

The Praxis® Study Companion

Elementary Education: Content Knowledge for Teaching

7811



Welcome to *The Praxis*® Study Companion

Prepare to Show What You Know

You have been working to acquire the knowledge and skills you need for your teaching career. Now you are ready to demonstrate your abilities by taking a *Praxis*® test.

Using the *Praxis Study Companion* is a smart way to prepare for the test so you can do your best on test day. This guide can help keep you on track and make the most efficient use of your study time.

The Study Companion contains practical information and helpful tools, including:

- An overview of the *Praxis* tests
- Specific information on the *Praxis* test you are taking
- A template study plan
- Study topics
- Practice questions and explanations of correct answers
- Test-taking tips and strategies
- Frequently asked questions
- Links to more detailed information

So where should you start? Begin by reviewing this guide in its entirety and note those sections that you need to revisit. Then you can create your own personalized study plan and schedule based on your individual needs and how much time you have before test day.

Keep in mind that study habits are individual. There are many different ways to successfully prepare for your test. Some people study better on their own, while others prefer a group dynamic. You may have more energy early in the day, but another test taker may concentrate better in the evening. So use this guide to develop the approach that works best for you.

Your teaching career begins with preparation. Good luck!

Know What to Expect

Which tests should I take?

Each state or agency that uses the *Praxis* tests sets its own requirements for which test or tests you must take for the teaching area you wish to pursue.

Before you register for a test, confirm your state or agency's testing requirements at www.ets.org/praxis/states.

How are the *Praxis* tests given?

Praxis tests are given on computer. Other formats are available for test takers approved for accommodations (see page 129).

What should I expect when taking the test on computer?

When taking the test on computer, you can expect to be asked to provide proper identification at the test center. Once admitted, you will be given the opportunity to learn how the computer interface works (how to answer questions, how to skip questions, how to go back to questions you skipped, etc.) before the testing time begins. Watch the [What to Expect on Test Day](#) video to see what the experience is like.

Where and when are the *Praxis* tests offered?

You can select the test center that is most convenient for you. The *Praxis* tests are administered through an international network of test centers, which includes Prometric® Testing Centers, some universities, and other locations throughout the world.

Testing schedules may differ, so see the *Praxis* web site for more detailed test registration information at www.ets.org/praxis/register.

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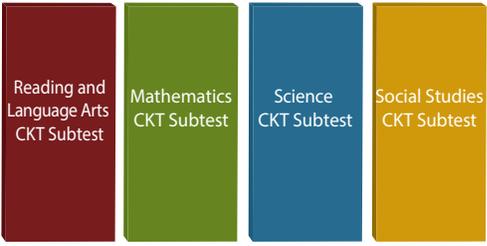
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1. Learn About Your Test

Learn about the specific test you will be taking

Elementary Education: Content Knowledge for Teaching (7811)

Test at a Glance				
Test Name	Elementary Education: Content Knowledge for Teaching (CKT)			
Test Code	7811			
Total Time	4 hours, 45 minutes (four separately timed subjects)			
Format	Selected-response and numeric-entry questions; an on-screen four-function calculator is provided. The Reading and Language Arts subtest may include questions with an audio component.			
Test Delivery	Computer delivered			
Elementary Education: Content Knowledge for Teaching 		Subtests	Subtest Length (Minutes)	Subtest Length (Questions)
		7812 Reading and Language Arts—CKT	90	63
		7813 Mathematics—CKT	85	52
		7814 Science—CKT	60	47
		7815 Social Studies—CKT	50	60

About This Test

The purpose of this test is to assess whether the prospective elementary teacher has the content knowledge needed at the time of entry to the profession in the areas of reading and language arts, mathematics, science, and social studies. It is designed for teacher candidates seeking a generalist elementary school license.

The content covered in each of the four subtests is described in the following pages.

All four subtests—Reading and Language Arts, Mathematics, Science, and Social Studies—are CKT assessments. CKT stands for “Content Knowledge for Teaching.” (See “About the CKT Subtests.”) The questions in these subtests reflect a new approach to identifying and measuring the content knowledge that teachers need. While assessing knowledge of the content that elementary students will learn, the CKT subtests focus on the kind of specialized knowledge of content that a teacher will apply to specific tasks of teaching, such as selecting an appropriate graphic organizer to support students in a particular reading task or interpreting a student’s mathematical misunderstanding based on a pattern of errors.

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

About The CKT Subtests

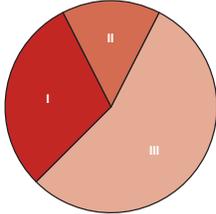
The subtests in mathematics and in reading and language arts were developed through a partnership between the Educational Testing Service and TeachingWorks at the University of Michigan. These tests draw on the theoretical framework of content knowledge for teaching, grounded in over 25 years of research, which identifies a type of professional content knowledge used only in teaching. Research evidence links this specialized content knowledge to improved content teaching and to positive learning outcomes for students. Most questions on the CKT subtests have a content dimension and a task-of-teaching dimension. They measure the specialized content knowledge that a teacher needs about a particular content topic (e.g., comparison of fractions) in order to carry out a content-specific task of teaching (e.g., evaluating a mathematical explanation). The tasks of teaching are based on the work teachers need to do in the content areas to implement high-leverage practices (HLPs) identified by TeachingWorks. HLPs are practices teachers use regularly across all subject areas and grade levels that are critical to helping students learn important content.

For more information about TeachingWorks and HLPs, see <http://www.teachingworks.org/>. For a CKT overview, see Deborah Loewenberg Ball, Mark Hoover Thames, and Geoffrey Phelps, "Content Knowledge for Teaching: What Makes It Special?" *Journal of Teacher Education* 59, no. 5 (2008): 389-407.

Elementary Education: Reading and Language Arts—CKT

(7812) Time: 90 minutes; Format: Selected response and numeric entry



	Reading and Language Arts Categories	Approximate Number of Questions	Approximate Percentage of Examination
	I. Foundational Literacy Skills II. Language III. Constructing Meaning	19 9 35	30% 15% 55%
Total		63	100%

About This Subtest

This subtest focuses on the essential content knowledge needed for teaching elementary reading and language arts. The 60 one-point questions and 3 two-point questions measure two kinds of content knowledge. The first kind is the content knowledge needed to do the work of the student curriculum, such as identifying the details in a passage that support the main idea. Approximately 20 percent of the questions measure this kind of content knowledge. The second kind is the specialized content knowledge needed to teach the student curriculum; this is the knowledge a teacher would use, for instance, when choosing the most appropriate graphic organizer to help students identify the supporting details for a main idea. This specialized content knowledge is not knowledge that students are expected to learn, nor is it general knowledge of classroom management strategies or learning theory; it is content knowledge specialized to the work of teaching elementary reading and language arts. Approximately 80 percent of the questions measure this kind of content knowledge.

Each question focuses on specific reading and language arts content (listed in “Content Topics”). Questions that measure specialized content knowledge also incorporate a particular task of teaching (listed in “Tasks of Teaching English Language Arts (ELA)”); these questions are intended to measure the specialized content knowledge needed to carry out the task effectively.

Below are descriptions of the three sections that follow: “Tasks of Teaching English Language Arts (ELA),” “Content Topics,” and “Measuring Content Knowledge in Practice.”

“Tasks of Teaching English Language Arts (ELA)” lists ten tasks that are a routine part of elementary reading and language arts instruction. These tasks are based primarily on certain high-leverage practices (HLPs) identified by TeachingWorks. They were developed by ETS and TeachingWorks and confirmed by a national committee of elementary teachers and teacher educators as being among the most essential tasks for effective teaching of elementary reading and language arts content.

“Content Topics” is a list of critical reading and language arts content that students are expected to master at the elementary level. The list, developed by a panel of prominent teacher educators and literacy researchers, was derived from student standards for elementary English language arts and literacy. The topics included were confirmed as important by a national survey of the field and refined by a national committee of elementary teachers and teacher educators.

“Measuring Content Knowledge in Practice” provides a more detailed explanation of the relationship between the content topics and tasks of teaching in the subtest. It also provides a sample test question to illustrate this relationship.

Tasks of Teaching English Language Arts (ELA)

This list includes tasks that are essential for effective teaching of elementary reading and language arts.

Planning and Facilitating Instruction

1. Evaluating texts, examples, and graphic representations for their support of particular ELA instructional goals
2. Creating and modifying texts, examples, and graphic representations to support particular ELA instructional goals, including differentiation for particular learners
3. Analyzing language and language systems
4. Explaining, defining, and demonstrating ELA processes and concepts for students
5. Facilitating class discussions and conversations with individual students to elicit or develop their thinking about particular ELA content
6. Evaluating instructional strategies and activities to elicit, develop, or assess students' thinking about particular ELA content or to develop or assess their facility with particular ELA processes

Analyzing Student Learning

7. Evaluating student reading, writing, speaking, and listening to identify specific strengths and/or areas for improvement or instructional focus
8. Evaluating student reading, writing, speaking, or listening to classify students' level of literacy development
9. Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions
10. Responding to student reading, writing, speaking, or listening to target the particular content issue in need of attention

Content Topics

This section includes tasks that are essential for effective teaching of elementary reading and language arts.

I. Foundational Literacy Skills

A. Print Concepts

Understands features of print

1. 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)
2. Differentiates between the pictures and the printed words on a page

B. Alphabetic Principle

Understands that print is a representation of sound in spoken words

1. Identifies the alphabet's uppercase and lowercase letter names, letter shapes, and corresponding sounds
2. 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

C. Phonological Awareness

Understands that words are made up of sound

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

D. Phonics and Word Recognition

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

1. 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/)
2. 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
3. Identifies grade-appropriate, high-frequency words by sight

E. Fluency

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

1. 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)
2. Uses context to confirm or self-correct for word recognition and understanding, rereading words and phrases when necessary
3. Demonstrates sufficient stamina to finish a reading task

II. Language**A. 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)

1. 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”)
2. 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
3. Produces simple, compound, and complex sentences
4. 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”)

B. Vocabulary

Comprehensively understands a wide variety of words, as shown through listening, speaking, reading, and writing

1. 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
2. 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
 - a. clarifies the meaning of an unknown word through context clues, using knowledge of words parts (e.g., affixes and roots)
 - b. makes word associations (e.g., antonyms/synonyms and cognates) and utilizes external resources (e.g., dictionaries and knowledge of peers)

C. 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

1. Discerns the appropriate level of formal language use across various contexts and analyzes the use of English dialects and registers within and across texts
2. Reaches beyond conventional appropriateness in speaking and writing and selects words, phrases, and punctuation for effect and precision
3. Makes choices about how to expand, reduce, and combine sentences in order to infuse writing with meaning, interest, and style

III. Constructing Meaning**A. 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

1. Asks and answers questions to demonstrate understanding of a text and refers to the text to support answers
2. Determines central ideas or themes in a text and summarizes/paraphrases the key supporting details, evidence, and ideas
3. Recounts stories, determining a central message, lesson, or moral and explains how those elements are supported by key details from the text
4. 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

B. Author's Craft and Text Structure

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

1. Analyzes how printed language (such as specific word choice) is used to convey meaning and tone
2. 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
3. Uses text features (e.g., captions, tables of contents, and diagrams) to locate relevant information efficiently and to support comprehension of a text
4. 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)

C. Integration and Application of Knowledge

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

1. 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
2. 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
3. Applies information and ideas to new contexts and problems and integrates information in order to write or speak about a subject knowledgeably
4. Tells how illustrations and other visual representations within a text support reader understanding

D. 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

1. Demonstrates knowledge of typical elements of different genres (e.g., narrator, dialogue, description, quotations, concrete facts and details, and examples)
2. Uses transitional words, phrases, and clauses to link ideas (e.g., “first,” “next,” “then”; “consequently”; and “specifically”) across all text types
3. Uses text structures (e.g., cause/effect, problem/solution, and sequence) for different purposes
4. Uses formats for introducing, sequencing, and concluding all types of texts
5. 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
6. Writes expository texts with a clear introduction to the topic and with supporting facts and concrete details logically grouped and organized

E. Production of Written Texts

Knows how to produce effective writing

1. Produces clear and coherent writing by adapting the organization and style of written information to the audience, task, and purpose
2. 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

F. 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

1. Locates, selects, gathers, recalls, categorizes, and possibly reorganizes relevant information from different text types to support analysis
2. 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)
3. Determines the credibility, accuracy, and biases of sources

G. 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

1. Uses social knowledge of discourse conventions to communicate clearly and persuasively
 - a. knows how to enter and hold a conversation (e.g., through taking turns, acknowledging others’ comments, clarifying information, and building on others’ ideas)
 - b. knows how to be considerate and respectful of others
2. Utilizes group discussions to build knowledge and comprehension
3. Asks and answers questions to seek help, gather additional information, or gain a deeper understanding
4. Paraphrases and summarizes a text or speaker’s main points, reasons, and evidence
5. Expresses ideas and feelings and builds on the ideas of others clearly and persuasively
6. 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
7. Regulates interpretation of texts or sources of information by reflecting on and evaluating others’ perspectives

H. Presentation of Knowledge and Ideas

Knows how to organize and present information in a style appropriate for the audience and purpose

1. Sequences ideas logically
2. Uses appropriate facts and relevant descriptive details to support main ideas
3. Establishes a line of reasoning and organization
4. Speaks clearly and at an understandable pace
5. Adopts a speaking style, register, and dialect appropriate for the given context
6. Uses digital and visual media displays strategically to enhance expression and comprehensibility of ideas

Measuring Content Knowledge in Practice

The sample test question below demonstrates the relationship between the tasks of teaching ELA and the content topics and subtopics in this subtest. Most questions on the subtest will measure the specialized content knowledge needed about a particular subtopic (e.g., I.A., Print Concepts) to carry out a particular task of teaching. While all topics will be covered in the proportions listed in the chart on page 7 (30 percent for Foundational Literacy Skills, 15 percent for Language, and 55 percent for Constructing Meaning), the proportion of different tasks of teaching may vary.

A teacher is administering an informal reading assessment that includes the following sentences.

Monkeys like to play together. They wrestle and roll.

When reading the sentences, one student says the word “wiggle” instead of “wrestle.” The student is likely using which of the following cuing systems?

Select all that apply.

Semantic
 Syntactic
 Graphophenemic

		Tasks of Teaching ELA																				
		1	2	3	4	5	6	7	8	9	10											
Content Topics	I.	A.																				
		B.																				
		C.																				
		D.																				•
		E.																				
	II.	A.																				
		B.																				
		C.																				
	III.	A.																				
		B.																				
		C.																				
		D.																				
			E.																			
			F.																			
		G.																				

Content Topic
I. Foundational Literacy Skills; D. Phonics and Word Recognition

Task of Teaching ELA
9. Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions

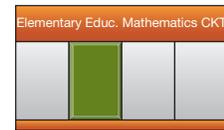
This question measures a test taker’s ability to interpret the miscues that a student makes in the course of reading a text. This is a critical part of the work elementary teachers do to support the development of their students’ phonics and word-recognition skills.

For the reading and language arts subtest, this question is classified as measuring a test taker’s knowledge of the topic “Foundational Literacy Skills” and subtopic D, “Phonics and Word Recognition,” in the context of Task of Teaching #9: “Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions.”

For the answer to this question, an explanation of the answer, and additional sample questions with explanatory information, please see Chapter 3. The sample questions in Chapter 3 demonstrate ways to measure content knowledge related to many different topics and tasks of teaching.

Elementary Education: Mathematics—CKT

(7813) Time: 85 minutes; Format: Selected response and numeric entry;
on-screen four-function calculator provided



	Mathematics Categories	Approximate Number of Questions	Approximate Percentage of Examination
	I. Counting and Operations with Whole Numbers II. Place Value and Decimals III. Fractions, Operations with Fractions, and Ratios IV. Early Equations and Expressions, Measurement, and Geometry Total	16 13 13 10 52	30% 25% 25% 20% 100%

About This Subtest

This subtest focuses on the essential content knowledge needed for teaching elementary mathematics. The 47 one-point questions and 5 two-point questions measure two kinds of content knowledge. The first kind is the content knowledge needed to do the work of the student curriculum, such as solving a math problem similar to one students would solve. Approximately 20 percent of the questions measure this kind of content knowledge. The second kind is the specialized content knowledge needed to teach the student curriculum; this is the knowledge a teacher would use, for instance, when choosing an example to demonstrate a mathematical concept or interpreting a student's mathematical misunderstanding based on a pattern of errors. This specialized content knowledge is not knowledge that students are expected to learn, nor is it general knowledge of classroom-management strategies or learning theory; it is mathematical knowledge specialized to the work of teaching elementary mathematics. Approximately 80 percent of the questions measure this kind of content knowledge.

Each question focuses on specific mathematics content (listed in "Content Topics"). Questions measuring specialized content knowledge also incorporate a particular task of teaching mathematics (listed in "Tasks of Teaching Mathematics"); these questions are intended to measure the specialized content knowledge needed to carry out the practice effectively.

Below are descriptions of the three sections that follow: "Tasks of Teaching Mathematics," "Content Topics," and "Measuring Content Knowledge in Practice."

"Tasks of Teaching Mathematics" lists sixteen tasks that are a routine part of elementary mathematics instruction. These tasks are based in part on the mathematical work that teachers must do to be able to implement certain high-leverage practices (HLPs) identified by TeachingWorks. They were identified by ETS and TeachingWorks, with input from a national committee of elementary teachers and teacher educators, as being among the most essential tasks for effective teaching of elementary mathematics content.

"Content Topics" is a list of critical mathematics content that students are expected to master at the elementary level. The list was derived from student standards for elementary mathematics. The topics included were confirmed as important through a national survey of the field and refined by a national committee of elementary teachers and teacher educators.

"Measuring Content Knowledge in Practice" provides a more detailed explanation of the relationship between the content topics and tasks of teaching in the subtest. It also provides a sample test question to illustrate this relationship.

On-Screen Calculator

An on-screen 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](#).

Tasks of Teaching Mathematics

This list includes tasks that are essential for effective teaching of elementary mathematics.

Explanations, Conjectures, and Definitions

1. Giving mathematically valid explanations for a process, conjecture, or relationship
2. Evaluating mathematical explanations for their validity, generalizability, explanatory power, and/or completeness
3. Determining the changes that would improve the validity, generalizability, completeness, and/or precision of a mathematical explanation
4. Evaluating a student conjecture for its validity and/or generalizability on a given domain
5. Evaluating mathematical definitions or other mathematical language for precision, validity, generalizability, usefulness in a particular context, and/or support for an instructional goal

Problems, Examples, and Structure

6. Evaluating mathematical problems for how well they elicit a particular idea, support the use of a particular solution strategy or practice, fit a particular mathematical structure, address the same concept as another problem, or assess a particular student conception or error
7. Writing mathematical problems that fit a particular solution strategy or mathematical structure
8. Evaluating examples for how well they introduce a concept; illustrate an idea or relationship; illustrate the appropriateness of a strategy, procedure, or practice; or address particular student questions, misconceptions, or partial conceptions
9. Generating or identifying nonexamples or counterexamples to highlight a mathematical distinction or to demonstrate why a student conjecture is incorrect or partially incorrect
10. Choosing which mathematical topics are most closely related to a particular instructional goal

Representations and Manipulatives

11. Selecting, creating, or evaluating representations or manipulatives for a mathematical purpose or to show a particular mathematical idea
12. Evaluating 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

Student Strategies and Errors

13. Determining whether student work demonstrates the use of a particular mathematical idea or strategy
14. Determining whether a strategy is mathematically valid or generalizable
15. Interpreting a student's mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error
16. Identifying tasks or situations in which student work or talk that seems mathematically valid might mask incorrect thinking

Content Topics

This section includes tasks that are essential for effective teaching of elementary mathematics.

