Sample Test Questions

1. Dora made a pile of 5 counters. Then Mr. Levy asked her to add counters to her pile of 5 so that the pile would have 7 counters. Dora counted out 7 more counters and added them to the pile of 5 counters.

Which of the following statements most likely explains the reason behind Dora’s error?

- (A) Dora does not fully understand one-to-one correspondence between numbers and objects.
- (B) Dora does not yet have a concept of the quantity 7.
- (C) Dora does not yet understand that one quantity can be composed of two smaller quantities.
- (D) Dora does not yet know her number facts for sums greater than 10.

Task of Teaching Mathematics	30. Interpreting a mathematical error
Topic	A. Counting and Operations with Whole Numbers
Subtopic	1. Counting

2. **Problem:** Rosana had a total of 9 shirts. She gave 2 to Emily. How many shirts does Rosana have now?

Which of the following problems has the same mathematical structure as the preceding problem?

- (A) Rosana used 7 paint colors for her project. Emily used 2 different paint colors for her project. How many paint colors did Rosana and Emily use together?
- (B) Rosana has some books. She bought 1 more book. Now she has 8 books. How many books did Rosana start with?
- (C) Rosana has a total of 3 stickers. Emily has 6 more stickers than Rosana. How many stickers does Emily have?
- (D) Rosana brought 5 cookies for lunch. How many cookies did she have after she ate the cookies?

Task of Teaching Mathematics	11. Determining or posing problems with the same (or different) mathematical structure
Topic	A. Counting and Operations with Whole Numbers
Subtopic	2. Operations with Whole Numbers

3. Josh is a third-grade student in Ms. Carter’s classroom. Josh’s answers to three addition problems are shown in the following work.

$$\begin{array}{r}
 385 \\
 + 462 \\
 \hline
 7147
 \end{array}
 \qquad
 \begin{array}{r}
 453 \\
 + 427 \\
 \hline
 8710
 \end{array}
 \qquad
 \begin{array}{r}
 321 \\
 + 836 \\
 \hline
 1157
 \end{array}$$

He incorrectly answered the first two problems but correctly answered the third problem. He will use the same strategy to answer the following problem.

$$\begin{array}{r}
 328 \\
 + 564 \\
 \hline
 \hline
 \end{array}$$

What will Josh’s answer be?

Task of Teaching Mathematics	28. Anticipating how a student error would replicate across similar problems
Topic	A. Counting and Operations with Whole Numbers
Subtopic	2. Operations with Whole Numbers

4. Ms. Hayes asked her students to calculate the difference $0.7 - 0.07$ by converting the decimals into base-10 fractions.

One student, Daryl, answered the problem as represented in the following work.

$$\begin{aligned} 0.7 - 0.07 &= \frac{7}{10} - \frac{7}{100} \\ &= \frac{70}{100} - \frac{7}{100} \\ &= \frac{63}{100} \\ &= 0.63 \end{aligned}$$

When Ms. Hayes asked Daryl to explain his strategy, he said, "The answer is 63 hundredths. I wrote the decimals 7 tenths and 7 hundredths as fractions and subtracted them. Since I wanted the denominators to be the same, I added a zero to the first 7 and a zero to 10. And 70 hundredths minus 7 hundredths is 63 hundredths."

Which of the following changes to Daryl's explanation is best for clarifying the mathematics that underlie his strategy?

- (A) He should indicate why $0.7 = \frac{7}{10}$ and $0.07 = \frac{7}{100}$
- (B) He should point out that $\frac{7 \times 10}{10 \times 10} = \frac{70}{100}$
- (C) He should point out that $\frac{70}{100} - \frac{7}{100} = \frac{70-7}{100}$
- (D) He should indicate why $0.63 = \frac{63}{100}$

Task of Teaching Mathematics	3. Critiquing an explanation for the purpose of determining how it could be mathematically improved for completeness, validity, or generalizability.
Topic	B. Place Value and Decimals
Subtopic	1. Place Value and Decimals

5. Ms. Dale wants her students to develop mental strategies that can be used to find the answer to addition and subtraction problems, including composing and decomposing numbers based on place value.

In one lesson, she asks her students to find numbers whose sum or difference is 28. She then has seven students share their answers as she writes them on the board.

Which **THREE** of the following student answers are most closely related to Ms. Dale's goal that students will be able to compose and decompose numbers based on place value?