I. Counting and Operations with Whole Numbers

A. Counting

1. Counts and skip counts whole numbers between 0 and 1,000
2. Counts on, starting with any whole number
3. Connects counting to cardinality
4. Demonstrates understanding of one-to-one correspondence between numbers and objects being counted
5. Subitizes (recognizes small quantities by sight)
6. Identifies relationships between counting and the concept of larger and smaller numbers (i.e., that sets with higher counts are larger than sets with smaller counts)

B. Operations with Whole Numbers

1. 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
2. Solves mathematical and real-world problems involving the four operations, including solving problems by using properties of operations

II. Place Value and Decimals

1. Demonstrates a conceptual understanding of the value of the digits in a number
2. Compares multidigit and decimal numbers
3. Rounds multidigit and decimal numbers
4. Composes and decomposes multidigit numbers into groupings and understands why grouping and ungrouping are helpful in performing operations on multidigit and decimal numbers
5. Uses drawings and objects such as manipulatives to represent place value, relating these drawings and objects to numerical equations and written descriptions

III. Fractions, Operations with Fractions, and Ratios

1. 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
2. Demonstrates understanding of characteristics of fractions that are less than one, equal to one, and greater than one
3. Demonstrates understanding of equipartitioning and that it is a building block for understanding fractions as part-whole relationships
4. Demonstrates understanding of fraction equivalence
5. Uses a variety of strategies for comparing fractions
6. Performs operations such as addition, subtraction, multiplication, and division with fractions as well as with fractions and whole numbers, understanding and using 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)
7. Demonstrates understanding of applications of operations on fractions (e.g., scaling)

IV. Early Equations and Expressions, Measurement, and Geometry

A. Early Equations and Expressions

1. 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
2. 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
3. Follows the standard order of operations (including the use of parentheses and the distributive property of multiplication over addition)
4. Demonstrates awareness of different interpretations of the word “variable,” including the ideas of quantities that are unknown (which underlies understanding how to solve equations) and quantities that vary (which can be connected to patterns and will support later understanding of functional relationships)
5. Uses the less-than and greater-than relational symbols ($<$, $>$) to compare quantities

B. Measurement

1. Describes measurable attributes of objects
2. Compares two objects with a common measurable attribute
3. Chooses appropriate measurement tools and uses the tools to take measurements
4. Calculates and estimates perimeter, area, volume, and measurements of angles in mathematical and real-world problems
5. Converts between measurement units

C. Geometry

1. Demonstrates understanding of shapes and their attributes
2. Composes and decomposes shapes
3. Draws shapes based on specific attributes such as number of angles and number of equal faces
4. Demonstrates understanding of lines, line segments, rays, and angles in two-dimensional figures
5. Classifies two-dimensional figures based on properties

Measuring Content Knowledge in Practice

The sample test question below demonstrates the relationship between the tasks of teaching mathematics and the content topics and subtopics in this subtest. Most questions on the subtest will measure the specialized content knowledge needed about a particular subtopic (e.g., I.A., Counting) to carry out a particular task of teaching. While all topics will be covered in the proportions listed in the chart on page 14 (30 percent for Counting and Operations with Whole Numbers; 25 percent for Place Value and Decimals; 25 percent for Fractions, Operations with Fractions, and Ratios; and 20 percent for Early Equations and Expressions, Measurement, and Geometry), the proportion of different tasks of teaching may vary.

$$\begin{array}{r} 385 \\ + 462 \\ \hline 7147 \end{array}$$

$$\begin{array}{r} 453 \\ + 427 \\ \hline 8710 \end{array}$$

$$\begin{array}{r} 321 \\ + 836 \\ \hline 1157 \end{array}$$

Josh is a third-grade student in Ms. Carter’s classroom. Josh’s answers to three addition problems are shown. He incorrectly answered the first two problems but correctly answered the third problem.

If Josh uses the same strategy to answer the following problem, what will his answer be?

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

Content Topics		Tasks of Teaching Mathematics																Content Topic I. B. Operations with Whole Numbers <u>Task of Teaching Mathematics</u> 15. Interpreting a student’s mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
I.	A.																	
	B.																	
II.	A.																	
III.	A.																	
IV.	A.																	
	B.																	
	C.																	

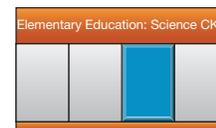
The question measures specialized content knowledge needed to teach operations with whole numbers; specifically, it deals with knowledge needed to interpret the error of a student learning to solve multidigit addition problems.

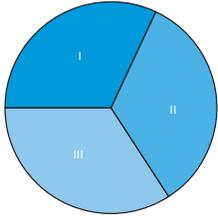
For the mathematics subtest, this question is classified as measuring content knowledge related to the topic of operations with whole numbers, in the context of Task of Teaching #15, “Interpreting a student’s mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error.”

For the answer to this question, an explanation of the answer, and additional sample questions with explanatory information, please see Chapter 3. The sample questions in Chapter 3 demonstrate ways to measure content knowledge related to many different topics and tasks of teaching.

Elementary Education: Science—CKT

(7814) Time: 60 minutes; Format: Selected response



	Science Categories	Approximate Number of Questions	Approximate Percentage of Examination
	I. Earth and Space Sciences	11–15	30%
II. Life Sciences	13–17	35%	
III. Physical Sciences	13–17	35%	
IV. Engineering, Technology and the Application of Science	<i>Questions in this category cover topics in categories I, II, and III above</i>		
Total	47	100%	

About This Subtest

This subtest focuses on the essential content knowledge needed for teaching elementary science. The 47 selected-response questions measure two kinds of content knowledge. The first kind is the content knowledge needed to do the work of the student curriculum, such as analyzing and interpreting data. Approximately 20 percent of the questions measure this kind of content knowledge. The second kind is the specialized content knowledge needed to teach the student curriculum; this is the knowledge a teacher would use, for instance, when choosing the most appropriate resources to help students explain an observation. This specialized content knowledge is not knowledge that students are expected to learn, nor is it general knowledge of classroom-management strategies or learning theory; it is content knowledge specialized to the work of teaching elementary science. Approximately 80 percent of the questions measure this kind of content knowledge.

Each question focuses on a specific performance expectation that describes using a science practice to engage in a science concept listed in “Content Topics”. Questions that measure specialized content knowledge also incorporate a particular task of teaching listed in “Tasks of Teaching Science”; these questions are intended to measure the specialized content knowledge needed to carry out the task effectively.

Below are descriptions of the three sections that follow: “Tasks of Teaching,” “Content Topics,” and “Measuring Content Knowledge in Practice.”

“Tasks of Teaching Science” lists the tasks that are a routine part of elementary science instruction. These tasks are based on the existing body of research and have been confirmed by a national committee of elementary teachers and teacher educators as among the most essential tasks for effective teaching of elementary science.

“Content Topics” is a list of expectations, organized by core idea, that students are expected to master at the elementary level, as defined by Next Generation Science Standards. The list was reviewed by a national committee of elementary teachers and teacher educators and confirmed by a national survey.

Questions in category IV—Engineering, Technology and the Application of Science—assess content from Life Sciences, Physical Sciences or Earth and Space Sciences. In your score report these questions will be reported in category I, II, or III.

“Measuring Content Knowledge in Practice” provides a sample test question to illustrate this relationship.

Tasks of Teaching Science

To define the practice-based content knowledge required to teach the student-level content domain, this part of the framework highlights the critical tasks that elementary science teachers engage in as they work with students, curriculum, and instruction.

Scientific Instructional Goals, Big Ideas, and Topics

1. Selecting or sequencing age-appropriate, grade-level instructional goals or big ideas for a topic
2. Identifying the big idea or instructional goal of an instructional activity
3. Choosing which science ideas or instructional activities are most closely related to a particular instructional goal
4. Linking science ideas to one another and to particular activities, models, and representations within and across lessons

Scientific Investigations and Demonstrations

5. Selecting investigations or demonstrations that facilitate understanding of disciplinary core ideas, scientific practices, or crosscutting concepts
6. Evaluating investigation questions for quality (e.g., testable, empirical)
7. Determining the variables, techniques, or tools that are appropriate for use by students to address a specific investigation question
8. Critiquing scientific procedures, data, observations, or results for their quality, accuracy, or appropriateness
9. Evaluating and selecting media for engaging students in virtual investigations not possible in firsthand situations
10. 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)

11. 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
12. 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)

13. Analyzing student ideas for common misconceptions regarding intended scientific learning

14. Selecting diagnostic items and eliciting student thinking about scientific ideas and practices to identify common student misconceptions and the basis for those misconceptions
15. 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
16. Identifying the connections between students' talk and work, and scientists' talk and work

Scientific Language, Discourse, Vocabulary, and Definitions

17. Selecting scientific language that is precise, accurate, grade-appropriate, and illustrates key scientific concepts
18. Anticipating scientific language and vocabulary that may be difficult for students
19. Supporting and critiquing students' participation in and use of verbal and written scientific discourse and argumentation
20. 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)

21. Critiquing student-generated explanations or descriptions for their generalizability, accuracy, precision, or consistency with scientific evidence
22. 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)

23. Evaluating or selecting scientific models and representations that predict or explain scientific phenomena or address instructional goals
24. Engaging students in using, modifying, creating, and critiquing scientific models and representations that are matched to an instructional goal
25. Evaluating student models or representations for evidence of scientific understanding
26. Generating or selecting diagnostic questions to evaluate student understanding of specific models or representations
27. Evaluating student ideas about what makes for good scientific models and representations

Content Topics

This section includes tasks that are essential for effective teaching of elementary science.

I. Earth and Space Sciences

A. Earth's Place in the Universe

1. The universe and its stars
 - a. use observations of the Sun, Moon, and stars to describe patterns that can be predicted
 - b. support an argument that the apparent brightness of the Sun and stars is due to their relative distances from Earth
2. Earth and the Solar System
 - a. make observations at different times of year to relate the amount of daylight to the time of year
 - b. represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky
3. The History of the Planet Earth
 - a. use information from several sources to provide evidence that Earth events can occur quickly or slowly
 - b. identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time

B. Earth's Systems

1. Earth's Materials and Systems
 - a. compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land
 - b. make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation
 - c. develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact
2. Plate Tectonics and Large-Scale System Interactions
 - a. develop a model to represent the shapes and kinds of land and bodies of water in an area

- b. analyze and interpret data from maps to describe patterns of Earth's features
3. The Roles of Water in Earth's Surface Processes
 - a. obtain information to identify where water is found on Earth and that it can be solid or liquid
 - b. describe and graph the amounts and percentages of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth
4. Weather and Climate
 - a. use and share observations of local weather conditions to describe patterns over time
 - b. represent data in tables and graphical displays to describe typical weather conditions expected during a particular season
 - c. obtain and combine information to describe climates in different regions of the world
5. Biogeology
 - a. construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs
 - b. make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation

C. Earth and Human Activity

1. Natural Resources
 - a. use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live
 - b. obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment
2. Natural Hazards
 - a. ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather
 - b. make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard
 - c. generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans³.

Human Impacts on Earth Systems

- a. communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment
- b. obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment

II. Life Sciences**A. From Molecules to Organisms: Structures and Processes**

1. Structure and Function
 - a. use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs
 - b. construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction
2. Growth and Development of Organisms
 - a. read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive
 - b. develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death
3. Organization for Matter and Energy Flow in Organisms
 - a. use observations to describe patterns of what plants and animals (including humans) need to survive
 - b. support an argument that plants get the materials they need for growth chiefly from air and water
 - c. use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun
4. Information Processing
 - a. use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs

- b. use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways

B. Ecosystems: Interactions, Energy, and Dynamics

1. Interdependent Relationships in Ecosystems
 - a. plan and conduct an investigation to determine whether plants need sunlight and water to grow
 - b. develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants
 - c. develop a model to describe the movement of matter among plants, animals, decomposers, and the environment
2. Cycles of Matter and Energy Transfer in Ecosystems
 - a. develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants
 - b. develop a model to describe the movement of matter among plants, animals, decomposers, and the environment
3. Ecosystem Dynamics, Functioning, and Resilience
 - a. make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change
4. Societal Interactions and Group Behavior
 - a. construct an argument that some animals form groups that help members survive

C. Heredity: Inheritance and Variation of Traits

1. Inheritance of Traits and Variation of Traits
 - a. make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents
 - b. analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms
 - c. use evidence to support the explanation that traits can be influenced by the environment

D. Biological Evolution: Unity and Diversity

1. Evidence of Common Ancestry and Diversity
 - a. analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago
2. Natural Selection
 - a. use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing
3. Adaptation
 - a. construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all
4. Biodiversity and Humans
 - a. make observations of plants and animals to compare the diversity of life in different habitats
 - b. make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change

III. Physical Sciences**A. Matter and Its Interactions**

1. Structure and Properties of Matter
 - a. plan and conduct an investigation to describe and classify different kinds of materials by their observable properties
 - b. analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose
 - c. make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object
 - d. develop a model to describe that matter is made of particles too small to be seen
 - e. measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved
 - f. make observations and measurements to identify materials based on their properties
2. Chemical Reactions
 - a. construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot
 - b. measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved
 - c. conduct an investigation to determine whether the mixing of two or more substances results in new substances

B. Motion and Stability: Forces and Interactions

1. Forces and Motion
 - a. plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object
 - b. analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull
 - c. plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object

- d. make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion
2. Types of Interactions
- a. plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object
 - b. plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object
 - c. ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other
 - d. define a simple design problem that can be solved by applying scientific ideas about magnets
 - e. support an argument that the gravitational force exerted by Earth on objects is directed down

C. Energy

- 1. Definition of Energy, Conservation of Energy and Energy Transfer
 - a. use evidence to construct an explanation relating the speed of an object to the energy of that object
 - b. make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents
 - c. ask questions and predict outcomes about the changes in energy that occur when objects collide
 - d. apply scientific ideas to design, test, and refine a device that converts energy from one form to another
- 2. Relationship between Energy and Forces
 - a. ask questions and predict outcomes about the changes in energy that occur when objects collide

- 3. Energy in Chemical Processes and Everyday Life
 - a. apply scientific ideas to design, test, and refine a device that converts energy from one form to another
 - b. use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the Sun

D. Waves and Their Application in Technologies for Information Transfer

- 1. Wave Properties
 - a. plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate
 - b. develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move
- 2. Electromagnetic Radiation
 - a. make observations to construct an evidence-based account that objects can be seen only when illuminated
 - b. plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light
 - c. develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen
- 3. Information Technologies and Instrumentation
 - a. use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance
 - b. generate and compare multiple solutions that use patterns to transfer information

IV. Engineering, Technology, and the Application of Science

Questions in this content category assess content from Life Sciences, Physical Sciences or Earth and Space Sciences. In your score report these questions will be reported in category I, II, or III.

A. Defining and Delimiting an Engineering Problem

1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool
2. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost

B. Developing Possible Solutions

1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool
2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem
3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved

C. Optimizing the Design Solution

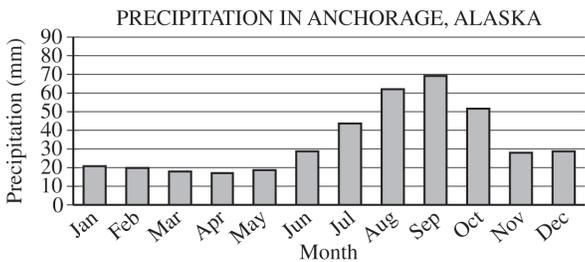
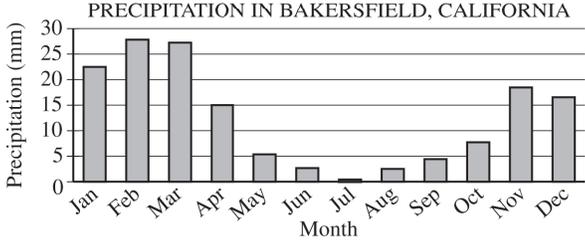
1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
2. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved

Measuring Content Knowledge in Practice

The sample test question below demonstrates the relationship between the Tasks of Teaching Science and the Content Topics in this subtest. Most of the questions on the subtest will measure the specialized content knowledge related to a particular concept (e.g., Weather and Climate) to carry out a particular task of teaching (e.g., Generating or selecting diagnostic questions to evaluate student understanding of specific models or representations). While the content topics will be covered in proportions listed in the chart above, the proportions of different tasks of teaching may vary.

Prior to a lesson on predicting weather outcomes, Ms. Monroe asked her students to look at the data presented in the two bar graphs showing average monthly precipitation in Anchorage, Alaska, and in Bakersfield, California.

Prior to a lesson on predicting weather outcomes, Ms. Monroe asked her students to look at the data presented in the two bar graphs showing average monthly precipitation in Anchorage, Alaska, and in Bakersfield, California.

1. Ms. Monroe would like to determine which students have not noticed the different scales on the two y-axes. Which question would best identify those students?

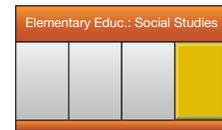
(A) “Which three months produce the least precipitation in each location?”
 (B) “Which location has less precipitation during summer months?”
 (C) “Which location has more precipitation during February and March?”
 (D) “Which location has more precipitation during November and December?”

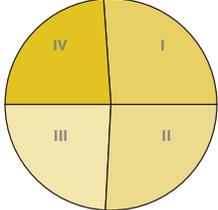
		I. ESS			II. LS				III. PS				IV. ETS			Instructional Tool VII. Scientific Models and Representations Task of Teaching Science d. Generating or selecting diagnostic questions to evaluate student understanding of specific models or representations Content Topic I. B. 4: Weather and Climate Performance Expectation • Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
Instructional Tools		A	B	C	A	B	C	D	A	B	C	D	A	B	C	
I																
II																
III																
IV																
V																
VI																
VII		•														

Explanation: The correct answer is (D). To answer this question, a teacher candidate needs to recognize the question that will elicit a different answer from a student who has misread the y-axis scales. Choice (A) does not involve a comparison between graphs, while choices (B) and (C) will produce the same response whether the student uses the y-axis scale or compares the heights of the bars during those months. In choice (D), a student comparing the heights of the bars would provide an incorrect response, indicating a need to point out the difference in the two scales.

Elementary Education: Social Studies—CKT

(7815) Time: 50 minutes; Format: Selected response



	Social Studies Categories	Approximate Number of Questions	Approximate Percentage of Test
	I. History	16	26%
II. Government and Citizenship	16	26%	
III. Human and Physical Geography	14	24%	
IV. Economics	14	24%	
Total	60	100%	

About This Subtest

The Elementary Education: Social Studies—CKT subtest is designed to assess whether just qualified teachers have the standards-relevant knowledge, skills, and abilities believed necessary for competent professional practice at time of entry into the profession. The 60 selected-response questions are based on the material typically covered in a bachelor's degree program in elementary education.

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

Tasks of Teaching Social Studies

To define the practice-based content knowledge required to teach the student-level content domain, this part of the framework highlights the critical tasks that elementary social studies teachers engage in as they work with students, curriculum, and instruction.

1. Anticipating student thinking in relation to social studies content
2. Selecting, adapting, and creating resources to support particular social studies instructional goals
3. Demonstrating understanding of social studies content in order to apply social studies concepts and skills in instruction
4. Designing learning experiences to promote student understanding of social studies content and processes in the school and in the community
5. Evaluating student ideas evident in work, talk, actions, and interactions to identify strengths and areas for instructional focus

Topics Covered

This section includes tasks that are essential for effective teaching of elementary social studies.