- (A) $7+7+7+7$
- (B) $8+10+10$
- (C) $14+14$
- (D) $20+8$
- (E) $20+10-2$
- (F) $25+3$
- (G) $39-11$

Task of Teaching Mathematics	25. Determining whether written work demonstrates use of a particular mathematical idea or strategy
Topic	B. Place Value and Decimals
Subtopic	1. Place Value and Decimals

6. A student used the same method to find the answer to three decimal subtraction problems. The student correctly answered the first problem but incorrectly answered the other two problems, as represented in the following work.

$$\begin{array}{r} \\ 12.75 \\ - 7.95 \\ \hline 4.80 \end{array} \qquad \begin{array}{r} 28.9 \\ - 6.98 \\ \hline 22.08 \end{array} \qquad \begin{array}{r} \\ \cancel{31} \\ - 2.7 \\ \hline 29.7 \end{array}$$

If the student continues to use the same method, which of the following problems is the student most likely to answer incorrectly?

- (A) $17.6 - 4.38$
- (B) $13.7 - 4.9$
- (C) $15.46 - 0.04$
- (D) $10.78 - 0.5$

Task of Teaching Mathematics	18. Selecting one or more problems that will assess particular student conceptions or errors
Topic	B. Place Value and Decimals
Subtopic	1. Place Value and Decimals

7. Which **THREE** of the following expressions are equivalent to $3,956 \times 4$?

(A) $3,000 \times 4 + 900 \times 4 + 50 \times 4 + 6 \times 4$

(B) $(4,000 \times 4 - 100 \times 4) + (60 \times 4 - 4 \times 4)$

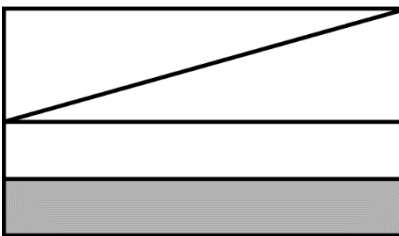
(C) $4 \times 3 + 4 \times 9 + 4 \times 5 + 4 \times 6$

(D) $4,000 \times 4 - 40 \times 4 - 4 \times 4$

(E) $3 \times 1,000 \times 4 + 95 \times 100 \times 4 + 6 \times 1 \times 4$

Topic	B. Place Value and Decimals
Subtopic	1. Place Value and Decimals

8. Mr. McCormick's students are working on naming fractions represented by area models. He asks his students to write the fraction represented by the shaded area in the large rectangle in the following figure and to explain their answer.



One student writes, "I think it is $\frac{1}{4}$ because the bottom part of the rectangle is divided into 2 parts."

Which of the following revisions of the student's answer most improves the mathematical precision of the explanation?

- (A) "I think it is $\frac{1}{4}$ because the rectangle is divided in half and the bottom part of it is divided into 2 parts."
- (B) "I think it is $\frac{1}{4}$ because the rectangle is divided in half and the bottom part of it is divided into 2 halves."
- (C) "I think it is $\frac{1}{4}$ because the rectangle is divided into 2 parts and the bottom part of it is divided into 2 parts."
- (D) "I think it is $\frac{1}{4}$ because the rectangle is divided into 2 parts and the bottom part of it is divided into 2 parts of equal area."

Task of Teaching Mathematics	10. Restating a conjecture, explanation, definition, etc. using more precise mathematical language
Topic	C. Fractions, Operations with Fractions, and Ratios
Subtopic	1. Fractions and Operations with Fractions

9. Which of the following word problems can be answered by finding the quotient of $3\frac{1}{4}$ and $\frac{1}{3}$?

Select **ALL** that apply.

- (A) Casey poured $3\frac{1}{4}$ quarts of fruit punch into cups. She filled each cup with $\frac{1}{3}$ quart of fruit punch. How many cups did Casey fill?
- (B) A pump working at a constant rate filled $3\frac{1}{4}$ equal-sized tanks of water in $\frac{1}{3}$ hour. At the same rate, how many tanks will the pump fill in 1 hour?
- (C) Laura uses $\frac{1}{3}$ of a piece of ribbon that is $3\frac{1}{4}$ feet long to wrap a present. What is the length of the ribbon she used to wrap the present?

Topic	C. Fractions, Operations with Fractions, and Ratios
Subtopic	1. Fractions and Operations with Fractions

10. A student found an incorrect answer to the problem $\frac{3}{4} + \frac{5}{6}$. The student's answer is represented in the following work.

$$\frac{3}{4} + \frac{5}{6} = \frac{9}{12} + \frac{10}{12} = \frac{19}{24}$$

Which of the following student work samples shows work that is most similar to the preceding work?