I. History

- A. Understands the concept of chronology
- B. Understands how various sources provide information about the past and present
- C. Understands the contributions of classical civilizations such as China, Egypt, Greece, and Rome
- D. Understands the characteristics of indigenous peoples in North America before European exploration
- E. Understands the causes and effects of European exploration and the colonization of North America
- F. Understands how conflict between the American colonies and Great Britain led to American independence
- G. Understands the development of the United States government
- H. Understands political, economic, and social changes that occurred in the United States during the nineteenth century
- I. Understands important developments in the United States during the twentieth and twenty-first centuries

II. Government and Citizenship

- A. Understands the concepts of family and community
- B. Understands the purposes and functions of government
- C. Understands the various levels of government
- D. Understands the various forms of government
- E. Understands important ideas in the Declaration of Independence and in the Constitution, including the Bill of Rights
- F. Understands the characteristics of responsible citizenship

III. Human and Physical Geography

- A. Understands the concepts of location, distance, and direction
- B. Understands physical characteristics of place and how they affect human activities and settlement patterns
- C. Understands human characteristics of place and how humans adapt to variations in the physical environment
- D. Understands similarities and differences between and among people

IV. Economics

- A. Understands how human needs are met
- B. Understands the concepts of goods and services and the roles of producers and consumers
- C. Understands the purposes of earning, spending, and saving money
- D. Understands how businesses operate
- E. Understands the patterns of economic activities in the United States and the world

Measuring Content Knowledge in Practice

The sample test question below demonstrates the relationship between the tasks of teaching Social Studies and the content topics and subtopics in this subtest. Most questions on the subtest will measure specialized content knowledge needed about a particular topic (e.g., I.A., Chronology) to carry out a particular task of teaching. While all topics will be covered in the proportions listed on the chart on page 27 (26 percent for History, 26 percent for Government and Citizenship, 24 percent for Human and Physical Geography, and 24 percent for Economics), the proportion of different tasks of teaching may vary.

<p>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?</p> <p>(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</p>							
Tasks of Teaching Social Studies							
			1	2	3	4	5
Content Topics	I.	A.					
		B.		•			
		C.					
		D.					
		E.					
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	IV.	A.					
		B.					
C.							
D.							
E.							
<p>Content Topic I. History; B. Understands how various sources provide information about the past and present</p> <p>Task of Teaching Social Studies 2. Selecting, adapting, and creating resources to support particular social studies instructional goals</p>							

2. Familiarize Yourself with Test Questions

Become comfortable with the types of questions you'll find on the Praxis tests

The *Praxis* Elementary Education: Content Knowledge for Teaching assessment is delivered on a computer. It includes a variety of question types, each intended to measure your ability to make different types of judgments similar to those made by elementary teachers. Most are one-point selected-response questions, for which you select one or more answers from a list of choices or make another kind of selection (e.g., by clicking on a sentence in a text or by clicking on part of a graphic). Numeric-entry questions, for which you enter a numeric value in an answer field, are also worth one point. The assessment also includes a small number of two-point questions, for which partial credit is available. The reading and language arts subtest includes three two-point questions, and the mathematics subtest includes five.

One-point questions may ask you to respond in a variety of ways, including the following.

- **Clicking an oval to select a single answer from a list of choices.** This is the most common question format.
- **Typing a number in an entry box.** When the answer is a number, you may be asked to enter a numerical response. Some questions may have more than one place to enter a response.
- **Clicking check boxes.** You may be asked to click check boxes instead of an oval when more than one choice within a set of answers can be selected. Sometimes the question will specify the number of intended responses. Other times you will be instructed to "Select all that apply"; for these questions, the number of correct answers can be anywhere from one to all of the answer choices given.
- **Clicking parts of a graphic.** In some questions, you will select your answers by clicking on a location (or locations) on a graphic, such as a map or chart, as opposed to choosing your answer from a list.
- **Clicking on text.** In questions with reading passages, you may be asked to choose your answers by clicking on a word, phrase, sentence, paragraph, or other section within the reading passage. Sometimes you will be asked to make more than one selection.
- **Dragging and dropping answer choices into targets on the screen.** You may be asked to select answers from a list of choices and drag your answers to the appropriate location in a table, paragraph of text, or graphic.
- **Selecting an answer choice from a drop-down menu.** You may be asked to choose an answer by selecting from a drop-down menu (e.g., to complete a sentence).

Two-point questions, for which partial credit is available, may ask you to respond in one of the following two ways.

- **Selecting multiple answers for composite (two-part) questions.** For this type of question, you will click on your answer(s) to part A and then click on your answer(s) to part B. Because each part of the composite question may have different directions, make sure to read the directions carefully for both part A and part B. If you answer part A correctly but do not provide the correct answer(s) for part B, you will earn one point. You cannot receive credit for part B unless part A is answered correctly.
- **Selecting boxes in a table.** In some questions, answer choices will appear in a table with three or more rows. You will be asked to select one choice for each row. You will receive full credit (two points) if all rows are completed correctly. You will receive one point if all but one row is completed correctly. You will receive zero points if two or more rows are not completed correctly.

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.

Perhaps the best way to understand computer-delivered questions is to view the [Computer-Delivered Testing Demonstration](#) on the Praxis web site to learn how a computer-delivered test works and see examples of some types of questions you may encounter.

Understanding Selected-Response Questions

Many selected-response questions begin with the phrase “which of the following.” Take a look at this example:

Which of the following is a flavor made from beans?

- (A) Strawberry
- (B) Cherry
- (C) Vanilla
- (D) Mint

How would you answer this question?

All of the answer choices are flavors. Your job is to decide which of the flavors is the one made from beans.

Try following these steps to select the correct answer.

- 1) **Limit your answer to the choices given.** You may know that chocolate and coffee are also flavors made from beans, but they are not listed. Rather than thinking of other possible answers, focus only on the choices given (“which of the following”).
- 2) **Eliminate incorrect answers.** You may know that strawberry and cherry flavors are made from fruit and that mint flavor is made from a plant. That leaves vanilla as the only possible answer.
- 3) **Verify your answer.** You can substitute “vanilla” for the phrase “which of the following” and turn the question into this statement: “Vanilla is a flavor made from beans.” This will help you be sure that your answer is correct. If you’re still uncertain, try substituting the other choices to see if they make sense. You may want to use this technique as you answer selected-response questions on the practice tests.

Try a more challenging example

The vanilla bean question is pretty straightforward, but you’ll find that more challenging questions have a similar structure. For example:

Entries in outlines are generally arranged according to which of the following relationships of ideas?

- (A) Literal and inferential
- (B) Concrete and abstract
- (C) Linear and recursive
- (D) Main and subordinate

You’ll notice that this example also contains the phrase “which of the following.” This phrase helps you determine that your answer will be a “relationship of ideas” from the choices provided. You are supposed to find the choice that describes how entries, or ideas, in outlines are related.

Sometimes it helps to put the question in your own words. Here, you could paraphrase the question in this way: “How are outlines usually organized?” Since the ideas in outlines usually appear as main ideas and subordinate ideas, the answer is (D).

QUICK TIP: Don't be intimidated by words you may not understand. It might be easy to be thrown by words like "recursive" or "inferential." Read carefully to understand the question and look for an answer that fits. An outline is something you are probably familiar with and expect to teach to your students. So slow down, and use what you know.

Watch out for selected-response questions containing "NOT," "LEAST," and "EXCEPT"

This type of question asks you to select the choice that does not fit. You must be very careful because it is easy to forget that you are selecting the negative. This question type is used in situations in which there are several good solutions or ways to approach something, but also a clearly wrong way.

How to approach questions about graphs, tables, or reading passages

When answering questions about graphs, tables, or reading passages, provide only the information that the questions ask for. In the case of a map or graph, you might want to read the questions first, and then look at the map or graph. In the case of a long reading passage, you might want to go ahead and read the passage first, noting places you think are important, and then answer the questions. Again, the important thing is to be sure you answer the questions as they refer to the material presented. So read the questions carefully.

How to approach unfamiliar formats

New question formats are developed from time to time to find new ways of assessing knowledge. Tests may include audio and video components, such as a movie clip or animation, instead of a map or reading passage. Other tests may allow you to zoom in on details in a graphic or picture.

Tests may also include interactive questions. These questions take advantage of technology to assess knowledge and skills in ways that standard selected-response questions cannot. If you see a format you are not familiar with, **read the directions carefully**. The directions always give clear instructions on how you are expected to respond.

QUICK TIP: Don't make the questions more difficult than they are. Don't read for hidden meanings or tricks. There are no trick questions on *Praxis* tests. They are intended to be serious, straightforward tests of your knowledge.

3. Practice with Sample Test Questions

Answer practice questions and find explanations for correct answers

Reading and Language Arts—CKT 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 explanations follow the questions, along with information about the content topic, subtopic, and task of teaching targeted in each question.

Directions: Select the best answer or answers for each question below. Questions in formats that may be unfamiliar are followed by a note titled “How to Answer the Question Above.”

1. A teacher is administering an informal reading assessment that includes the following sentences.

Monkeys like to play together. They wrestle and roll.

When reading the sentences, one student says the word “widdle” instead of “wrestle.” The student is likely using which of the following cuing systems?

Select all that apply.

- (A) Semantic
- (B) Syntactic
- (C) Graphophonemic

How to Answer the Question Above

This is a “select all that apply” question. You should select one, two, or all three of the answer choices—however many are correct. You earn credit for the question only if you select all of the choices that are correct answers. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

2. Which two of the following words are appropriate to include in a lesson on the different phonemes created by r-controlled vowels?

- (A) Angry
- (B) Bridge
- (C) Bird
- (D) Real
- (E) Silver

How to Answer the Question Above

This is a multiple-choice question with two correct answers. You must select both correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

3. A student uses a “W” to represent the initial sound in the word “doughnut.” In this scenario, which of the following patterns of thinking is the student demonstrating?

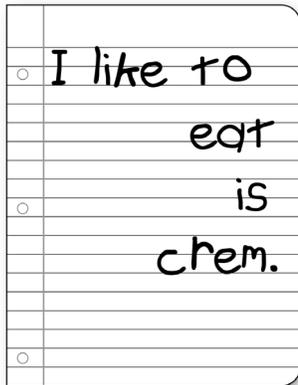
Select all that apply.

- (A) Believing that each sound can be represented by only one letter
- (B) Thinking that the position of a letter within a word does not affect the sound it makes
- (C) Confusing a sound in a letter name with a sound represented by the letter

How to Answer the Question Above

This is a “select all that apply” question. You should select one, two, or all three of the answer choices—however many are correct. You earn credit for the question only if you select all of the choices that are correct answers. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

4. A student writes the sentence “I like to eat ice cream” as follows.



Which of the following print concepts should the teacher focus on when reading with the student?

Select all that apply.

- (A) Text direction
- (B) Return sweep
- (C) Punctuation meaning

How to Answer the Question Above

This is a “select all that apply” question. You should select one, two, or all three of the answer choices—however many are correct. You earn credit for the question only if you select all of the choices that are correct answers. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

The remaining sample test questions for reading and language arts are organized into sets in which two or more questions refer to the same instructional scenario and text; the text is either a reading passage or an example of student work. For some sets, the scenario and text are shown only at the beginning of the set. However, for other sets that contain questions referring to highlighted portions of the text, the scenario and text appear a second or third time, to show the highlighting described in the question or questions. A scenario and text may also be repeated so that they can be viewed on the same page as each test question that refers to them. On the actual test, the scenario and text will always appear on the left-hand side of the screen, with whatever highlighting is needed for a given question, and the questions will appear on the right-hand side.

Questions 5–7 refer to the following scenario.

Ms. Weise is reading and discussing “The Tortoise and the Hare” with her class.

One day, a hare was boasting to all the other animals in the forest. “I’m faster than the wind,” he said. “No one has ever beaten me. No one ever will!”

“Does anyone here want to challenge me to a race?” the hare dared the animals of the forest. The foxes and frogs and snakes all stared back silently.

Then the hare heard a modest voice say, “I will race you.” It was the tortoise.

The hare guffawed. “You? What a funny joke! I can run circles around you!”

“Perhaps,” the tortoise said, smiling to himself. “Shall we race?”

“On your mark, get set, go!” chanted the nearby animals. In a flash, the hare was off and out of sight. The tortoise set off slowly, just plodding along steadily, one heavy foot in front of the other.

After a while the hare looked back and could not see the tortoise anywhere. It was a hot day. The hare said to himself, “I’m so far ahead that I can win this race easily. It won’t hurt if I just take a little rest.” So he found a shady spot and lay down on a patch of grass.

When he awoke, the sun hung lower in the sky. The hare looked for the tortoise but didn’t see him. “I might as well go finish the race,” he said, heading towards the finish line. But when he got close, he saw the tortoise crawling over the finish line before him. “Oh no!” the hare said.

All the animals cheered, “Tortoise won! Tortoise won!” And the tortoise smiled to himself again.

5. Which of the following student statements about the story required the student to make a text-based inference?
- (A) The hare thinks he is going to win the race because he wins every race.
 - (B) The foxes, frogs, and snakes are afraid to race against the hare.
 - (C) The hare laughs at the tortoise when he says he wants to race.
 - (D) The hare takes a nap because he thinks he’s way ahead of the tortoise.

Ms. Weise is reading and discussing “The Tortoise and the Hare” with her class.

One day, a hare was boasting to all the other animals in the forest. “I’m faster than the wind,” he said. “No one has ever beaten me. No one ever will!”

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All the animals cheered, “Tortoise won! Tortoise won!” And the tortoise smiled to himself again.

6. Ms. Weise wants students to find examples from “The Tortoise and the Hare” to demonstrate three basic elements of story structure:

- (1) an orientation that sets the scene,
- (2) a complication that is introduced, triggering the main series of events, and
- (3) a resolution.

Of the three highlighted paragraphs of dialogue, select the one paragraph in which the complication is introduced.

How to Answer the Question Above

This is a “select in passage” question with one correct answer. For this kind of question, you will select your answer directly from the passage, not from a separate list of answer choices. In this case, the three answer choices are the three highlighted paragraphs in the passage, and only one of them is the correct answer. In the actual test, you will answer this question by using your mouse to click on the appropriate paragraph, which will change the color of the highlighting from gray to black. If you change your mind, click on a different highlighted paragraph.

Ms. Weise is reading and discussing “The Tortoise and the Hare” with her class.

One day, a hare was boasting to all the other animals in the forest: “I’m faster than the wind,” he said. No one has ever beaten me. No one ever will!”

“Does anyone here want to challenge me to a race?” the hare dared the animals of the forest. The foxes and frogs and snakes all stared back silently.

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All the animals cheered, “Tortoise won! Tortoise won!” And the tortoise smiled to himself again.

7. Part A

Which of the following pairs of words is most appropriate for Ms. Weise to introduce to students to support their discussion of the main characters’ personality traits?

- (A) Vengeful, unknowing
- (B) Jealous, supportive
- (C) Lazy, unathletic
- (D) Determined, arrogant

Part B

Review the five highlighted sentences from the story. Which two sentences best support the answer to part A? One sentence should support the first word, and the other sentence should support the second word.

How to Answer the Question Above

This is a two-part question that is worth two points and eligible for partial credit. Each part of a two-part question may follow any of the question formats on the test. For all two-part questions, the answer to part B is reliant on the answer to part A. If you answer part A incorrectly, you cannot earn credit for part B. However, you can earn one point if you answer part A correctly but do not answer part B correctly.

In this question, part A follows a standard multiple-choice format with four answer choices and one correct answer. Part B follows a “select in passage” format, with five answer choices highlighted in the passage and two correct answers; both of these answers—and no other choices—must be selected to earn credit for part B. In the actual test, you answer part B by using your mouse to click on the appropriate highlighted sentences, which changes the color of the highlighting from gray to black. To change one of your answers, click on the selected sentence again to revert back to gray highlighting and then click on a different highlighted sentence.

Questions 8–9 refer to the following scenario.

As part of an interdisciplinary unit about ancient Egypt, students will read an informational text that introduces them to hieroglyphics. Following is an excerpt from the text.

Instead of using words and letters, Egyptians in ancient times used hieroglyphics to record their history. The ancient Egyptian language is one of the earliest recorded written languages. Hieroglyphic writing was used from about 3200 BC until the late fourth century AD. Because it is so different from modern-day language, it can often be difficult to decipher. Archaeologists and anthropologists who first discovered hieroglyphics had no idea how to translate the obscure pictures. However, in 1799, they found the Rosetta Stone. The Rosetta Stone is inscribed with a single message written in three different languages: Egyptian hieroglyphics, demotic script, and ancient Greek. Although it was regarded as an extremely layered and complex task, scientists were able to use their knowledge of ancient Greek and demotic script to translate the hieroglyphics. By translating the hieroglyphics into modern languages, scientists were able to gain a better understanding of how ancient Egyptians lived.

8. Select the two sentences from the passage that signal a cause-effect relationship.

How to Answer the Question Above

This is a “select in passage” question with two correct answers. For this kind of question, you select your answer directly from the passage, not from a separate list of answer choices. In this case, all nine of the sentences in the passage are considered answer choices, so none of them are highlighted. In the actual test, you answer this question by using your mouse to click on the appropriate two sentences, which changes the color of the sentence to white, with black highlighting. To change one of your answers, click on the selected sentence again to remove the black highlighting, and then click on a different sentence.

As part of an interdisciplinary unit about ancient Egypt, students will read an informational text that introduces them to hieroglyphics. Following is an excerpt from the text.

Instead of using words and letters, Egyptians in ancient times used hieroglyphics to record their history. The ancient Egyptian language is one of the earliest recorded written languages. Hieroglyphic writing was used from about 3200 BC until the late fourth century AD. Because it is so different from modern-day language, it can often be difficult to decipher. Archaeologists and anthropologists who first discovered hieroglyphics had no idea how to translate the obscure pictures. However, in 1799, they found the Rosetta Stone. The Rosetta Stone is inscribed with a single message written in three different languages: Egyptian hieroglyphics, demotic script, and ancient Greek. Although it was regarded as an extremely layered and complex task, scientists were able to use their knowledge of ancient Greek and demotic script to translate the hieroglyphics. By translating the hieroglyphics into modern languages, scientists were able to gain a better understanding of how ancient Egyptians lived.

9. To plan vocabulary instruction in the lesson, the teacher analyzes the text to identify Tier 2 (general academic) words or phrases that would be important to target when discussing the text. The teacher will not include Tier 1 (basic, commonly used) or Tier 3 (discipline-specific) words or phrases in the discussion.

Of the highlighted words or phrases, select the three that are appropriately categorized as Tier 2.

How to Answer the Question Above

This is a “select in passage” question with three correct answers. For this kind of question, you select your answer directly from the passage, not from a separate list of answer choices. In this case, there are seven highlighted answer choices in the text. In the actual test, you answer this question by using your mouse to click on the appropriate highlighted words, which will change the color of the highlighting from gray to black. To change one of your answers, click on the selected word again to remove the black highlighting and then click on a different highlighted word.

Questions 10–13 refer to the following scenario.

An upper-elementary school teacher is having students read and discuss the following text and table.

How Old Would You Be on Mars?

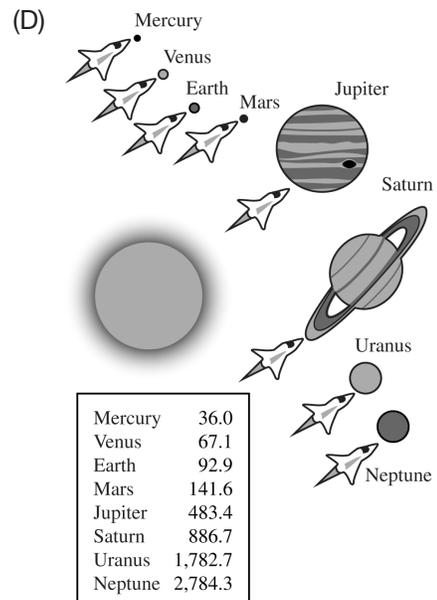
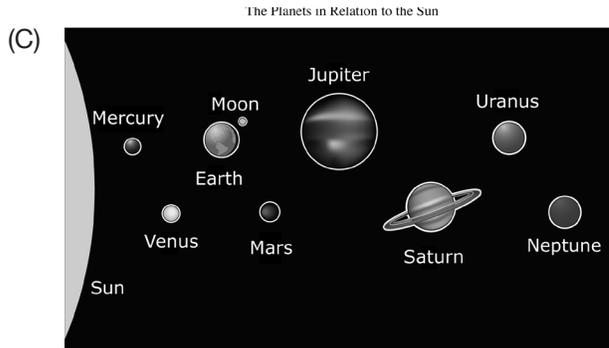
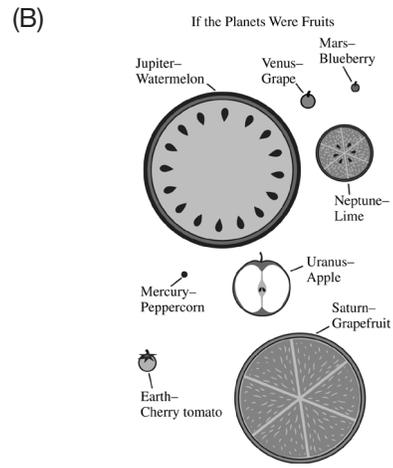
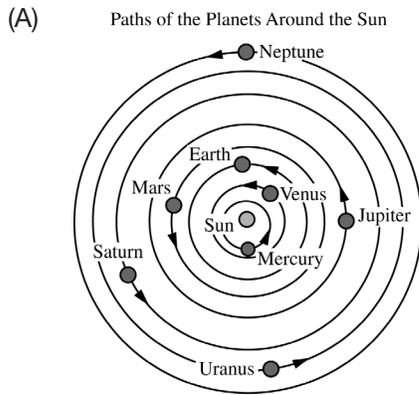
You know that a year on Earth is 365 days long, which is the amount of time it takes for Earth to orbit once around the Sun. But a year on Mars is 687 Earth days long. That's how long it takes Mars to orbit the Sun.

Imagine that people lived on Mars. A typical fifth grader would be only six Mars years old because a Mars year is almost twice as long as an Earth year. If you lived on Mars, you would have a Mars birthday only once every 687 Earth days.

Each planet takes a different amount of time to orbit the Sun. A year on another planet depends on how long it takes that planet to orbit. The table below shows the number of Earth days each planet takes to orbit the Sun. It also shows how far from the Sun each planet orbits.

Planet	Distance from the Sun	Time the planet takes to make orbit
Mercury	About 58 million kilometers	88 Earth days
Venus	About 108 million kilometers	225 Earth days
Earth	About 150 million kilometers	365 Earth days
Mars	About 228 million kilometers	687 Earth days
Jupiter	About 778 million kilometers	4,330 Earth days
Saturn	About 1,429 million kilometers	10,756 Earth days
Uranus	About 2,871 million kilometers	30,687 Earth days
Neptune	About 4,504 million kilometers	60,190 Earth days

10. During a discussion of the table, a student states, “It would take 687 days to get from Mars to the Sun.” Which of the following visual representations best helps address the student’s confusion by illustrating a topic that is critical to understanding the text and table but is not fully explained in them?



How to Answer the Question Above

This is a standard multiple-choice question with four answer choices. However, the choices are in the form of graphics. On the actual test, most graphics can be magnified for easier viewing.

An upper-elementary school teacher is having students read and discuss the following text and table.

How Old Would You Be on Mars?

You know that a year on Earth is 365 days long, which is the amount of time it takes for Earth to orbit once around the Sun. But a year on Mars is 687 Earth days long. That's how long it takes Mars to orbit the Sun.

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Uranus	About 2,871 million kilometers	30,687 Earth days
Neptune	About 4,504 million kilometers	60,190 Earth days

11. Which of the following questions requires students to integrate information from both the text and the table when responding?
- (A) Is Earth closer to the Sun than Jupiter is?
 - (B) Is a year on Saturn longer than a year on Earth?
 - (C) How is a planet's orbit connected to the length of the year on the planet?
 - (D) If you are 10 years old in Earth years, how old are you in Mars years?
12. After reading the text, a student states, "If I lived farther from the Sun, I'd still be a baby!" Which of the following beliefs is most likely causing the student's misunderstanding?
- (A) Age is calculated differently on each planet.
 - (B) Planets farther from the Sun have longer years.
 - (C) Having fewer birthdays makes you physically younger.
 - (D) The Sun itself contributes to the aging process.

An upper-elementary school teacher is having students read and discuss the following text and table.

How Old Would You Be on Mars?

You know that a year on Earth is 365 days long, which is the amount of time it takes for Earth to orbit once around the Sun. But a year on Mars is 687 Earth days long. That's how long it takes Mars to orbit the Sun.

Imagine that people lived on Mars. A typical fifth grader would be only six Mars years old because a Mars year is almost twice as long as an Earth year. If you lived on Mars, you would have a Mars birthday only once every 687 Earth days.

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Uranus	About 2,871 million kilometers	30,687 Earth days
Neptune	About 4,504 million kilometers	60,190 Earth days

13. The text and table are followed by several questions. The teacher has provided students with the following list of question types to help them identify what kind of work is required in order to answer each question.

Right There questions are answered directly in one place in the text.

Think and Search questions are answered by combining information from different parts of the text.

Author and You questions require you to combine information from the author with things you already know.

On My Own questions are answered without the text by using outside knowledge.

Which question type best matches the question “What holds the planets in their orbits?”

- (A) Right There
- (B) Think and Search
- (C) Author and You
- (D) On My Own

Questions 14–16 refer to the following scenario.

After reading *Charlotte’s Web* (1952) by E. B. White, students respond to the prompt “What does Wilbur learn from his friendship with Charlotte? Develop your response by using specific evidence from the text and explaining your thinking.” One student’s first draft is below.

Wilbur learns a lot from Charlotte. She saved his life, and she teaches him to believe in himself. He got lots of confidence from Charlotte. She teaches him about the world and the seasons. She teaches him about friendship. After she saves Wilbur’s life by spinning webs with special messages about him, he asked her why she helped him when he never did anything for her. She answers him by saying “By helping you, perhaps I was trying to lift up my life a trifle. Heaven knows anyone’s life can stand a little of that.” Then she died, and Wilbur takes care of her children.

14. Which two of the following statements best describe the draft?
- (A) It establishes an overall claim that is relevant to the prompt.
 - (B) It provides textual evidence that supports the overall claim.
 - (C) It develops multiple subclaims using examples from the story.
 - (D) It includes enough context about the story to make the quotation understandable.
 - (E) It explains how the quotation supports the overall claim.

How to Answer the Question Above

This is a multiple-choice question with two correct answers. You must select both correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choices next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

15. Which of the following usage problems does the student demonstrate in the paragraph?

Select all that apply.

- (A) Lack of subject-verb agreement
- (B) Sentence fragments
- (C) Inconsistent verb tense

How to Answer the Question Above

This is a “select all that apply” question. You should select one, two, or all three of the answer choices—however many are correct. You earn credit for the question only if you select all of the choices that are correct answers. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

After reading *Charlotte's Web* (1952) by E. B. White, students respond to the prompt “What does Wilbur learn from his friendship with Charlotte? Develop your response by using specific evidence from the text and explaining your thinking.” One student’s first draft is below.

Wilbur learns a lot from Charlotte. She saved his life, and she teaches him to believe in himself. He got lots of confidence from Charlotte. She teaches him about the world and the seasons. She teaches him about friendship. After she saves Wilbur’s life by spinning webs with special messages about him, he asked her why she helped him when he never did anything for her. She answers him by saying “By helping you, perhaps I was trying to lift up my life a trifle. Heaven knows anyone’s life can stand a little of that.” Then she died, and Wilbur takes care of her children.

16. The teacher wants to provide students with support in revising their first drafts and considers having them use the following graphic organizer.

Quote It! Text: _____		
Page: _____	Page: _____	Page: _____
“ ”	“ ”	“ ”
↓	↓	↓
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Which two of the following modifications to the graphic organizer will best support students’ revisions for this writing task?

- (A) Replacing each quotation box with a picture of a main character to make the organizer more concrete
- (B) Adding a space at the top of the organizer for the claim to ensure that the writing goal is clear
- (C) Adding a section at the bottom of the organizer for comparing the viewpoints expressed by the different quoted characters
- (D) Including arrows between the sections of the organizer with lined spaces to show that the ideas are connected
- (E) Providing more genre-specific labels for the different sections of the organizer

How to Answer the Question Above

This is a multiple-choice question with two correct answers. You must select both correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

Reading and Language Arts—CKT Answers

The answers to the sample test questions are provided below, along with explanations and classifications. Each question focuses on a specific reading and language arts topic and subtopic listed in “Content Topics” on pages 8-12. Questions that measure specialized content knowledge also incorporate a particular “Task of Teaching ELA” listed on page 8. These questions are intended to measure the specialized content knowledge needed to carry out the task effectively.

1. The correct answers are (A), (B), and (C). “Wiggle” makes sense in the sentence, suggesting that the student may be using semantic cuing (A). Because “wiggle” is a verb, it fits the sentence syntactically (B), so the student may also be using syntactic cuing. Finally, “wiggle” looks similar to “wrestle,” since it shares the first letter and the last two letters and is approximately the same length, suggesting that the student may also be using graphophonemic cuing (C).

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	9. Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions
Topic	I. Foundational Skills
Subtopic	D. Phonics and Word Recognition

2. The correct answers are (C) and (E). The /ir/ sound in “bird” (C), similar to the same sound in “stir,” “third,” and “sir,” is an r-controlled sound. “Silver” (E), also contains an r-controlled /er/ sound, similar to the same sound as in “winter,” “her,” and “fern.” Answer choices (A) “angry,” (B) “bridge,” and (D) “real” have vowels following the r sound, not before it, which means they are not r-controlled sounds.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	1. Evaluating texts, examples, and graphic representations for their support of particular ELA instructional goals
Topic	I. Foundational Skills
Subtopic	D. Phonics and Word Recognition

3. The correct answer is (C) only. The student’s use of “w” to represent the /d/ in “doughnut” suggests that the student has concluded that because the letter name for “w” starts with the sound /d/ (as in “double-u”), the correct letter to represent /d/ is “w.” The substitution does not suggest a misunderstanding about the impact of position on sound (B) or about how many letters can represent a single sound (A).

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	7. Evaluating student reading, writing, speaking, and listening to identify specific strengths and/or areas for improvement or instructional focus.
Topic	I. Foundational Skills
Subtopic	B. Alphabetic Principle

4. The correct answer is (B) only. An important concept of print is knowing where to continue reading once a reader has come to the end of a line. In this case, the student's writing suggests a need for reinforcement of this concept; after writing the first line, the student began a new line of text after "eat" and "is," even though these words could have fit on the same line as "crem." (A) is incorrect because the student has written the words from left to right, so the teacher does not need to reinforce the concept of text direction. Finally, the teacher's focus does not appear to be needed on punctuation meaning (C), since the student correctly punctuates the sentence at the end with a period.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	7. Evaluating student reading, writing, speaking, and listening to identify specific strengths and/or areas for improvement or instructional focus.
Topic	I. Foundational Skills
Subtopic	A. Print Concepts

5. The correct answer is (B) because the text does not state explicitly that the animals are afraid to race the hare. However, students can make this inference because it says that the animals "stared back silently" when the hare issued his challenge. The hare's intimidating previous statement "No one has ever beaten me. No one ever will!" offers additional support for the inference. (A) is incorrect because it simply paraphrases the hare's own statement "No one has ever beaten me. No one ever will!" It does not require students to make an inference. (C) is incorrect. Although students may need to consult a dictionary to understand that "guffawed" means "laughed," they do not need to make an inference. (D) is incorrect because, like (A), it simply paraphrases the hare's own statement, "I'm so far ahead that I can win this race easily. It won't hurt if I just take a little rest."

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	9. Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions
Topic	III. Constructing Meaning
Subtopic	A. Key Ideas and Details

6. The correct paragraph to highlight is "Then the hare heard a modest voice say, 'I will race you.' It was the tortoise." This paragraph introduces the complication: the tortoise's surprising challenge to the hare. This complication, in turn, triggers the main series of events in the story, including the hare's condescending reaction and the tortoise's confident reply (both depicted in the other two selectable paragraphs), the race, and the tortoise's victory (the resolution).

Content Knowledge Type	Work of the Student Curriculum
Task of Teaching ELA	not applicable
Topic	III. Constructing Meaning
Subtopic	B. Author's Craft and Text Structure

7. This is a two-part, or composite, test question. In order to answer part B correctly, you must answer part A correctly. For part A, the correct answer is (D). The characteristic "determined" best matches the personality of the tortoise, who is described in the story as setting "off slowly, just plodding along steadily, one heavy foot in front of the other." This is the first highlighted sentence that should be selected for part B. The characteristic "arrogant" best matches the personality of the hare, who makes haughty statements such as "I'm faster than the wind." This is the second highlighted sentence that should be selected for part B. In part A, (A) is incorrect. Although the hare might be described as "unknowing" because he is unable to imagine being beaten by the tortoise, this is not his dominant personality trait in the story. In addition, "vengeful" is not an appropriate description for either character. (B) is incorrect because although the hare is likely jealous of the tortoise's victory, this jealousy is only implied at the very end of the story; it is not a dominant personality trait. Further, neither character could be described as "supportive" of the other. Finally, (C) is incorrect because although the hare does behave in a lazy way by taking a nap in the middle of the race, neither character could be described as unathletic; the hare is a skilled racer, and the tortoise, by winning the race, shows that he is also athletic.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	1. Evaluating texts, examples, and graphic representations for their support of particular ELA instructional goals
Topic	III. Constructing Meaning
Subtopic	A. Key Ideas and Details

8. Sentence 4, “Because it is so different from modern-day language, it can often be difficult to decipher,” and sentence 9, “By translating the hieroglyphics into modern languages, scientists were able to gain a better understanding of how ancient Egyptians lived,” are the correct answers. “Because” is a primary transitional word used to signal a cause-and-effect relationship, and in sentence 4, it is used to explain the reason for the effect of hieroglyphic writing being “difficult to decipher” (“Because it is so different from modern-day language”). The other effective model, sentence 9, uses a phrase beginning with “By” to explain how the cause “translating hieroglyphics into modern languages” yielded the effect of scientists having a better understanding of how ancient Egyptians lived. No other sentences in the paragraph demonstrate a cause-and-effect relationship.

Content Knowledge Type	Work of the Student Curriculum
Task of Teaching ELA	not applicable
Topic	III. Constructing Meaning
Subtopic	D. Text Types

9. “Decipher,” “obscure,” and “inscribed” are the correct answers. Each of these words is considered a Tier-2 word because it is an academic word that appears in a variety of subject areas. “Because” and “first” are not correct because these are basic and commonly used, or Tier 1, so they would not warrant vocabulary instruction. Finally, the terms “hieroglyphics” and “Rosetta Stone” are considered Tier-3 words because they are used only in the disciplines of archaeology and anthropology.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	1. Evaluating texts, examples, and graphic representations for their support of particular ELA instructional goals
Topic	II. Language
Subtopic	B. Vocabulary

10. The correct answer is (A). The student’s statement demonstrates a misunderstanding of what it means to “orbit”; the student seems to be confusing Mars’s orbit around the Sun with a trip from Mars to the Sun. The diagram in (A) is the only one that demonstrates the path the planets take around the Sun, which helps to illustrate the meaning of “orbit” for the student. The diagrams in the other answer choices do not provide a visual for the student that illustrates the idea of “orbit.” Rather, the diagram in (B) shows the relative size of the planets. The diagram in (C) shows the order of the planets in the solar system, and the one in (D) shows the distance of each planet from the Sun in millions of miles.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	9. Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions
Topic	III. Constructing Meaning
Subtopic	A. Key Ideas and Details

11. The correct answer is (B). To answer this question, the student can infer from the first paragraph that because an Earth year is “the amount of time it takes for Earth to orbit once around the Sun” and a Mars year is “how long it takes Mars to orbit the Sun,” a Saturn year must also be the amount of time it takes for Saturn to orbit once around the Sun. The second sentence of the third paragraph (“A year on another planet depends on how long it takes that planet to orbit”) further reinforces this inference. The student can then integrate this idea with the information from the third table column, “Time the planet takes to make orbit,” to see that Saturn takes 10,756 Earth days to orbit, which is clearly longer than Earth’s year of 365 days, a length of time mentioned in both the text and the table. (A) is incorrect because this question is explicitly answered in the table only, under “Distance from the Sun.” (C) is incorrect because this question is answered in the text only, both in the first paragraph and in the third paragraph, in the statement “A year on another planet depends on how long it takes that planet to orbit.” (D) is incorrect because to answer the question, the student can rely on the text and on the background knowledge that a typical fifth grader is ten or eleven years old, since the second paragraph says, “A typical fifth grader would be only six Mars years old because a Mars year is almost twice as long as an Earth year.”

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	5. Facilitating class discussions and conversations with individual students to elicit, develop, or assess their thinking about particular ELA content
Topic	III. Constructing Meaning
Subtopic	C. Integration and Application of Knowledge

12. The correct answer is (C). The student’s statement indicates a confusion between the concepts of physical age and planetary years. The student does not understand that if he lived on a planet farther from the Sun than Earth is, he would have fewer birthdays because an orbit takes longer, therefore making an actual year longer. He would not actually be a “baby” or younger physically than if he were on Earth. (A) and (B) are not misconceptions. Age is actually calculated differently on each planet (A), and planets that are farther from the Sun do actually have longer years (B). (D) is incorrect because while the Sun does cause the skin to “age,” in the sense that it damages the skin, this kind of aging is different from physical growth, which is the focus of the student’s misconception. Keeping a baby’s skin farther from the Sun might cause him to avoid getting skin damage, but it would not prevent him from growing into an elementary-aged child.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	9. Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions
Topic	III. Constructing Meaning
Subtopic	A. Key Ideas and Details

13. The correct answer is (D), “On My Own.” In this case, the question cannot be answered through any other means than the student’s outside knowledge, since neither the text nor the table discuss how the planets hold their orbits. Therefore, the student is unable to answer the question with information pulled directly from one part of the text (“Right There”), by integrating information from different parts of the text (“Think and Search”), or by combining information from the text with background knowledge (“Author and You”).