- (A) $\frac{3}{8} + \frac{2}{3} = \frac{3}{24} + \frac{2}{24} = \frac{5}{24}$
- (B) $\frac{4}{5} + \frac{1}{2} = \frac{16}{20} + \frac{10}{20} = \frac{26}{20}$
- (C) $\frac{5}{7} + \frac{3}{4} = \frac{9}{11} + \frac{10}{11} = \frac{19}{22}$
- (D) $\frac{1}{2} + \frac{7}{9} = \frac{9}{18} + \frac{14}{18} = \frac{23}{36}$

Task of Teaching Mathematics	29. Choosing which student work samples represent the same error
Topic	C. Fractions, Operations with Fractions, and Ratios
Subtopic	1. Fractions and Operations with Fractions

11. A student filled in the missing numbers in three number sentences, using the same reasoning in all three problems. The student's work is shown in the following figure.

Write the number that belongs in each box to make each number sentence true.

$$6 + 5 = \boxed{11} + 4$$

$$\boxed{13} - 4 = 9 - 6$$

$$\boxed{2} + 7 = 9 + 4$$

Which of the following statements most likely explains the reasoning behind the student's incorrect answers?

- (A) The student lacks fluency with adding and subtracting within 20.
- (B) The student thinks that any number can be written in each blank.
- (C) The student thinks that the answer to the left-hand side of the equation comes right after the equal sign.
- (D) The student thinks that there must always be an odd number and an even number on each side of the equal sign.

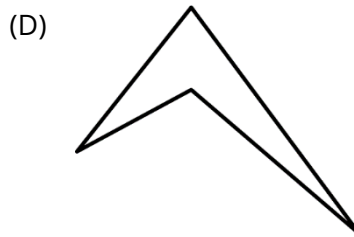
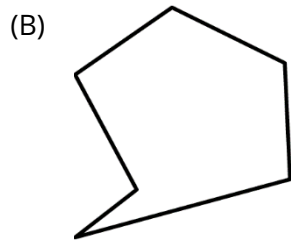
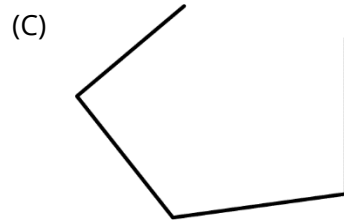
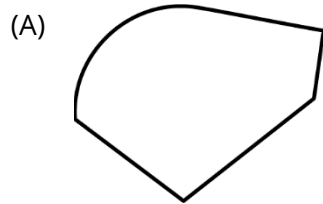
Task of Teaching Mathematics	30. Interpreting a mathematical error
Topic	D. Early Equations and Expressions, Measurement, and Geometry
Subtopic	1. Early Equations and Expressions

12. A first-grade teacher is planning activities to introduce students to nonstandard units of measurement. Which of the following activities will best meet the teacher’s goal?
- (A) Asking students to stand in a line from the shortest person to the tallest
 - (B) Asking students to use pencils to measure the length of a desk
 - (C) Asking students to determine how many one-liter bottles of water can fill a one-gallon container
 - (D) Asking students to use a measuring tape to measure the length of the classroom door

Task of Teaching Mathematics	17. Evaluating whether a particular problem matches a particular purpose (e.g. for example, elicit a particular mathematical idea, support the use of a particular solution strategy or mathematical practice, or address the same concept/idea as a given problem)
Topic	D. Early Equations and Expressions, Measurement, and Geometry
Subtopic	2. Measurement

13. Mr. Bass is working on defining quadrilaterals with his students. He notices that many students are focused on the number of sides, saying things like “a quadrilateral is a shape with four sides.”

Which **TWO** of the following figures are most likely to support students in refining their definition of quadrilaterals?



Task of Teaching Mathematics	15. Generating or identifying a non-example for a particular purpose (e.g. highlight a mathematical distinction)
Topic	D. Early Equations and Expressions, Measurement, and Geometry
Subtopic	3. Geometry

Science Sample Test Questions

14. A teacher asks students to predict whether the Sun would look different to them if they were suddenly transported from Earth to Neptune. Which of the following written responses demonstrates the most accurate scientific reasoning?
- (A) Earth and Neptune are both in our solar system, so the Sun would look the same to me on both planets.
 - (B) The Sun would look larger and brighter when I'm looking at it from Neptune because Neptune is closer to the Sun than Earth is.
 - (C) Neptune is farther from the Sun than Earth is, so the Sun would look smaller and dimmer when I'm standing on Neptune than it does when I'm standing on Earth.
 - (D) If I went from Earth to Neptune, the Sun would look larger and brighter to me because Neptune is larger than Earth and is farther from the Sun than Earth.