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	5. Facilitating class discussions and conversations with individual students to elicit, develop, or assess their thinking about particular ELA content
Topic	III. Constructing Meaning
Subtopic	C. Integration and Application of Knowledge

14. The correct answers are (A) and (D). (A) is correct because the overall claim “Wilbur learns a lot from Charlotte” is clearly relevant to the prompt “What does Wilbur learn from his friendship with Charlotte?” (D) is correct because the contextual information provided before the quotation sets up the relationship between Charlotte and Wilbur so that readers can understand her comment. However, (B) is incorrect because the textual evidence provided in the story is either too general to support the overall claim (e.g., “He got lots of confidence from Charlotte”) or focuses on Charlotte’s actions and words, rather than on what Wilbur learns from them, thereby failing to support the overall claim. (C) is incorrect because although the draft includes multiple subclaims (e.g., “she teaches him to believe in himself” and “She teaches him about the world and the seasons”), only the claim “She teaches him about friendship” is developed through Charlotte’s explanation of the personal benefits of acts of friendship. Finally, (E) is incorrect because the information provided after the quotation is a summary of a plot point rather than an explanation of the significance of the quotation in the context of the claim.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	9. Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions
Topic	III. Constructing Meaning
Subtopic	E. Production of Written texts

15. The correct answer is (C) only. The student shifts between past and present verb tense in the response. “She saved...,” “He got...,” “he asked,” and “she died” are in past tense, while the other verbs are in present tense. (A) and (B) are incorrect because the subjects and verbs match, and there are no sentence fragments.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	9. Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions
Topic	II. Language
Subtopic	A. Conventions of Standard Academic English

16. The correct answers are (B) and (E). Adding a space for the claim at the top of the graphic organizer (B) is an appropriate modification that will likely help students to select details that truly support the claim as textual evidence. Also, providing more genre-specific labels, such as “Evidence” and “Explanation” (E) will likely lead students to include more appropriate evidence and to explain their thinking. (A) is incorrect because replacing the quotation boxes with pictures to make it more aesthetically pleasing will eliminate the crucial element of textual evidence from this graphic organizer. Adding pictures of the characters is not a helpful modification for supporting the student’s revision. (C) also detracts from the assignment’s main goal of stating a claim and supporting it; adding a space for different characters’ viewpoints will likely be confusing and is unnecessary. Finally, (D) is an inappropriate modification and would also likely cause confusion. The relationship between each piece of textual evidence and the explanation of that evidence is the most critical, and this relationship is already represented clearly in the current graphic organizer.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching ELA	2. Creating and modifying texts, examples, and graphic representations to support particular ELA instructional goals, including differentiation for particular learners
Topic	III. Constructing Meaning
Subtopic	E. Production of Written texts

Mathematics—CKT 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 explanations follow the questions, along with information about the content topic, subtopic, and task of teaching targeted in each question.

Directions: Select the best answer or answers for each question below. Questions in formats that may be unfamiliar are followed by a note entitled “How to Answer the Question Above.”

- Which three of the following expressions are equivalent to $3,956 \div 4$?
 - $3,000 \div 4 + 900 \div 4 + 50 \div 4 + 6 \div 4$
 - $(4,000 \div 4 - 100 \div 4) + (60 \div 4 - 4 \div 4)$
 - $4 \div 3 + 4 \div 9 + 4 \div 5 + 4 \div 6$
 - $4,000 \div 4 - 40 \div 4 - 4 \div 4$
 - $3 \div 1,000 \div 4 + 95 \div 100 \div 4 + 6 \div 1 \div 4$
- 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.

 - 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?
 - 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?
 - 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?

How to Answer the Question Above

This is a multiple-choice question with three correct answers. You must select all three correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

How to Answer the Question Above

This is a “select all that apply” question. You should select one, two, or all three of the answer choices—however many are correct. You earn credit for the question only if you select all of the choices that are correct answers. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

3. 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 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.
- 4.

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

Josh is a third-grade student in Ms. Carter's classroom. Josh's answers to three addition problems are shown. He incorrectly answered the first two problems but correctly answered the third problem.

If Josh uses the same strategy to answer the following problem, what will his answer be?

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

How to Answer the Question Above

This is a numeric-entry test question. It requires you to enter a number in the box rather than select a number from a list of answer choices. In the actual test, simply type in the number. Backspace to erase.

5. Mr. Keller's sixth-grade class is learning about algebraic equations. In his teachers' edition of the textbook, Mr. Keller finds a page that suggests he ask students to critique the following two solutions to determine whether they are valid.

$4x + 2 = 12$	$5 = 2x + 3$
$6x = 12$	$5 = 5x$
$x = 12 \div 6$	$5 \div 5 = x$
$x = 2$	$x = 1$

Which of the following is most clearly highlighted by asking students to critique the invalid strategies?

- (A) Understanding the meaning of the equal sign
- (B) Understanding the importance of combining like terms
- (C) Understanding the use of properties of operations to simplify expressions
- (D) Understanding the use of inverse operations to solve equations

6. 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) $39 - 11$

How to Answer the Question Above

This is a multiple-choice question with three correct answers. You must select all three correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

7. $6 \div 2 = 3$ $3 \cdot 2 = 6$
 $21 \div 7 = 3$ $3 \cdot 7 = 21$

Mr. Khan's students are discussing the problems shown. Mr. Khan asks his students what relationships they notice in the problems. One student responds with the following conjecture.

I noticed that when you divide by a number and then multiply the result by the same number, you always get back the first number.

Provided that division by zero is excluded, for which of the following sets of numbers is the student's conjecture true?

Select all that apply.

- (A) Whole numbers
- (B) Integers
- (C) Fractions and decimals

How to Answer the Question Above

This is a “select all that apply” question. You should select one, two, or all three of the answer choices—however many are correct. You earn credit for the question only if you select all of the choices that are correct answers. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

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

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

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) $\frac{1}{2} + \frac{7}{9} = \frac{9}{18} + \frac{14}{18} = \frac{23}{36}$
9. 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 problem above?
- (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 4 of the cookies?

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

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

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

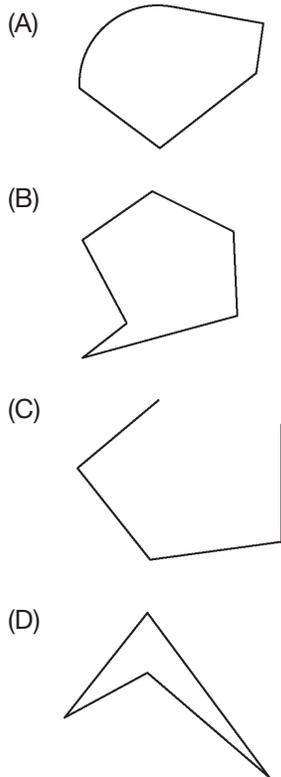
When Ms. Hayes asked Daryl to explain his strategy, he said, "The answer is 63 hundredths. I wrote the decimals 7 tenths and 7 hundredths as fractions and subtracted them. Since I wanted the denominators to be the same, I added a zero to the first 7 and a zero to 10. 70 hundredths minus 7 hundredths 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 $\frac{7 \cdot 10}{10 \cdot 10} = \frac{70}{100}$.
- (C) He should point out that $\frac{70}{100} - \frac{7}{100} = \frac{70-7}{100}$.
- (D) He should indicate why $0.63 = \frac{63}{100}$.

11. 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?



How to Answer the Question Above

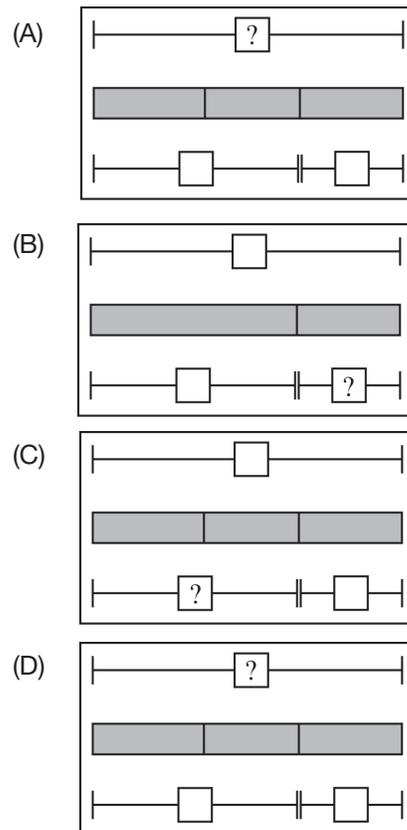
This is a multiple-choice question with two correct answers. You must select both correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

12. Ms. Howe’s students are learning how to use models to help them answer word problems. The models use bars to represent the relationships between the given quantities and the unknown quantity. In each model, the unknown quantity is represented with a question mark. The quantities given in the word problem will occupy the other boxes.

Ms. Howe presents the following word problem to her students.

Max had \$24. He gave $\frac{1}{3}$ of his money to Sarah and the rest to Olivia. How much money did he give to Olivia?

Which of the following models best corresponds to the given word problem?



13. Ms. Kress asked her students to compare $\frac{1}{3}$ and $\frac{7}{8}$. Four of her students correctly answered that $\frac{7}{8}$ is greater than $\frac{1}{3}$, but they gave different explanations when asked to describe their strategies to the class.

Indicate whether each of the following student explanations provides evidence of a mathematically valid strategy for comparing $\frac{1}{3}$ and $\frac{7}{8}$.

Student Explanation	Provides Evidence	Does Not Provide Evidence
When you look at the numbers, you see that 7 is bigger than 1, so $\frac{7}{8}$ is the bigger fraction.		
In the first fraction, 1 is less than half of 3, but in the second, 7 is more than half of 8, so $\frac{7}{8}$ is larger than $\frac{1}{3}$.		
I multiplied 1 times 7 and 3 times 7, so $\frac{1}{3}$ is the same as $\frac{7}{21}$. This means that $\frac{7}{8}$ is bigger than $\frac{1}{3}$ because $\frac{1}{8}$ is bigger than $\frac{1}{21}$.		
I wanted to make a fraction equal to $\frac{1}{3}$ with the same bottom number as $\frac{7}{8}$, so I added 5 to 3 and got 8. Then I added 5 to 1 and got 6, but 7 is greater than 6, so $\frac{7}{8}$ is greater.		

How to Answer the Question Above

This is a table question worth two points and eligible for partial credit. It requires you to select one choice for each row. You will receive full credit (two points) if all rows are completed correctly. You will receive one point if all but one row is completed correctly. In the actual test, click on a box to select it; a check mark will appear. If you change your mind, click on the check mark to remove it, or simply click on another box in the same row, and your check mark will move to the new box.

Mathematics—CKT Answers

The answers to the sample test questions are provided below, along with explanations and classifications. Each question focuses on a specific mathematics topic and subtopic listed in “Content Topics,” beginning on page 16. Questions that measure specialized content knowledge also incorporate a particular “Task of Teaching Mathematics” listed on page 15. These questions are intended to measure the specialized content knowledge needed to carry out the task effectively.

1. 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 $(3,000 + 900 + 50 + 6) \cdot 4$. Applying the distributive property yields $3,000 \cdot 4 + 900 \cdot 4 + 50 \cdot 4 + 6 \cdot 4$, which is the expression in (A). Since 3,956 can be written as $3,900 + 56$, the given expression is equivalent to $(3,900 + 56) \cdot 4$. Applying the distributive property yields $3,900 \cdot 4 + 56 \cdot 4$. One can rewrite 3,900 as $4,000 - 100$ and 56 as $60 - 4$, which yields the equivalent expression $(4,000 - 100) \cdot 4 + (60 - 4) \cdot 4$. Applying the distributive property again yields $(4,000 - 100) \cdot 4 + (60 - 4) \cdot 4$, which is the expression in (B). Since 3,956 can be written as $4,000 - 40 - 4$, the given expression is equivalent to $(4,000 - 40 - 4) \cdot 4$. Applying the distributive property yields $4,000 \cdot 4 - 40 \cdot 4 - 4 \cdot 4$, which is the expression in (D). Applying the distributive property to the expression in (C) yields $4 \cdot (3 + 9 + 5 + 6)$, which is equivalent to $4 \cdot 23$, but this expression is not equivalent to the given expression. Since $6 \cdot 1 = 6$, applying the distributive property to the expression in (E) yields $3 \cdot 1,000 + 95 \cdot 100 + 6$, which is equivalent to $(3,000 + 9,500 + 6) \cdot 4$. The sum of the numbers in the parentheses is 12,506; therefore, the expression in (E) is not equivalent to the given expression.

Content Knowledge Type	Work of the Student Curriculum
Task of Teaching Mathematics	not applicable
Topic	II. Place Value and Decimals

2. 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.

Content Knowledge Type	Work of the Student Curriculum
Task of Teaching Mathematics	not applicable
Topic	III. Fractions, Operations with Fractions, and Ratios

3. 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. (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. (B) is not the key because Dora counted out 7 counters, so there is evidence that she has a concept of the quantity 7. (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.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Mathematics	15. Interpreting a student's mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error
Topic	I. Counting and Operations with Whole Numbers
Subtopic	A. Counting

4. 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.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Mathematics	15. Interpreting a student's mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error
Topic	I. Counting and Operations with Whole Numbers
Subtopic	B. Operations with Whole Numbers

5. The correct answer is (B). In the first solution, $4x$ and 2 are added to get $6x$, but the $4x$ term contains a variable, whereas the 2 is a constant term; it is incorrect to add $4x$ and 2 because they are not like terms. Similarly, in the second solution, $2x$ and 3 are added to get $5x$, but $2x$ and 3 are not like terms, so this strategy is not valid. Therefore, understanding the importance of combining like terms is the answer choice that is most clearly highlighted by asking students to critique the two invalid strategies.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Mathematics	8. Evaluating examples for how well they introduce a concept; illustrate an idea or relationship; illustrate the appropriateness of a strategy, procedure or practice; or address particular student questions, misconceptions, or partial conceptions
Topic	IV. Early Equations and Expressions, Measurement, and Geometry
Subtopic	A. Early Equations and Expressions

6. 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. (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. (C) is incorrect because the number 28 is decomposed as the sum of 14 and itself, so this decomposition is related to doubles. (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.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Mathematics	13. Determining whether student work demonstrates use of a particular mathematical idea or strategy
Topic	II. Place Value and Decimals

7. The correct answers are (A), (B), and (C). The student's conjecture can be represented by the equation $(a \div b) \cdot b = a$, where a and b are numbers. Based on the order of operations, the left-hand side of the equation can be written as $a \div b \cdot b$, and since multiplication and division by the same number are inverse operations, it is true in general that $(a \div b) \cdot b = a$, with one exception. The exception is when $b = 0$, since division by zero is undefined. However, the question excludes division by zero, so the student's conjecture is true for whole numbers, integers, and fractions and decimals. Whole numbers are the numbers $0, 1, 2, 3, \dots$, and integers are positive and negative whole numbers.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Mathematics	4. Evaluating a student conjecture for its validity and/or generalizability on a given domain
Topic	I. Counting and Operations with Whole Numbers
Subtopic	B. Operations with Whole Numbers

8. 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 finds the least common denominator, but the rewritten fractions are not equivalent to the original fractions. The work in (B) is different because the student does not find the least common denominator, and then the student correctly adds the fractions. The work in (C) is different because the student did not correctly find equivalent fractions that shared the least common denominator.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Mathematics	15. Interpreting a student's mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error
Topic	III. Fractions, Operations with Fractions, and Ratios

9. The correct answer is (D). In the original problem, an initial quantity is given, a portion of it is taken away, and the problem asks for the resulting quantity. (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.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Mathematics	6. Evaluating mathematical problems for how well they elicit a particular idea, support the use of a particular solution strategy or practice, fit a particular mathematical structure, address the same concept as another problem, or assess a particular student conception or error
Topic	I. Counting and Operations with Whole Numbers
Subtopic	B. Operations with Whole Numbers

10. 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 $\frac{70}{100}$. (A) is incorrect because Daryl clearly conveyed that $0.7 = \frac{7}{10}$ and $0.7 = \frac{7}{100}$ 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-ten fraction. (C) is incorrect because Daryl did point out that $\frac{70}{100} - \frac{7}{10} = \frac{70-7}{100}$ when he said, "70 hundredths minus 7 hundredths is 63 hundredths." (D) is incorrect because Daryl referred to the decimal 0.63 as *63 hundredths*, which was a direct link to the base-ten fraction $\frac{63}{100}$.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Mathematics	3. Determining the changes that would improve the validity, generalizability, completeness, and/or precision of a mathematical explanation
Topic	II. Place Value and Decimals

11. 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. (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. (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.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Mathematics	9. Generating or identifying nonexamples or counterexamples to highlight a mathematical distinction or to demonstrate why a student conjecture is incorrect or partially incorrect
Topic	IV. Early Equations and Expressions, Measurement, and Geometry
Subtopic	C. Geometry

12. The correct answer is (C). First, since it is known that Max had \$24, the model should show that the total amount is known. Next, since Max gave $\frac{1}{3}$ of his money to Sarah, the model should show that the total is divided in thirds. Finally, the model should show that the money given to Olivia, which is $\frac{2}{3}$ of the total amount, is the unknown. (C) is the only choice that shows that the total amount would be filled in, the total amount is divided in thirds, and the unknown is $\frac{2}{3}$ of the total amount. (A) is incorrect because it shows that the unknown is the total amount, which is not true. (B) is incorrect because it shows that the unknown is the smaller part of the whole, which is incorrect. Also, note that in both (A) and (B), all that is given is that one part is larger than the other, not that one part is $\frac{2}{3}$ of the whole and the other part is $\frac{1}{3}$ of the whole. (D) is incorrect because it shows that the unknown is the total amount, which is not true.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Mathematics	11. Selecting, creating, or evaluating representations or manipulatives for a mathematical purpose or to show a particular mathematical idea
Topic	III. Fractions, Operations with Fractions, and Ratios

13. The first and fourth explanations do not provide evidence of a mathematically valid strategy for comparing $\frac{1}{3}$ and $\frac{7}{8}$, but the second and third explanations do. In the first explanation, the student only compares the numerators of the fractions, which is not a valid strategy because it does not take into account the effect of the denominator on the size of the pieces. In the second explanation, the student compares both fractions to the benchmark fraction $\frac{1}{2}$, which is a valid strategy since $\frac{1}{3}$ is less than $\frac{1}{2}$ and $\frac{7}{8}$ is greater than $\frac{1}{2}$. In the third explanation, the student uses multiplicative reasoning to find a common numerator, and then the student compares the fractions by reasoning about the sizes of the unit fractions $\frac{1}{8}$ and $\frac{1}{21}$. This is a valid strategy. In the fourth explanation, the student uses additive reasoning to try to find a fraction equivalent to $\frac{1}{3}$ that has a denominator of 8, but $\frac{6}{8}$ is not equivalent to $\frac{1}{3}$, so this strategy is not valid.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Mathematics	2. Evaluating mathematical explanations for their validity, generalizability, explanatory power, and/or completeness
Topic	III. Fractions, Operations with Fractions, and Ratios

Science—CKT Sample Test Questions

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

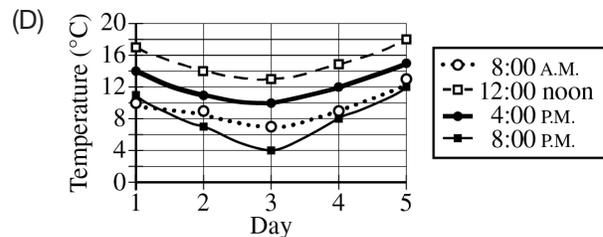
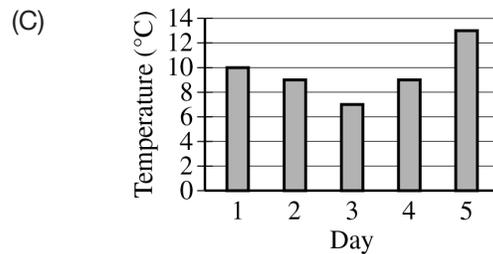
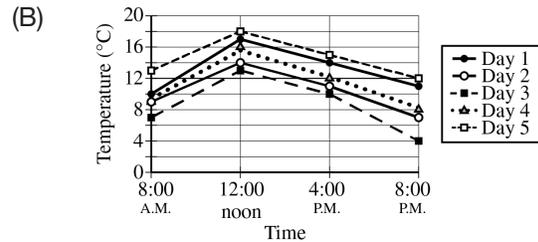
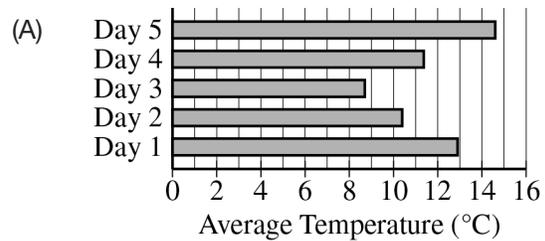
Directions: Select the best answer or answers for each question below. Questions in formats that may be unfamiliar are followed by a note titled “How to Answer the Question Above.”