Task of Teaching Science	19. Critiquing student-generated explanations or descriptions for their generalizability, accuracy, precision, or consistency with scientific evidence
Topic	A. Earth and Space Sciences
Subtopic	1. Earth's Place in the Universe

15. Which of the following procedures will best allow students to investigate seasonal changes in the amount of daylight?
- (A) Once a week, students will record the length of the shadow cast by a meterstick at local noon.
 - (B) Once a week, students will record whether it is dark or light outside at breakfast time and at dinnertime.
 - (C) Each day, students will record the high temperature measured and reported by a nearby weather station.
 - (D) Each day, students will record the location (direction) on the horizon where the Sun rises and sets.

Task of Teaching Science	5. Selecting investigations or demonstrations that facilitate understanding of disciplinary core ideas, scientific practices, or crosscutting concepts
Topic	A. Earth and Space Sciences
Subtopic	1. Earth's Place in the Universe

16. A class is brainstorming ideas for reducing the various effects of damage to the existing homes and other buildings in a community that experiences annual river flooding. Students present several different ideas, and then the class discusses the merits of each idea with the goal of choosing one to develop into a project. Which of the following ideas should the students choose if their goal is to help reduce the financial costs associated with the annual flooding?
- (A) Organizing a national campaign to increase awareness among homeowners about the federal flood insurance program
 - (B) Restoring the riverbank back to the natural habitat and creating ecological barriers to hold back floodwaters after heavy rains
 - (C) Educating the community on the relationship between climate change and the increased intensity of extreme weather events, such as flooding
 - (D) Developing new businesses that are located several miles away from the riverbanks

Task of Teaching Science	18. Supporting and critiquing students' participation in and use of verbal and written scientific discourse and argumentation
Topic	A. Earth and Space Sciences
Subtopic	2. Earth Systems

17. A teacher is selecting resources to use in a discussion about whether plants pass on traits to their offspring. Which of the following resources is most appropriate to include in the discussion?
- (A) A photograph of a forest with mature and immature oak trees
 - (B) A diagram showing the different parts of an adult bean plant
 - (C) A video of the various species of dwarf shrubs typical of Arctic ecosystems
 - (D) A drawing showing a cactus plant at the beginning of its life cycle

Task of Teaching Science	10. Evaluating instructional materials and other resources for their ability to sufficiently address scientific concepts; engage students with relevant phenomena; develop and use scientific ideas; promote students' thinking about phenomena, experiences, and knowledge; provide a sense of purpose; take account of students' ideas; and assess student progress
Topic	B. Life Sciences
Subtopic	1. Organisms

18. A teacher presents students with a picture of a polar bear in the desert and a picture of a camel in the Arctic. The teacher then leads the students in a discussion of how the animals will likely respond to the two different situations. The activity described is most appropriate for including in a unit on which of the following topics?

- (A) Behaviors of parents and offspring that help the offspring to survive
- (B) The internal and external structures that animals use for reproduction
- (C) The ecological roles of the different types of organisms in an ecosystem
- (D) Trait variations that help organisms to survive in particular environments

Task of Teaching Science	2. Identifying the big idea or instructional goal of an instructional activity
Topic	B. Life Sciences
Subtopic	1. Organisms

19. Students and their teacher develop several different models of how animals contribute to the processes of pollination and the dispersal of plant seeds. Which **THREE** of the following features are the most relevant to modeling how animals contribute to pollination and seed dispersal?

- (A) The presence of fur or hair
- (B) The presence of wings or legs
- (C) An ability to recognize flowers by color or smell
- (D) An ability to change skin patterns or colors

Task of Teaching Science	22. Engaging students in using, modifying, creating, and critiquing scientific models and representations that are matched to an instructional goal
Topic	B. Life Sciences
Subtopic	2. Ecosystems

20. In a classroom activity, a teacher heated an ice cube until it melted completely. The teacher then asked each student in the class to propose a method for changing the physical state of the water again. Of the following written responses, which **TWO** demonstrate the most accurate scientific reasoning?

- (A) The ice cube changed to a liquid when heat was added. If more heat is added to the liquid water and it gets hot enough, it can become a gas.
- (B) Adding heat to the ice cube made it change to liquid water. Adding cold to the water can make it change back into an ice cube.
- (C) Heating the ice cube made the gas bubbles inside it change to a liquid. Turning the heat off will make the liquid change back to a gas.
- (D) When heat was added to the ice, it turned to a liquid. Taking the heat away from the liquid water by putting it in the freezer will make ice.

Task of Teaching Science	19. Critiquing student-generated explanations or descriptions for their generalizability, accuracy, precision, or consistency with scientific evidence
Topic	C. Physical Sciences
Subtopic	1. Matter and Interactions

21. A teacher is working with students to develop a method for separating a mixture of iron filings, sand, salt, and glass marbles into the component parts. The teacher provides the students with a spoon, a glass jar, a magnet, a funnel, filter paper, and water. To help the students begin, the teacher asks them to recall what they learned about the solubility of different substances in water. In the activity described, the water will be most useful for separating which of the following components from the mixture?

- (A) The iron filings
- (B) The sand
- (C) The salt
- (D) The glass marbles

Task of Teaching Science	4. Linking science ideas to one another and to particular activities, models, and representations within and across lessons
Topic	C. Physical Sciences
Subtopic	1. Matter and Interactions

22. A class is investigating how pushing and pulling on a cart affects the cart's motion. Two students are selected to stand on opposite sides of the cart, and each student will either push or pull the cart according to the instructions provided by the other students in the class. Which of the following is a misconception that could cause a student to provide incorrect instructions?

- (A) Pulling in opposite directions with different strengths will make the cart move.
- (B) Pushing equally in opposite directions will make the cart stay in the same spot.
- (C) Pushing and pulling in the same direction will move the cart faster than pulling in opposite directions.
- (D) Pushing and pulling in the same direction with different strengths will make the cart stay in the same spot.

Task of Teaching Science	12. Analyzing student ideas for common misconceptions regarding intended scientific learning
Topic	C. Physical Sciences
Subtopic	2. Forces, Energy, and Waves

Mathematics and Science Answers

1. The correct answer is (C). Dora counted out 7 more counters, not realizing that 5 can be part of 7, so she does not seem to understand that one quantity can be composed of two smaller quantities. Choice (A) is not the key because Dora actually counted out 7 more counters, so there is evidence that she does understand one-to-one correspondence. Choice (B) is not the key because Dora counted out 7 counters, so there is evidence that she has a concept of the quantity 7. Choice (D) is not the key because even though Dora made a pile of 12 counters, knowing number facts for sums greater than 10 was not necessary for the original task, which was to add counters to her pile of 5 counters so there would be 7 counters in the pile. Therefore, (D) does not explain the reason behind Dora's error.
2. The correct answer is (D). In the original problem, an initial quantity is given and a portion of it is then taken away, and the problem asks for the resulting quantity. Choice (D) has the same structure. In the problem in (A), two parts are given (the paint colors Rosana used and the paint colors that Emily used), and the problem asks for the whole. In the problem in (B), the initial quantity is unknown, an additional book is joined to that quantity, and the end result is given. In the problem in (C), an initial quantity is given (Rosana's stickers), the amount by which it differs from a second quantity (Emily's stickers) is also given, and the problem asks for the size of the second quantity (Emily's stickers).

While this problem, like the original one, can be solved directly by subtraction, the structure reflects a comparison rather than a reduction of quantity, and the information is presented in a different order.

3. The correct answer is 8812. Josh's error is that he is not regrouping when necessary; instead he is just writing the sum of the digits in each place value column. His written answer is correct in the third problem because 11 hundreds (the result of adding 3 hundreds and 8 hundreds) is equivalent to regrouping to get 1100. However, when he does not regroup in the first two problems, his written answers are incorrect. For example, in the first problem, Josh adds 8 tens and 6 tens to get 14 tens, but instead of regrouping 10 of those tens to get 100 and then writing the final answer as 847, Josh just adds the 3 hundreds and the 4 hundreds and then writes the final answer as 7147. Therefore, if Josh uses the same method in the last problem, he will add 8 and 4 to get 12 ones, but he will not regroup, and then he will add 2 and 6 to get 8 and 3 and 5 to get 8, and his final answer will be 8812.
4. The correct answer is (B). When Daryl tried to explain why $\frac{7}{10} = \frac{70}{100}$, what he really said was that $\frac{7+0}{10+0} = \frac{70}{100}$. However, 70 comes from multiplying 7 by 10, and 100 comes from multiplying 10 by 10, so a better explanation would be to say that he had to multiply the numerator and

denominator of $\frac{7}{10}$ by 10 to obtain the equivalent fraction $\frac{70}{100}$. Choice (A) is incorrect because Daryl clearly conveyed that $0.7 = \frac{7}{10}$ and $0.07 = \frac{7}{100}$ by referring to the decimals 0.7 and 0.07 as 7 tenths and 7 hundredths, respectively, which linked each of the two decimal numbers to its corresponding base-10 fraction. Choice (C) is incorrect because Daryl did point out that $\frac{70}{100} - \frac{7}{100} = \frac{70-7}{100}$ when he said, "And 70 hundredths minus 7 hundredths is 63 hundredths." Choice (D) is incorrect because Daryl referred to the decimal 0.63 as 63 hundredths, which was a direct link to the base-10 fraction $\frac{63}{100}$.