A lower elementary grade class has been studying the weather. Below are some data that the students have collected.

Class Weather Data (°C)

	Day 1	Day 2	Day 3	Day 4	Day 5
Morning (8:00 A.M.)	10	9	7	9	13
Noon (12:00)	17	14	13	16	18
Afternoon (4:00 P.M.)	14	11	10	12	15
Evening (8:00 P.M.)	11	7	4	8	12

1. Which of the following representations would best help the students describe the relationship between time of day and temperature?

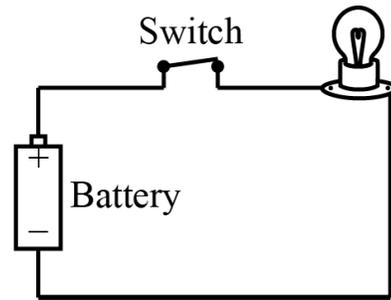


2. Which of the following sets of resources will best support a lower elementary investigation of shadows cast by different materials?
- (A) Three students of different heights and a meterstick to measure the lengths of the shadows cast by the students at different times of the day
 - (B) A light source, sheets of clear plastic, different colored plastics, paper, and cardboard to use for casting shadows against a wall in a darkened classroom
 - (C) A light source, three different wooden objects, and a ruler to measure the varying lengths of the shadows cast by the objects as they are repositioned closer or farther away from the light source
 - (D) Sheets of black paper to use to draw and cut out silhouettes that are then pasted on sheets of white paper
3. Mr. Mikeska wants his students to understand that the preserved remains of plants and animals can provide information about how a particular location on Earth has changed over long periods of geologic time. To illustrate the concept, Mr. Mikeska will guide his students through a classroom activity on the Atacama Desert region in western Chile.

Which of the following materials for the activity will best help Mr. Mikeska's students achieve the stated learning objective?

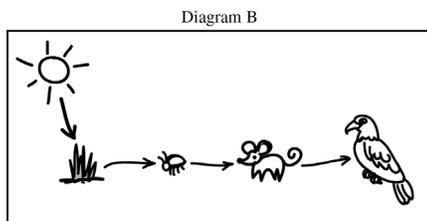
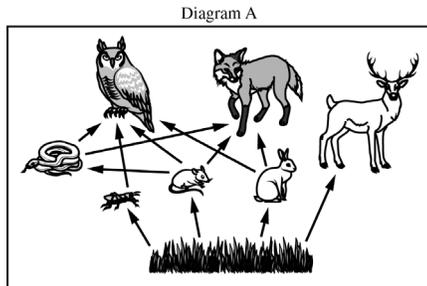
- (A) Photographs of the Atacama Desert that show fossils of fish in a rock layer
- (B) A short video showing archaeologists excavating a site in the Atacama Desert
- (C) An interview with astronomers who work at the new observatory in the Atacama Desert
- (D) Clay models that show the special adaptations of different types of Atacama Desert plants

A group of students builds the circuit shown in the diagram.



4. In which of the following statements does the student provide evidence that energy transfer occurs in the circuit?
- (A) Bryan: The battery is a source of stored energy, and the energy inside the battery is able to flow through the circuit when everything is connected properly.
 - (B) Taira: I know energy was transferred because the lightbulb was lit. Energy from the battery was transferred into light energy.
 - (C) Ravi: Since the switch is closed, energy can travel from the battery through the whole circuit.
 - (D) Natalie: The wires are metal so they are conductors. This lets them transfer energy from the battery through the circuit.

Ms. Smith is beginning an instructional unit on where the energy for living things comes from for her lower elementary grade students. She has found several diagrams available online to help introduce the unit, but she only has time to use one diagram in her class lesson.



5. Which diagram should Ms. Smith use for her class presentation, and what is the best rationale for using the diagram?
- Diagram A, because it shows many relationships between the animals and food sources.
 - Diagram A, because all energy in animals' food starts with plants.
 - Diagram B, because hand-drawn pictures are more accessible to students.
 - Diagram B, because all energy in animals' food was once energy from the Sun.

A teacher presents the following challenge to teams of second-grade students.

- Build a bridge using 100 building bricks only.
- Test the bridge to see how much weight it can hold.
- Record your data.
- Refine your bridge design so that it can carry more weight.

The teacher visits teams of students as they work and asks how they might improve their design.

6. Which student response most clearly shows an understanding of the design problem and its constraints?
- "We need to use a lot more building bricks to make the bridge stronger."
 - "We think taping the building bricks together would make it hold more."
 - "We could make the sides of the bridge thicker and the road narrower."
 - "We want to change from using building bricks to using wood blocks."

Students are provided with the data table shown below and are asked to create a pie chart showing how much of Earth's freshwater is available for drinking.

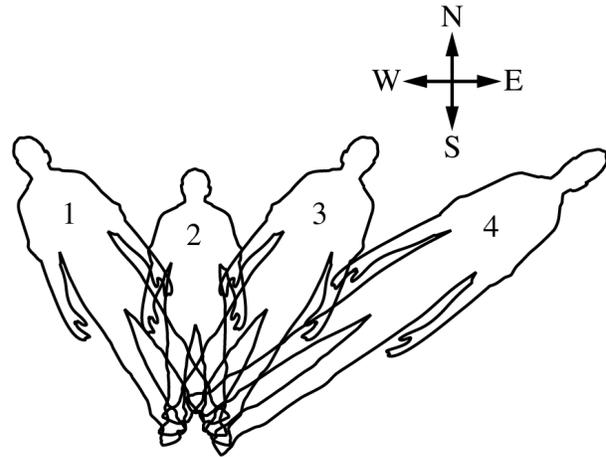
Source of Water	Volume of Water (Millions of km ³)
Saltwater Reservoirs	
Pacific Ocean	669.9
Atlantic Ocean	310.4
Indian Ocean	264.0
Southern Ocean	71.8
Arctic Ocean	18.8
Saline lakes	85.4
Saline groundwater	12.9
Freshwater Reservoirs	
Ice and snow	24.3
Ground ice and permafrost	0.3
Fresh groundwater	10.5
Freshwater lakes	0.1
Swamps	0.01
Rivers	0.02

7. Which of the following points will best help students decide how to organize their charts? Select three points.
- (A) Some lakes are freshwater and some lakes are salt water.
 - (B) Reservoirs that do not contain freshwater can be left out of the chart.
 - (C) The water in the Arctic Ocean is mostly under the Arctic ice cap.
 - (D) Some freshwater is not available for use by organisms.
 - (E) Several reservoirs with small volumes can be combined.

How to Answer the Question Above

This is a multiple-choice question with three correct answers. You must select all three correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

A student's shadow was traced at various times throughout the day. The following image shows the results.



When interpreting the patterns, one student stated that the tracing for number 4 was drawn at midday because it is the longest and faces more toward the east.

8. Which two of the following questions could the teacher ask to help the student clarify his thinking about the relationship of the shadows to the daily movement pattern of the Sun in the sky?
- (A) In what direction does the Sun set?
 - (B) How does the height of the student affect the difference in the four tracings?
 - (C) Why are some shadows longer than others?
 - (D) How would your shadows look different in the middle of winter?
 - (E) How do your drawings compare with those of other students?

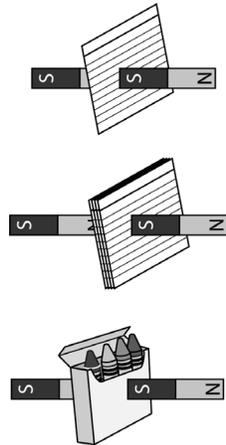
How to Answer the Question Above

This is a multiple-choice question with two correct answers. You must select both correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

Ms. Ling is designing an inquiry activity for her early elementary classroom that will require students to make physical models of bird beaks using spoons and toothpicks. The students will use the models to pick up objects of different sizes and shapes that represent different types of food. Students will use their observations to determine which beak model is best to pick up each food type.

9. This activity will best reinforce which of the following ideas?
- (A) Plants and animals have different requirements depending on where they live.
 - (B) Plants and animals can change the environment to meet their needs.
 - (C) Matter cycles through plants, animals, decomposers, and the environment.
 - (D) Plants and animals have specialized characteristics that help them perform specific tasks.

Four teams of students worked with two bar magnets each. Each team performed three trials testing one magnet's ability to attract the other through the following objects: a single index card, a stack of four index cards, and a box containing four crayons. The experimental design is represented in the figure.



All four teams observed that the magnetic attraction was weaker as the number of index cards was increased and even weaker when the box of crayons was used. The students then proposed questions that they felt would help them interpret their results.

10. Investigating which two of the following questions will provide the students with the most useful information?
- (A) Would replacing the box of crayons with the same thickness of index cards make a difference?
 - (B) How are bar magnets different from horseshoe magnets?
 - (C) Did we follow the step-by-step directions for the experiment correctly?
 - (D) Will increasing the distance between the magnets affect the attraction even if nothing is placed between the magnets?
 - (E) What would happen if we put the crayons inside the box in a different order from left to right?

How to Answer the Question Above

This is a multiple-choice question with two correct answers. You must select both correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

Science—CKT Answers

1. The correct answer is (B). This question tests your ability to select a graphical representation of data that will reveal a possible relationship between two specific variables. For the activity described, the graph in choice (B) is the best representation of the students' data because it reveals how temperature changed during the day for each of five different days, which will allow the students to identify the relationship between time of day and temperature. In contrast, the other graphs are not as useful for revealing the relationship between time of day and temperature. The graph in choice (A) shows the average temperature for each of five different days but does not reveal how the temperature changed during any of those days. Similarly, the graph in choice (C) shows the morning temperature for each of five different days but does not reveal how the temperature changed during any of those days. The graph in choice (D) shows how the temperature at a particular time of day changed over five consecutive days, but the graph is not the best representation for identifying a pattern in how the temperature changed during each of those days.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Science	Evaluating or selecting scientific models and representations that predict or explain scientific phenomena or address instructional goals
Topic	Earth and Space Sciences
Subtopic	Earth's Systems

2. The correct answer is (B). This question tests your ability to select the resources needed for an investigation of shadows cast by different materials. The resources presented in (B) are sufficient for the investigation because they include a light source and objects made of different materials, including plastic, paper, and cardboard. The resources presented in (A), which are more appropriate for an investigation of how the Sun's position in the sky affects shadow length, do not include a light source or objects made of different materials. The resources presented in (C), which are more appropriate for an investigation of shadows cast by objects with different shapes, include only objects made of wood. The resources presented in (D), which are more appropriate for reinforcing the idea that shadows are two-dimensional representations of three-dimensional objects, do not include a light source or objects made of materials other than paper.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Science	Selecting investigations or demonstrations that facilitate understanding of disciplinary core ideas, scientific practices, or cross-cutting concepts
Topic	Physical Science
Subtopic	Waves and their Interactions

3. The correct answer is (A). This question tests your ability to develop activities that will help students achieve specific learning objectives. The materials described in (A) will best help the students achieve the stated learning objective because the students will have an opportunity to link the observation of fossils, such as fish fossils found in an area that has become a desert, to the idea that fossils can provide evidence of environmental change over time. The other choices describe materials that are more appropriately linked to ideas outside the teacher's stated learning objective. The materials described in (B) are more appropriate for a lesson on the study of human history by archaeologists. The materials described in (C) are more appropriate for a lesson on the methods astronomers use to study celestial objects and phenomena. The materials described in (D) are more appropriate for a lesson on how plants are adapted to their environments.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Science	Linking science ideas to one another and to particular activities, models, and representations within and across lessons
Topic	Life Sciences
Subtopic	Biological Evolution

4. The correct answer is (B). This question tests your ability to identify statements that cite relevant evidence in support of a claim. The statement in (B) correctly cites the lit lightbulb as evidence that energy stored in the battery was transformed into light energy. In contrast, the statements in (A), (C), and (D) cite prior knowledge about circuits but do not cite evidence to support the claim that energy transfer occurred in the circuit.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Science	Critiquing student-generated explanations or descriptions for their generalizability, accuracy, precision, or consistency with scientific evidence
Topic	Physical Sciences
Subtopic	Energy

5. The correct answer is (D). This question tests your ability to select instructional materials that sufficiently address a specific scientific concept. As described in the question, a teacher is trying to decide which of two diagrams is more appropriate for an instructional unit on the energy sources that support living things. Choice (D) correctly identifies diagram B as more appropriate for the unit and provides a rationale that the diagram explicitly represents the Sun as the source of the energy flowing through a food chain. Choice (A) incorrectly identifies diagram A as more appropriate and provides an irrelevant rationale that the diagram represents many different feeding relationships. Choice (B) incorrectly identifies diagram A as more appropriate and provides an incorrect rationale that plants are the ultimate source of the energy flowing through all ecosystems. Choice (C) correctly identifies diagram B as more appropriate but provides an irrelevant rationale that hand-drawn pictures are more accessible to students.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Science	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	Physical Sciences
Subtopic	Energy

6. The correct answer is (C). This question tests your ability to evaluate students' ideas for solving a particular problem using an engineering design process. The response presented in (C) shows the best understanding of the design problem and its constraints because the student proposes a change to the design that could be implemented without additional materials. The changes proposed in the other responses would require additional materials, such as more building bricks (A), tape (B), or wood blocks (D). By proposing changes to the design that would require additional materials, the students are demonstrating that they do not understand the constraints of the teacher's challenge.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Science	Evaluating student ideas about what makes for good scientific models and representations
Topic	Physical Sciences
Subtopic	Engineering Design

7. The correct answers are (B), (D), and (E). This question tests your ability to identify information that will help students create a graphical representation of data. The students are given a task of creating a pie chart showing the portion of Earth's freshwater that is available for drinking. The information in (B) is relevant to the task because the students should create the pie chart using the data about freshwater but not about salt water. The information in (D) is relevant to the task because the students need to determine which reservoirs listed in the data table contain freshwater that is available for drinking. The information presented in (E) is relevant to the task because the pie chart created by the students will be easier to interpret if the students combine the data about reservoirs containing similar types of freshwater. The information in (A) is not relevant to the task because the students should not use the data for saline lakes when creating the pie chart. The information in (C) is not relevant to the task because the students should not use the data for oceans, which contain salt water, when creating the pie chart.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Science	Engaging students in using, modifying, creating, and critiquing scientific models and representations that are matched to an instructional goal

Topic	Earth and Space Sciences
Subtopic	Earth's Systems

8. The correct answers are (A) and (C). This question tests your understanding of how to guide students toward correcting misconceptions. In the activity described, a student has incorrectly concluded that the longest of four shadows was created at midday, when the Sun was high in the sky. By responding to the question posed in (A), the student will have an opportunity to realize that the shadows cast by the student always pointed away from the Sun's position in the sky, and that the longest of the four shadows pointed to the northeast. By responding to the question posed in (C), the student will have an opportunity to realize that the longest shadows observed in the activity were cast when the Sun was low in the sky. Responding to the questions posed in the other choices will not help the student understand how the Sun's position in the sky affects shadow length. The question posed in (B) is more appropriate for clarifying that the height of the student casting the shadows did not change during the activity. The question posed in (D) is more appropriate for understanding how the Sun's position in the sky changes with the seasons. The question posed in (E) is more appropriate for identifying a potential source of error in the investigation.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Science	Analyzing student ideas for common misconceptions regarding intended scientific learning
Topic	Earth and Space Sciences
Subtopic	Earth's Place in the Universe

9. The correct answer is (D). This question tests your ability to link an idea with a particular classroom activity. The idea presented in (D) is appropriately linked to the activity described in the question because the activity provides students with an opportunity to investigate how beak shape and size, which are specialized characteristics, affect a bird's ability to pick up different objects, which is a specific task. The ideas presented in the other choices are not appropriately linked to the activity described. For example, the activity does not provide students with an opportunity to compare the requirements of birds living in different places (A), to investigate whether birds can change their environment to meet their needs (B), or to explore how matter cycles through different ecosystems (C).

Content Knowledge Type	Specialized Content Knowledge
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Task of Teaching Science	Linking science ideas to one another and to particular activities, models, and representations within and across lessons
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Topic	Life Sciences
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Subtopic	Engineering Design
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10. The correct answers are (A) and (D). This question tests your ability to identify scientific questions that will lead to a better understanding of a natural phenomenon. In the activity described, students are designing experiments to investigate how different factors affect the attraction between two bar magnets. By investigating the scientific question posed in (A), the students will test whether they introduced an uncontrolled variable into their initial experiment by using different objects (index cards and a box of crayons) to separate the two bar magnets. By investigating the scientific question posed in (D), the students will test whether changing the distance between the two bar magnets will affect the strength of the magnetic attraction even when no objects are placed between the magnets. Investigating the questions posed in the other choices will not help the students interpret their results. The scientific question posed in (B) is not relevant to the investigation because it focuses on the differences between bar magnets and horseshoe magnets. Investigating the scientific question posed in (C) will not generate new information because the students already know that the four teams obtained similar results, indicating that human error was not a contributing factor. Investigating the question posed in (E) will not generate new information because the experiment will be the same as before, especially if the bar magnets are the same distance apart and are separated by the same box of crayons.

Content Knowledge Type	Specialized Content Knowledge
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Task of Teaching Science	Determining the variables, techniques, or tools that are appropriate for students to address a specific investigation question
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Topic	Physical Sciences
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Subtopic	Motion and Stability: Forces and Interactions
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Social Studies—CKT Sample Test Questions

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

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case.

1. During a history lesson, a teacher ties a string from one side of the classroom to the other. Hanging from the string at random intervals are signs labeled with events that led to the start of the American Revolution. The signs do not display the dates of the events. Students take turns moving signs on the string to appear in order from earliest to latest until the signs are all in the correct order.

Which of the following lesson objectives best matches the activity?
 - (A) Students will demonstrate the ability to consider alternate points of view.
 - (B) Students will compare and contrast the characteristics of famous individuals.
 - (C) Students will identify cause-and-effect relationships to determine chronology.
 - (D) Students will analyze historical data to determine the importance of historical events.

2. A teacher overhears student conversations during class and learns that many of them love to play with toy bricks and logs that can be used to make objects such as buildings and spaceships. During a unit on the American Revolution, the teacher assigns students to use the toys to each create a diorama of an important event before the outbreak of the American Revolution. Which of the following is the most likely instructional benefit provided by the assignment?
 - (A) Appealing to student creativity and engagement
 - (B) Preventing students from losing focus during class
 - (C) Facilitating the use of differentiated instruction
 - (D) Considering multiple points of view

3. 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

4. **To review a lesson on early United States history, a teacher assigns students to write a brief essay on the origins of the United States Constitution. The following excerpt contains ideas that were common among student essays.**

“After we won the American Revolution, we set out to create a new government under the Articles of Confederation. After years of problems under the Articles of Confederation, people started to draft a new constitution instead. A group of federalists like James Madison and Alexander Hamilton argued that we needed a weaker central government so that people and states could have more rights. The Constitution was finally ratified with a bill of rights.”