5. The correct answers are (B), (D), and (E). A decomposition of numbers based on place value means that the number is written as the sum or difference of tens and ones. In (B) the number 28 is decomposed as the sum of 2 tens, $10 + 10$, and 8 ones. In (D) the number 28 is decomposed as the sum of 2 tens, 20, and 8 ones. In (E) the number 28 is decomposed as the difference of 3 tens, written as the sum of 2 tens and 1 ten, and 2 ones. Choice (A) is incorrect because the number 28 is decomposed as a repeated addition of the number 7, so this decomposition is related to skip counting. Choice (C) is incorrect because the number 28 is decomposed as the sum of 14 and itself, so this decomposition is related

to doubles. Choices (F) and (G) are incorrect because although both answers are decompositions of 28, neither of the numbers in either decomposition is a multiple of 10.

6. The correct answer is (A). The student incorrectly answered the decimal subtraction problems in which the minuend has fewer digits to the right of the decimal point than the subtrahend has. Since the student correctly answered the problem in which the minuend and the subtrahend have the same number of digits to the right of the decimal point, it is likely that the student would also correctly answer the problems in (B) and (C). It is also likely that the student would correctly answer the problem in (D) by bringing down the 8 and subtracting 5 from 7 to get 10.28.
7. The correct answers are (A), (B), and (D). Since 3,956 can be written as $3,000 + 900 + 50 + 6$, the given expression is equivalent to $(3,000 + 900 + 50 + 6) \times 4$. Applying the distributive property yields $3,000 \times 4 + 900 \times 4 + 50 \times 4 + 6 \times 4$, which is the expression in (A). Since 3,956 can be written as $3,900 + 56$, the given expression is equivalent to $(3,900 + 56) \times 4$. Applying the distributive property yields $3,900 \times 4 + 56 \times 4$. One can rewrite 3,900 as $4,000 - 100$ and 56 as $60 - 4$, which yields the equivalent expression $(4,000 - 100) \times 4 + (60 - 4) \times 4$. Applying the distributive property, again yields $(4,000 \times 4 - 100 \times 4) + (60 \times 4 - 4 \times 4)$ which is the expression in (B). Since 3,956

can be written as $4,000 - 40 - 4$, the given expression is equivalent to $(4,000 - 40 - 4) \times 4$. Applying the distributive property yields $4,000 \times 4 - 40 \times 4 - 4 \times 4$, which is the expression in (D). Applying the distributive property to the expression in (C) yields $4 \times (3 + 9 + 5 + 6)$, which is equivalent to 4×23 , but this expression is not equivalent to the given expression. Since $6 \times 1 = 6$, applying the distributive property to the expression in (E) yields $(3 \times 1,000 + 95 \times 100 + 6) \times 4$, which is equivalent to $(3,000 + 9,500 + 6) \times 4$. The sum of the numbers in the parentheses is 12,506; therefore, the expression in (E) is not equivalent to the given expression.

8. The correct answer is (B). An area model for a fraction is a geometric figure whose area is partitioned into a number of disjoint parts so that any two of the parts have equal areas. In the large rectangle, each of the two triangles in the top part and each of the two small rectangles in the bottom part have an area equal to $\frac{1}{4}$ of the area of the large rectangle. The revision in (B) is precise because it explains that the rectangle is partitioned so that the area of the shaded part of the model is equal to $\frac{1}{4}$ of the area of the model. Choice (A) is not correct because the revision does not explain that the 2 parts of the bottom part of the rectangle are of equal area. Choices (C) and (D) are not correct because neither of these
- revisions explains that the top and bottom parts of the rectangle have equal area.
9. The correct answers are (A) and (B). The problem in (A) is a measurement division problem. Solving the problem involves answering the question, "How many $\frac{1}{3}$ -quart units are there in $3\frac{1}{4}$ quarts?" The answer can be found by dividing $3\frac{1}{4}$ by $\frac{1}{3}$. The problem in (B) is a unit rate problem, since it asks how many tanks the pump will fill in 1 hour. Solving the problem involves answering the question, "What is the rate of tanks per hour at which the pump is working if it fills $3\frac{1}{4}$ tanks in $\frac{1}{3}$ hour?" Since the rate is measured in tanks per hour, the answer can be found by dividing $3\frac{1}{4}$ by $\frac{1}{3}$. Solving the problem in (C) involves answering the question, "What is $\frac{1}{3}$ of $3\frac{1}{4}$ feet?" The answer can be found by multiplying $3\frac{1}{4}$ by $\frac{1}{3}$ but cannot be found by dividing $3\frac{1}{4}$ by $\frac{1}{3}$, so (C) is not correct.
10. The correct answer is (D). When the student answered the problem $\frac{3}{4} + \frac{5}{6}$, the student first correctly found equivalent fractions to $\frac{3}{4}$ and $\frac{5}{6}$ that shared the least common denominator. However, the student

then incorrectly added the fractions by adding the denominators to get an answer of $\frac{19}{24}$ rather than using the common denominator, which would have led to the correct answer of $\frac{19}{12}$.

Similarly in (D), the work shows that the student correctly found equivalent fractions that shared the least common denominator, but the student then incorrectly added the fractions by adding the denominators. The work in (A) is different because the student found the least common denominator, but the rewritten fractions are not equivalent to the original fractions. The work in (B) is different because the student did not find the least common denominator, and then the student correctly added the fractions. The work in (C) is different because the student did not correctly find equivalent fractions that shared the least common denominator.

11. The correct answer is (C). The correct interpretation of the equal sign is that the expression to the left of the equal sign has the same value as the expression to the right of the equal sign, but the student misinterpreted the equal sign to mean that the value of the expression to the left is the same as the first number immediately following the equal sign. The student's answer to each equation makes sense if all symbols that follow the first number to the right of the equal sign are ignored, so choices (A) and (B) are incorrect. Although the student's

answers are consistent with the statement in (D), the statement in (C) is a more likely explanation of the student's reasoning than the statement in (D).

12. The correct answer is (B). Standard units of measurement are universally available and are the same size in all contexts, while nonstandard units are invented measures that are not considered accepted standards of measurement (for example, pencils, shoes, or blocks). Choice (A) is incorrect because it does not involve any measurement but requires students to stand in order of height. Choices (C) and (D) are incorrect because they involve standard units of measurement.
13. The correct answers are (A) and (C). The figure in (A) has four sides, but one side is curved, which highlights the need to clarify that the sides of quadrilaterals must be line segments. The figure in (C) has four sides but is not closed, which highlights the need to clarify that quadrilaterals are closed figures. Choice (B) is not a correct choice because the students would correctly say the figure is not a quadrilateral since it does not have four sides, so it would not support the students in refining their definition of quadrilaterals. Choice (D) is not a correct choice because, based on their definition, the students would correctly say that it is a quadrilateral, so it would not support the students in refining their definition of quadrilaterals.

14. The correct answer is (C). The response demonstrates the most accurate scientific reasoning by indicating that Neptune is farther from the Sun than Earth is and by indicating that the Sun will appear smaller and dimmer when viewed from farther away.
15. The correct answer is (B). Students will be able to identify patterns in how the amount of daylight changes as one season changes to the next.
16. The correct answer is (B). This idea best addresses the impact of the annual flooding on the existing homes and other buildings and suggests a community-based and cost-effective solution to the problem.
17. The correct answer is (A). Students will be able to see that the mature and immature oak trees share similar features, which will help the students understand that plants pass on traits to their offspring.
18. The correct answer is (D). The traits that help the polar bear to survive in an Arctic environment might be less helpful for survival in a desert environment. Similarly, the traits that help the camel to survive in a desert environment might be less helpful for survival in an Arctic environment.
19. The correct answers are (A), (B), and (C). Some plants have seeds with hooks on their surface that attach to the fur or hair of certain animals, which results in the dispersal of the seeds. For pollination or seed

dispersal, some plants rely on animals that move from one place to another using structures such as wings or legs. Some plants have vividly colored flowers or aromatic flowers that attract specific species that transfer pollen.