The essay should indicate to the teacher that students may need additional instruction on which of the following details?

- (A) The federalists called for a stronger central government.
 - (B) The Articles of Confederation also contained a bill of rights.
 - (C) The United States Constitution was drafted during the American Revolution.
 - (D) James Madison and Alexander Hamilton did not participate in these debates
5. A fifth-grade class creates a list of services that different levels of government provide. The teacher then divides students into groups and instructs them to brainstorm ways the local, state, and national governments pay for the list of services they created.

Which of the following best identifies the academic purpose of the activity?

- (A) Reviewing the services commonly provided by different levels of government with students
- (B) Accessing students’ prior knowledge before beginning a lesson on taxation
- (C) Having students complete a prewriting activity before assigning a written report on taxation
- (D) Conducting a formal assessment to determine mastery of a subject

6. A third-grade teacher has completed a lesson on the United States Constitution and wants to assess whether students understand the importance of the Bill of Rights. During a classroom activity, students work in groups to draft and ratify a classroom bill of rights. Listed below are examples of amendments suggested by some of the students

Students must come to school on time.

Students cannot go outside for recess until they clean up their desks.

Students have the right to ask questions if they need help with their work.

Students need to respect the teacher and the principal.

Students may bring a book to share in the class library.

Based on the examples suggested by the students, it is evident that further instruction is required on which of the following concepts?

- (A) The importance of laws and rules
- (B) The authority structure of the school faculty
- (C) The purpose of punishments for committing crimes
- (D) The difference between freedoms and responsibilities

7. Which TWO of the following resources would best allow students to examine the political views of their congressional representatives?
- (A) Legislative voting records from a government Web site
 - (B) Election campaign advertisements
 - (C) Approval-rating polls made by television news channels
 - (D) Social media posts made by voters and constituents
 - (E) A State of the Union address made by the president
10. 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. 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

How to Answer the Question Above

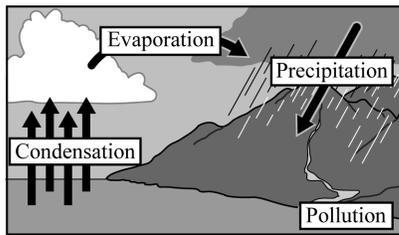
This is a multiple-choice question with two correct answers. You must select both correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

8. What are three main agents of erosion?
- (A) Water, wind, and gravity
 - (B) Tornadoes, hurricanes, and tsunamis
 - (C) Deforestation, overgrazing, and overpopulation
 - (D) Canyons, sandbars, and fjords
9. A third-grade teacher is planning a geography activity in which students determine the highest points of elevation in four regions of the country. Which of the following tools will students need to learn to interpret to complete the activity?
- (A) Longitude and latitude
 - (B) Contour lines
 - (C) Scale
 - (D) Compass rose

How to Answer the Question Above

This is a multiple-choice question with two correct answers. You must select both correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choice next to it; this causes an “x” to appear in the box. If you change your mind, click the box again to remove the “x.”

11. After a geography lesson, a teacher asks students to label a diagram of the water cycle. The following image shows one student's work.



A review of which TWO of the following details about the water cycle would best address the misconceptions shown in the student's work?

- (A) Water must first evaporate before it condenses.
- (B) Precipitation can occur over bodies of water.
- (C) Clouds can form without immediate precipitation.
- (D) Runoff can occur without polluting bodies of water.
- (E) Gravity forces water down mountain slopes.

How to Answer the Question Above

This is a multiple-choice question with two correct answers. You must select both correct answers—and no incorrect answers—to earn credit for the question. In the actual test, the answer choices appear next to empty check boxes. Click on a box to select the answer choice next to it; this causes an "x" to appear in the box. If you change your mind, click the box again to remove the "x."

12. 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
13. Which of the following terms best describes the economic condition that causes prices to increase when there is a shortage of goods in high demand?
- (A) Deflation
 - (B) Taxation
 - (C) Scarcity
 - (D) Abundance
14. A local store normally sells bars of soap for \$3.75 each. Next week, there will be a sale: two bars of soap for \$5.00.
- Which of the following examples best represents a careful consideration of costs and benefits when making economic choices?
- (A) Juan always buys soap when he goes to the store, regardless of the price.
 - (B) Ellie is at the store today and will need soap soon, but she decides to wait until next week to buy it.
 - (C) Maggie does not need to buy soap today, but she buys it anyway because she is at the store.
 - (D) Danny buys soap only when it is on sale, even if he is out of soap at home.
15. Which of the following questions would best facilitate a discussion in a fifth-grade classroom about the importance of investing for the future?
- (A) Should the school spend its remaining budget on a pizza party or a new computer for the library?
 - (B) How often do you receive an allowance from your parents?
 - (C) Would you prefer to spend your lunch money on pizza or a cheeseburger?
 - (D) Would you rather buy a new bicycle now or wait to see whether it goes on sale?

Social Studies—CKT Answers

1. The correct answer is (C). Each sign is not labeled with the date of the event, so the activity requires students to consider the cause-and-effect relationships of events to assist them in determining their chronological order. (A) is incorrect because the students are not examining multiple points of view in the activity. (B) is incorrect because the students are not studying the characteristics of individuals. (D) is incorrect because the students are not using historical data to draw conclusions about the importance of historical events.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	Designing learning experiences to promote student understanding of social studies content and processes
Topic	I. History
Subtopic	A. Understands the concept of chronology

2. The correct answer is (A). Students have demonstrated that they are interested in creating models using building-block-style toys. The teacher chooses to appeal to that interest in an attempt to engage students in the content. (B) is incorrect because while the activity may encourage students to focus on their work, this is not the most valuable benefit. (C) is incorrect because the project can be completed by children of all ability levels with little to no differentiation. (D) is incorrect because the project is not likely to have students consider multiple points of view.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	1. Anticipating student thinking in relation to social studies content
Topic	I. History
Subtopic	F. Understands how conflict between the American colonies and Great Britain led to American independence

3. 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.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	2. Selecting, adapting, and creating resources to support particular social studies instructional goals
Topic	I. History
Subtopic	B. Understands how various sources provide information about the past and present

4. The correct answer is (A). The essay incorrectly attributes federalist arguments to wanting a weaker central government. Federalists like James Madison and Alexander Hamilton cited instances of central government weakness under the Articles of Confederation in their arguments for ratifying the Constitution and making the central government more powerful. (B) is incorrect because the Articles of Confederation did not contain a bill of rights. (C) is incorrect because the United States Constitution was drafted in 1787, after the 1783 Treaty of Paris and after the ratification of the Articles of Confederation in 1781. (D) is incorrect because James Madison and Alexander Hamilton were among the foremost advocates for the ratification of the Constitution.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	5. Evaluating student ideas evident in student work, talk, actions, and interactions to identify strengths and areas for instructional focus
Topic	I. History
Subtopic	G. Understands the characteristics of indigenous peoples in North America before European exploration

5. The correct answer is (B). By grouping students to collaboratively identify how various branches of government pay for services, the teacher will learn what the students know about taxation to plan an appropriate lesson. (A) is incorrect because these services are already provided to students at the beginning of the activity. (C) is incorrect because while the activity may introduce the concept of taxation to students it will not likely prepare them to write a report on the subject. (D) is incorrect because the group brainstorming activity does not serve as a reliable or valid assessment of mastery.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	5. Evaluating student ideas evident in student work, talk, actions, and interactions to identify strengths and areas for instructional focus
Topic	II. Government and Citizenship
Subtopic	C. Understands the various levels of government

6. The correct answer is (D). The lesson activity is focused on the purpose and importance of the Bill of Rights, which guarantees people in the United States certain rights and freedoms. Some of the students' proposed amendments seem to be focused more on rules that must be followed than they are with rights that should be protected. The teacher should focus the next lesson on the differences between freedoms and responsibilities. (A) is incorrect because the students seem to understand the importance of rules and laws, but they do not seem to understand the differences between those rules and laws and the freedoms and rights guaranteed by the Bill of Rights. (B) is incorrect because a lesson on the hierarchy or authority structure of the school faculty will not address the issues shown in student work. (C) is incorrect because the students seem to need help understanding the purpose of the Bill of Rights, which does not document punishments for crimes.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	5. Evaluating student ideas evident in student work, talk, actions, and interactions to identify strengths and areas for instructional focus
Topic	II. Government and Citizenship
Subtopic	E. Understands important ideas in the Declaration of Independence and in the Constitution, including the Bill of Rights

7. The correct answers are (A) and (B). Students seeking to determine the political views of elected representatives should look at their voting records on legislation to determine their partisan stance on issues. Students can also view representatives' election campaign advertisements, which likely lay out the representatives' values and goals for legislation. (C) is incorrect because approval-ratings polls are a reflection of constituent satisfaction and do not provide an official's political stance on certain issues. (D) is incorrect because social media posts made by voters may not reflect any official stance that an elected representative has made. (E) is incorrect because the State of the Union address is given by the president of the United States and not by members of the legislative branch. This would not provide information about representatives.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	2. Selecting, adapting, and creating resources to support particular social studies instructional goals
Topic	II. Government and Citizenship
Subtopic	F. Understands the characteristics of responsible citizenship

8. The correct answer is (A). Erosion is the geological process in which earthen materials are worn away and transported by natural forces such as wind, water, or the downslope movement of soil caused by gravity. (B) is incorrect because while these weather formations may cause the movement of wind and water, they are not

the specific agents of erosion. (C) is incorrect. While deforestation, overgrazing, and overpopulation may cause soil to shift or be displaced, they are not the main agents of the physical process of erosion. (D) is incorrect. Canyons, sandbars, and fjords are each formed by erosion and are not agents of erosion. The correct answer is (A). The Cascade Mountains crosses through the state of Washington.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	3. Demonstrating understanding of social studies content in order to apply social studies concepts and skills in instruction
Topic	III. Human and Physical Geography
Subtopic	B. Understands physical characteristics of place and how they affect human activities and settlement patterns

9. The correct answer is (B). Contour lines are used in topographic maps to represent elevation, or height above sea level. (A) is incorrect because longitude and latitude are more useful as coordinates for determining the absolute location of a landmark. (C) is incorrect because the scale of a map shows a proportional measure of distance and no elevation. (D) is incorrect because the legend displays the symbols and geographic features of a physical map, such as mountains, rivers, and dams.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	1. Anticipating student thinking in relation to social studies content
Topic	III. Human and Physical Geography
Subtopic	A. Understands the concepts of location, distance, and direction

10. 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.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	5. Evaluating student ideas evident in student work, talk, actions, and interactions to identify strengths and areas for instructional focus
Topic	III. Human and Physical Geography
Subtopic	C. Understands human characteristics of place and how humans adapt to variations in the physical environment

11. The correct answers are (A) and (D). (A) is correct because evaporation immediately precedes condensation, rather than the other way around. (D) is correct because pollution is not necessarily a function of runoff. (B), (C), and (E) do not correspond to a misconception shown in the student's work.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	5. Evaluating student ideas evident in student work, talk, actions, and interactions to identify strengths and areas for instructional focus
Topic	III. Human and Physical Geography
Subtopic	B. Understands physical characteristics of place and how they affect human activities and settlement patterns

12. 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.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	4. Designing learning experiences to promote student understanding of social studies content and processes
Topic	IV. Economics
Subtopic	A. Understands how human needs are met

13. The correct answer is (C). Scarcity refers to when the needs and wants of consumers exceed the resources available to meet them. Scarcity in goods during periods of high demand will often cause prices to increase. (A) is incorrect because deflation refers to the persistent fall in the general price level of goods and services. (B) is incorrect because taxation is not dependent on the supply or demand of a good. (D) is incorrect because abundance refers to a large supply of goods and not a shortage of goods.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	3. Demonstrating understanding of social studies content in order to apply social studies concepts and skills in instruction

Topic	IV. Economics
Subtopic	A. Understands how human needs are met

14. The correct answer is (B). Ellie weighs the cost and benefits of buying soap by considering the fact that she has enough soap to last until next week, when soap will cost less. (A) is incorrect because Juan's decision to buy soap no matter the cost does not indicate any cost-benefit analysis. (C) is incorrect because Maggie does not consider the future cost of the soap when weighing the benefits of waiting to buy soap later. (D) is incorrect because if Danny only buys soap when it is on sale, he is not likely to have enough soap between sales.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	3. Demonstrating understanding of social studies content in order to apply social studies concepts and skills in instruction
Topic	IV. Economics
Subtopic	A. Understands how human needs are met

15. The correct answer is (A). This discussion question would provide an age-appropriate way for students to consider the importance of investing for the future. The pizza party is a form of consumption that will serve a temporary purpose, whereas the new computer can be considered an investment that will serve the library for a long time. Option (B) is incorrect because the question only asks about a planned source of income and not a way to invest the income. Option (C) is incorrect because this question is more likely to facilitate a discussion about opportunity cost. Option (D) is incorrect because this question is more likely to facilitate a discussion about cost-benefit analysis.

Content Knowledge Type	Specialized Content Knowledge
Task of Teaching Social Studies	4. Designing learning experiences to promote student understanding of social studies content and processes
Topic	IV. Economics
Subtopic	A. Understands how human needs are met

4. Determine Your Strategy for Success

Set clear goals and deadlines so your test preparation is focused and efficient

Effective *Praxis* test preparation doesn't just happen. You'll want to set clear goals and deadlines for yourself along the way. Otherwise, you may not feel ready and confident on test day.

1) Learn what the test covers.

You may have heard that there are several different versions of the same test. It's true. You may take one version of the test and your friend may take a different version a few months later. Each test has different questions covering the same subject area, but both versions of the test measure the same skills and content knowledge.

You'll find specific information on the test you're taking on page 5, which outlines the content categories that the test measures and what percentage of the test covers each topic. Visit www.ets.org/praxis/testprep for information on other *Praxis* tests.

2) Assess how well you know the content.

Research shows that test takers tend to overestimate their preparedness—this is why some test takers assume they did well and then find out they did not pass.

The *Praxis* tests are demanding enough to require serious review of likely content, and the longer you've been away from the content, the more preparation you will most likely need. If it has been longer than a few months since you've studied your content area, make a concerted effort to prepare.

3) Collect study materials.

Gathering and organizing your materials for review are critical steps in preparing for the *Praxis* tests. Consider the following reference sources as you plan your study:

- Did you take a course in which the content area was covered? If yes, do you still have your books or your notes?
- Does your local library have a high school-level textbook in this area? Does your college library have a good introductory college-level textbook in this area?

Practice materials are available for purchase for many *Praxis* tests at www.ets.org/praxis/testprep. Test preparation materials include sample questions and answers with explanations.

4) Plan and organize your time.

You can begin to plan and organize your time while you are still collecting materials. Allow yourself plenty of review time to avoid cramming new material at the end. Here are a few tips:

- Choose a test date far enough in the future to leave you plenty of preparation time. Test dates can be found at www.ets.org/praxis/institutions/scores/passing/.
- Work backward from that date to figure out how much time you will need for review.
- Set a realistic schedule—and stick to it.

5) Understand how questions will be scored.

Scoring information can be found on page 132.

6) Develop a study plan.

A study plan provides a road map to prepare for the *Praxis* tests. It can help you understand what skills and knowledge are covered on the test and where to focus your attention. Use the study plan template on page 83 to organize your efforts.

And most important—get started!

Would a Study Group Work for You?

Using this guide as part of a study group

People who have a lot of studying to do sometimes find it helpful to form a study group with others who are working toward the same goal. Study groups give members opportunities to ask questions and get detailed answers. In a group, some members usually have a better understanding of certain topics, while others in the group may be better at other topics. As members take turns explaining concepts to one another, everyone builds self-confidence.

If the group encounters a question that none of the members can answer well, the group can go to a teacher or other expert and get answers efficiently. Because study groups schedule regular meetings, members study in a more disciplined fashion. They also gain emotional support. The group should be large enough so that multiple people can contribute different kinds of knowledge, but small enough so that it stays focused. Often, three to six members is a good size.

Here are some ways to use this guide as part of a study group:

- **Plan the group's study program.** Parts of the study plan template, beginning on page 83 can help to structure your group's study program. By filling out the first five columns and sharing the worksheets, everyone will learn more about your group's mix of abilities and about the resources, such as textbooks, that members can share with the group. In the sixth column ("Dates I will study the content"), you can create an overall schedule for your group's study program.
- **Plan individual group sessions.** At the end of each session, the group should decide what specific topics will be covered at the next meeting and who will present each topic. Use the topic headings and subheadings in the Test at a Glance table on page 5 to select topics, and then select practice questions, beginning on page 33.
- **Prepare your presentation for the group.** When it's your turn to present, prepare something that is more than a lecture. Write two or three original questions to pose to the group. Practicing writing actual questions can help you better understand the topics covered on the test as well as the types of questions you will encounter on the test. It will also give other members of the group extra practice at answering questions.
- **Take a practice test together.** The idea of a practice test is to simulate an actual administration of the test, so scheduling a test session with the group will add to the realism and may also help boost everyone's confidence. Remember, complete the practice test using only the time that will be allotted for that test on your administration day.
- **Learn from the results of the practice test.** Review the results of the practice test, including the number of questions answered correctly in each content category. For tests that contain constructed-

response questions, look at the Sample Test Questions section, which also contain sample responses to those questions and shows how they were scored. Then try to follow the same guidelines that the test scorers use.

- **Be as critical as you can.** You're not doing your study partner(s) any favors by letting them get away with an answer that does not cover all parts of the question adequately.
- **Be specific.** Write comments that are as detailed as the comments about the sample responses. Indicate where and how your study partner(s) are doing an inadequate job of answering the question. Writing notes in the margins of the answer sheet may also help.
- **Be supportive.** Include comments that point out what your study partner(s) got right.

Then plan one or more study sessions based on aspects of the questions on which group members performed poorly. For example, each group member might be responsible for rewriting one paragraph of a response in which someone else did an inadequate job.

Whether you decide to study alone or with a group, remember that the best way to prepare is to have an organized plan. The plan should set goals based on specific topics and skills that you need to learn, and it should commit you to a realistic set of deadlines for meeting those goals. Then you need to discipline yourself to stick with your plan and accomplish your goals on schedule.

5. Develop Your Study Plan

Develop a personalized study plan and schedule

Planning your study time is important because it will help ensure that you review all content areas covered on the test. Use the sample study plan below as a guide. It shows a plan for the *Core Academic Skills for Educators: Reading* test. Following that is a study plan template that you can fill out to create your own plan. Use the “Learn about Your Test” and “Test Specifications” information beginning on page 5 to help complete it.

Use this worksheet to:

- 1. Define Content Areas:** List the most important content areas for your test as defined in chapter 1.
- 2. Determine Strengths and Weaknesses:** Identify your strengths and weaknesses in each content area.
- 3. Identify Resources:** Identify the books, courses, and other resources you plan to use for each content area.
- 4. Study:** Create and commit to a schedule that provides for regular study periods.