20. The correct answers are (A) and (D). These responses demonstrate accurate scientific reasoning. Heating the water to its boiling point will result in a change in the physical state of the water from liquid to gas. Removing heat (thermal energy) from the liquid water by cooling it in a freezer to below its freezing point will result in a change in the physical state of the water from liquid to solid.
21. The correct answer is (C). Of the four components in the mixture, only the salt will dissolve in the water, forming a solution of salt water. The salt water can be separated from the mixture by using filter paper. The salt can be recovered from the salt water by using evaporation.
22. The correct answer is (D). If the two students push and pull in the same direction, the cart will move in that direction, even when the students are pushing and pulling with different strengths.

Understanding Question Types

The *Praxis*® assessments include a variety of question types: constructed response (for which you write a response of your own); selected response, for which you select one or more answers from a list of choices or make another kind of selection (e.g., by selecting a sentence in a text or by selecting part of a graphic); and numeric entry, for which you enter a numeric value in an answer field. You may be familiar with these question formats from taking other standardized tests. If not, familiarize yourself with them so you don't spend time during the test figuring out how to answer them.

Understanding Selected-Response and Numeric-Entry Questions

For most questions, you respond by selecting an oval to select a single answer from a list of answer choices.

However, interactive question types may also ask you to respond by:

- Selecting more than one choice from a list of choices.
- Typing in a numeric-entry box. When the answer is a number, you may be asked to enter a numerical answer. Some questions may have more than one entry box to enter a response. Numeric-entry questions are generally found on mathematics tests.
- Selecting parts of a graphic. In some questions, you will select your answers by selecting a location (or locations) on a graphic such as a map or chart, as opposed to choosing your answer from a list.
- Selecting sentences. In questions with reading passages, you may be asked to choose your answers by selecting a sentence (or sentences) within the reading passage.
- Dragging and dropping answer choices into targets on the screen. You may be asked to select answers from a list of choices and to drag your answers to the appropriate location in a table, paragraph of text or graphic.
- Selecting answer choices from a drop-down menu. You may be asked to choose answers by selecting choices from a drop-down menu (e.g., to complete a sentence).

Remember that with every question you will get clear instructions.

Understanding Constructed-Response Questions

Some tests have constructed-response questions, which require you to demonstrate your knowledge in a subject area by writing your own response to topics. Essays and short-answer questions are types of constructed-response questions.

For example, an essay question might present you with a topic and ask you to discuss the extent to which you agree or disagree with the opinion stated. You must support your position with specific reasons and examples from your own experience, observations, or reading.

Review a few sample essay topics:

- *Brown v. Board of Education of Topeka*

“We come then to the question presented: Does segregation of children in public schools solely on the basis of race, even though the physical facilities and other ‘tangible’ factors may be equal, deprive the children of the minority group of equal educational opportunities? We believe that it does.”

- A. What legal doctrine or principle, established in *Plessy v. Ferguson* (1896), did the Supreme Court reverse when it issued the 1954 ruling quoted above?
 - B. What was the rationale given by the justices for their 1954 ruling?
- *In his self-analysis, Mr. Payton says that the better-performing students say small-group work is boring and that they learn more working alone or only with students like themselves. Assume that Mr. Payton wants to continue using cooperative learning groups because he believes they have value for all students.*
 - Describe **TWO** strategies he could use to address the concerns of the students who have complained.
 - Explain how each strategy suggested could provide an opportunity to improve the functioning of cooperative learning groups. Base your response on principles of effective instructional strategies.
 - *“Minimum-wage jobs are a ticket to nowhere. They are boring and repetitive and teach employees little or nothing of value. Minimum-wage employers take advantage of people because they need a job.”*
 - Discuss the extent to which you agree or disagree with this opinion. Support your views with specific reasons and examples from your own experience, observations, or reading.

Keep these things in mind when you respond to a constructed-response question:

1. **Answer the question accurately.** Analyze what each part of the question is asking you to do. If the question asks you to describe or discuss, you should provide more than just a list.
2. **Answer the question completely.** If a question asks you to do three distinct things in your response, you should cover all three things for the best score. Otherwise, no matter how well you write, you will not be awarded full credit.
3. **Answer the question that is asked.** Do not change the question or challenge the basis of the question. You will receive no credit or a low score if you answer another question or if you state, for example, that there is no possible answer.
4. **Give a thorough and detailed response.** You must demonstrate that you have a thorough understanding of the subject matter. However, your response should be straightforward and not filled with unnecessary information.
5. **Take notes on scratch paper** so that you don't miss any details. Then you'll be sure to have all the information you need to answer the question.
6. **Reread your response.** Check that you have written what you thought you wrote. Be sure not to leave sentences unfinished or omit clarifying information.

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