Praxis Test Name (Test Code): Core Academic Skills for Educators: Reading (5712)

Test Date: 9/15/15

Content covered	Description of content	How well do I know the content? (scale 1–5)	What resources do I have/need for the content?	Where can I find the resources I need?	Dates I will study the content	Date completed
Key Ideas and Details						
Close reading	Draw inferences and implications from the directly stated content of a reading selection	3	Middle school English textbook	College library, middle school teacher	7/15/15	7/15/15
Determining Ideas	Identify summaries or paraphrases of the main idea or primary purpose of a reading selection	3	Middle school English textbook	College library, middle school teacher	7/17/15	7/17/15
Determining Ideas	Identify summaries or paraphrases of the supporting ideas and specific details in a reading selection	3	Middle and high school English textbook	College library, middle and high school teachers	7/20/15	7/21/15
Craft, Structure, and Language Skills						
Interpreting tone	Determine the author's attitude toward material discussed in a reading selection	4	Middle and high school English textbook	College library, middle and high school teachers	7/25/15	7/26/15
Analysis of structure	Identify key transition words and phrases in a reading selection and how they are used	3	Middle and high school English textbook, dictionary	College library, middle and high school teachers	7/25/15	7/27/15
Analysis of structure	Identify how a reading selection is organized in terms of cause/effect, compare/contrast, problem/solution, etc.	5	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/1/15	8/1/15
Author's purpose	Determine the role that an idea, reference, or piece of information plays in an author's discussion or argument	5	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/1/15	8/1/15

(continued on next page)

Content covered	Description of content	How well do I know the content? (scale 1–5)	What resources do I have/need for the content?	Where can I find the resources I need?	Dates I will study the content	Date completed
Language in different contexts	Determine whether information presented in a reading selection is presented as fact or opinion	4	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/1/15	8/1/15
Contextual meaning	Identify the meanings of words as they are used in the context of a reading selection	2	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/1/15	8/1/15
Figurative Language	Understand figurative language and nuances in word meanings	2	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/8/15	8/8/15
Vocabulary range	Understand a range of words and phrases sufficient for reading at the college and career readiness level	2	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/15/15	8/17/15
Integration of Knowledge and Ideas						
Diverse media and formats	Analyze content presented in diverse media and formats, including visually and quantitatively, as well as in words	2	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/22/15	8/24/15
Evaluation of arguments	Identify the relationship among ideas presented in a reading selection	4	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/24/15	8/24/15
Evaluation of arguments	Determine whether evidence strengthens, weakens, or is relevant to the arguments in a reading selection	3	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/27/15	8/27/15
Evaluation of arguments	Determine the logical assumptions upon which an argument or conclusion is based	5	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/28/15	8/30/15
Evaluation of arguments	Draw conclusions from material presented in a reading selection	5	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/30/15	8/31/15
Comparison of texts	Recognize or predict ideas or situations that are extensions of or similar to what has been presented in a reading selection	4	High school textbook, college course notes	College library, course notes, high school teacher, college professor	9/3/15	9/4/15
Comparison of texts	Apply ideas presented in a reading selection to other situations	2	High school textbook, college course notes	College library, course notes, high school teacher, college professor	9/5/15	9/6/15

6. Study Topics

Detailed study topics with questions for discussion

Using the Study Topics That Follow

The Elementary Education: Content Knowledge for Teaching test is designed to measure the knowledge and skills necessary for a beginning elementary teacher.

This chapter is intended to help you organize your preparation for the test and to give you a clear indication of the depth and breadth of the knowledge required for success on the test. For the CKT subtests (reading and language arts and mathematics), the tasks of teaching and content topics are reproduced, along with study questions that demonstrate how to combine both of these dimensions as you review. For the science and social studies subtests, detailed study topics are provided, along with study questions in each topic area.

Virtually all accredited programs address the topics covered by the test; however, you are not expected to be an expert on all aspects of the topics. You are likely to find that the topics that follow are covered by most introductory textbooks. Consult materials and resources, including lecture and laboratory notes, from all your coursework. For the CKT subtests, you will also find it helpful to identify student work samples and curriculum materials, which you could gather from your student teaching experience, from your own studies, or from education web sites. You should be able to match up specific topics and subtopics with what you have covered in your courses.

Try not to be overwhelmed by the volume and scope of content knowledge in this guide. Although a specific term may not seem familiar as you see it here, you might find you can understand it when applied to a real-life situation. Many of the items on the actual test will provide you with a context to apply to these topics or terms.

Study Questions

Interspersed throughout the content topics are study questions, intended to help test your knowledge of fundamental concepts and your ability to apply those concepts to situations in the classroom or the real world. Most of the areas require you to combine several pieces of knowledge to formulate an integrated understanding and response. If you spend time on these questions, you will gain increased understanding and facility with the subject matter covered on the test. You may want to discuss these questions and your answers with a teacher or mentor.

Note that this study companion *does not provide answers for the study questions*, but thinking about the answers to them will help improve your understanding of fundamental concepts and will probably help you answer a broad range of questions on the test.

Reading and Language Arts—CKT Study Topics

The reading and language arts component of the Elementary Education: Content Knowledge for Teaching test measures the content knowledge required to do the work of the elementary reading and language arts curriculum and the specialized content knowledge you must have to teach it. To prepare for the test, you may find it helpful first to review the topics (e.g., I. Foundational Literacy Skills) and subtopics (e.g., A. Print Concepts) below, making sure that you're able to do the work commonly required of elementary students. Next, review each subtopic in the context of selected tasks of teaching, using the study questions to guide your review. The list of study questions is intended to help you tap into some of the specialized content knowledge you need to carry out the targeted tasks of teaching, but the list is not exhaustive. For a more thorough review of each subtopic, choose additional tasks of teaching from the complete list below, and ask yourself, "What do I need to know about this content to be able to engage in this task of teaching?" Note that some tasks of teaching are used more with some subtopics than with others.

Tasks of Teaching English Language Arts (ELA)

This list includes tasks that are essential for effective teaching of elementary reading and language arts.

Planning and Facilitating Instruction

1. Evaluating texts, examples, and graphic representations for their support of particular ELA instructional goals
2. Creating and modifying texts, examples, and graphic representations to support particular ELA instructional goals, including differentiation for particular learners
3. Analyzing language and language systems
4. Explaining, defining, and demonstrating ELA processes and concepts for students
5. Facilitating class discussions and conversations with individual students to elicit or develop their thinking about particular ELA content
6. Evaluating instructional strategies and activities to elicit, develop, or assess students' thinking about particular ELA content or to develop or assess their facility with particular ELA processes

Analyzing Student Learning

7. Evaluating student reading, writing, speaking, and listening to identify specific strengths and/or areas for improvement or instructional focus
8. Evaluating student reading, writing, speaking, or listening to classify students' level of literacy development
9. Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions
10. Responding to student reading, writing, speaking, or listening to target the particular content issue in need of attention

Content Topics

I. Foundational Literacy Skills

A. Print Concepts

Understands features of print

1. 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)
2. Differentiates between the pictures and the printed words on a page

Study Question	Task Targeted by Study Question
Look at some writing samples by kindergarten and first-grade students. What does each sample tell you about the student's understanding of print concepts such as directionality and return sweep?	7. Evaluating student reading, writing, speaking, and listening to identify specific strengths and/or areas for improvement or instructional focus
What kinds of instructional strategies and activities can help to address challenges students might encounter with the print concepts listed above?	6. Evaluating instructional strategies and activities to elicit, develop, or assess students' thinking about particular ELA content or to develop or assess their facility with particular ELA processes

B. Alphabetic Principle

Understands that print is a representation of sound in spoken words

1. Identifies the alphabet's uppercase and lowercase letter names, letter shapes, and corresponding sounds
2. 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

Study Question	Task Targeted by Study Question
What are some common challenges students face when learning about letter-sound relationships? What kinds of instructional materials can help to address these challenges?	1. Evaluating texts, examples, and graphic representations for their support of particular ELA instructional goals
Based on the same samples of kindergarten and first-grade writing described in the Print Concepts discussion area above, how would you classify the spelling development level of each author (e.g., emergent, letter name-alphabetic)?	8. Evaluating student reading, writing, speaking, or listening to classify students' level of literacy development

C. Phonological Awareness

Understands that words are made up of sounds

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

Study Question	Task Targeted by Study Question
Choose a list of commonly used one- and two-syllable words. How would you break these words into phonemes? What kinds of vowel sounds do they include? Next choose a list of commonly used two- and three-syllable words. How would you break these words into syllables?	3. Analyzing language and language systems
Review some commonly used activities for developing phonological awareness and match each to an instructional goal. For instance, which activities are most appropriate for teaching students how to blend onsets and rimes? Which are best for teaching how to substitute phonemes in one-syllable words?	6. Evaluating instructional strategies and activities to elicit, develop, or assess students’ thinking about particular ELA content or to develop or assess their facility with particular ELA processes

D. Phonics and Word Recognition

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

1. Pronounces unfamiliar words by systematically applying knowledge of letter-sound correspondence and orthographic patterns and by making word analogies (e.g., “bolt” sounds like “colt” but starts with /b/)
2. 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
3. Identifies grade-appropriate high-frequency words by sight

Study Question	Task Targeted by Study Question
Take a running record of an elementary student reading a text at the student’s instructional level. Based on the miscues, what conclusions can you draw about the cuing systems the student is using?	9. Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions
Based on the student’s miscues, what kinds of word-attack strategies would be most helpful to review with the student? Why are these strategies more appropriate for this student than other word-attack strategies might be?	10. Responding to student reading, writing, speaking, or listening to target the particular content issue in need of attention

E. Fluency

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

1. 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)
2. Uses context to confirm or self-correct for word recognition and understanding, rereading words and phrases when necessary
3. Demonstrates sufficient stamina to finish a reading task

Study Question	Task Targeted by Study Question
Listen to an elementary student reading an unfamiliar text. How would you evaluate the student's fluency? Be sure to consider accuracy, rate, and prosody.	7. Evaluating student reading, writing, speaking, and listening to identify specific strengths and/or areas for improvement or instructional focus
What are some effective activities for helping students develop stamina as readers? Why are they effective?	6. Evaluating instructional strategies and activities to elicit, develop, or assess students' thinking about particular ELA content or to develop or assess their facility with particular ELA processes

II. Language**A. 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

1. 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")
2. 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
3. Produces simple, compound, and complex sentences
4. Spells grade-appropriate, irregularly spelled words by applying conventional knowledge of alphabetic spelling, common orthographic patterns, syllables and affixes, and derivational suffixes ("compete" versus "competition")

Study Question	Task Targeted by Study Question
Choose a short informational text that might be used with upper-elementary students. Consider how the author varies sentence structure in the passage to show different relationships between ideas. How would you explain the purpose of the variations to students (e.g., listing items in a series to show equally important aspects of a broader idea or using the subordinating conjunction "after" to show the sequence of events in two clauses)?	4. Explaining, defining, and demonstrating ELA processes and concepts for students

Study Question	Task Targeted by Study Question
Review a paragraph-long writing sample from an upper-elementary student that contains some errors in grammar and usage. What patterns of errors do you notice? What conventions or structural rules would the student need to understand in order to correct them?	9. Analyzing student reading, writing, speaking, or listening to identify patterns of thinking, cuing systems, misconceptions, and partial conceptions

B. Vocabulary

Comprehensively understands a wide variety of words, as shown through listening, speaking, reading, and writing

1. 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 as well as the connotative meanings represented through figurative and idiomatic language
2. 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
 - a. clarifies the meaning of an unknown word through context clues, using knowledge of words parts (e.g., affixes and roots)
 - b. makes word associations (e.g., antonyms/synonyms and cognates) and utilizes external resources (e.g., dictionaries and knowledge of peers)

Study Question	Task Targeted by Study Question
Review a list of common Greek and Latin roots and common affixes. Then analyze several vocabulary lists from elementary textbooks. Which words on each list contain common roots that could help students determine their meaning? Which contain common affixes?	3. Analyzing language and language systems
Choose a short informational text that might be used with upper-elementary students. Identify all words in the text that might be unfamiliar to upper-elementary students. What are some effective ways to support students in determining the meaning of each word? Consider what kinds of context clues might be provided in the text and whether knowledge of word parts might be helpful. Your answers are likely to vary for each word.	6. Evaluating instructional strategies and activities to elicit, develop, or assess students' thinking about particular ELA content or to develop or assess their facility with particular ELA processes

C. 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

1. Discerns the appropriate level of formal language use across various contexts and analyzes the use of English dialects and registers within and across texts
2. Reaches beyond conventional appropriateness in speaking and writing and selects words, phrases, and punctuation for effect and precision
3. Makes choices about how to expand, reduce, and combine sentences in order to infuse writing with meaning, interest, and style

Study Question	Task Targeted by Study Question
Choose a short narrative text that contains dialect and might be used with upper-elementary students. How might you use the text to help demonstrate to students what a character's or narrator's form of speech can convey about his or her background? Which words and phrases could be used to model the power of precise word choice to convey meaning about an event or a character?	1. Evaluating texts, examples, and graphic representations for their support of particular ELA instructional goals
Find a third- or fourth-grade student writing sample made up mainly of simple sentences. How might the sentences be combined to add interest to the writing and to demonstrate connections between ideas? How might you support a student in combining the sentences?	10. Responding to student reading, writing, speaking, or listening to target the particular content issue in need of attention

III. Constructing Meaning

A. 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

1. Asks and answers questions to demonstrate understanding of a text and refers to the text to support answers
2. Determines central ideas or themes in a text and summarizes/paraphrases the key supporting details, evidence, and ideas
3. Recounts stories, determining a central message, lesson, or moral, and explains how those elements are supported by key details from the text
4. 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 different characters respond to challenges

Study Question	Task Targeted by Study Question
Choose a challenging informational text that might be used with upper-elementary students. Read the text closely. What background information would you need to provide to make the main ideas and supporting details in the text understandable to typical upper-elementary students? What type of graphic organizer would help students to capture the main ideas and details as they read?	1. Evaluating texts, examples, and graphic representations for their support of particular ELA instructional goals
Choose a poem or short story that might be taught in an upper-elementary class. Read it and think about its theme or themes. What questions could you ask to support an open-ended discussion of the theme(s) in which students support their answers with evidence from the text? What specific textual evidence would you want to target in the discussion?	5. Facilitating class discussions and conversations with individual students to elicit or develop their thinking about particular ELA content

B. Author's Craft and Text Structure

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

1. Analyzes how printed language (such as specific word choice) is used to convey meaning and tone
2. 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
3. Uses text features (e.g., captions, tables of contents, and diagrams) to locate relevant information efficiently and to support comprehension of a text
4. 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)

Study Question	Task Targeted by Study Question
Choose a short informational text that develops an argument and might be used with upper-elementary students. What purpose does each paragraph of the text serve in developing the argument? What words and phrases in each paragraph help to convey the purpose? How might you explain these different purposes to your students?	4. Explaining, defining, and demonstrating ELA processes and concepts for students
Choose a poem or short story that might be taught in an upper-elementary class and uses figurative language. What specific words or phrases are students likely to misunderstand? What questions could you pose in a class discussion to assess your students' understanding of the language or to address their misunderstandings?	5. Facilitating class discussions and conversations with individual students to elicit or develop their thinking about particular ELA content

C. Integration and Application of Knowledge

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

1. 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
2. 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
3. Applies information and ideas to new contexts and problems and integrates information in order to write or speak about a subject knowledgeably
4. Tells how illustrations and other visual representations within a text support reader understanding

Study Question	Task Targeted by Study Question
Choose an upper-elementary science or social studies passage that describes a complex process, concept, or relationship. What kind of diagram, table, or other graphic might help support students' understanding of the process, concept, or relationship? Make a sketch of the graphic, and explain how it would help to support students' understanding.	2. Creating and modifying texts, examples, and graphic representations to support particular ELA instructional goals, including differentiation for particular learners

Study Question	Task Targeted by Study Question
Choose two upper-elementary-level poems that deal with a similar topic. How would you compare the theme, tone, and speaker of the poems? What questions could you pose in a class discussion to help your students analyze the similarities and differences?	5. Facilitating class discussions and conversations with individual students to elicit or develop their thinking about particular ELA content

D. 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

1. Demonstrates knowledge of typical elements of different genres (e.g., narrator, dialogue, description, quotations, concrete facts and details, and examples)
2. Uses transitional words, phrases, and clauses to link ideas (e.g., "first," "next," "then"; "consequently"; and "specifically") across all text types
3. Uses text structures (e.g., cause/effect, problem/solution, and sequence) for different purposes
4. Uses formats for introducing, sequencing, and concluding all types of texts
5. 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
6. Writes expository texts with a clear introduction to the topic and with supporting facts and concrete details logically grouped and organized

Study Question	Task Targeted by Study Question
Find three examples of informational texts that you could use to demonstrate to students the cause/effect, problem/solution, and sequence text structures. Identify the words and phrases that help to signal each text structure.	1. Evaluating texts, examples, and graphic representations for their support of particular ELA instructional goals
Select a rubric for evaluating upper-elementary narrative writing, and use the rubric to evaluate a student's narrative writing sample. (Both should be available online.) What are the clearest strengths of the writing sample? The clearest areas in need of improvement? Now do the same for lower-elementary narrative writing and for lower- and upper-elementary expository writing.	7. Evaluating student reading, writing, speaking, and listening to identify specific strengths and/or areas for improvement or instructional focus

E. Production of Written Texts

Knows how to produce effective writing

1. Produces clear and coherent writing by adapting the organization and style of written information to the audience, task, and purpose
2. 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

Study Question	Task Targeted by Study Question
Imagine that you are planning a lower-elementary expository writing unit. Sketch out some ideas about how you might approach this unit, and create a specific prompt that directs students toward this type of writing. Then browse through some graphic organizers for planning expository writing. Which graphic organizer would best support students in planning their writing for the prompt that you selected? Why?	1. Evaluating texts, examples, and graphic representations for their support of particular ELA instructional goals
Write a short argumentative text that you could use as a model for students. How could you modify this text to demonstrate writing that does not appropriately address the audience? The purpose?	2. Creating and modifying texts, examples, and graphic representations to support particular ELA instructional goals, including differentiation for particular learners

F. Research to Build and Present Knowledge

Knows how to conduct research in order to gather relevant information associated with a question, topic, or other form of inquiry

1. Locates, selects, gathers, recalls, categorizes, and possibly reorganizes relevant information from different text types to support analysis
2. Analyzes and reflects on evidence found in narrative texts (by comparing and contrasting characters, settings, and events) and in informational texts (by explaining how an author uses reasons and evidence to support particular points and by identifying the corresponding reasons and evidence)
3. Determines the credibility, accuracy, and biases of sources

Study Question	Task Targeted by Study Question
Choose a short text that develops an argument and might be used with upper-elementary students. Identify the typical elements of argumentation that the author uses and the specific sentences in the text that demonstrate these elements. Which elements of argumentation are weakly communicated or not present at all? As an instructional activity, what kinds of questions could you ask students to help them recognize and correct these weaknesses?	4. Explaining, defining, and demonstrating ELA processes and concepts for students

Study Question	Task Targeted by Study Question
Choose a short narrative text that might be used with upper-elementary students as the basis for a written response in which they develop an argument. Write one prompt that you could give students that requires them to analyze a narrative element or compare or connect elements in the text: (e.g., how the main character changed, how two characters are alike or different, how the setting is used to convey meaning). Then identify at least two pieces of textual evidence that would be appropriate for students to include.	7. Evaluating student reading, writing, speaking, and listening to identify specific strengths and/or areas for improvement or instructional focus.

G. 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

1. Uses social knowledge of discourse conventions to communicate clearly and persuasively
 - a. knows how to enter and hold a conversation (e.g., through taking turns, acknowledging others' comments, clarifying information, and building on others' ideas)
 - b. knows how to be considerate and respectful of others
2. Utilizes group discussions to build knowledge and comprehension
3. Asks and answers questions to seek help, gather additional information, or gain a deeper understanding
4. Paraphrases and summarizes a text or speaker's main points, reasons, and evidence
5. Expresses ideas and feelings and builds on the ideas of others clearly and persuasively
6. 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
7. Regulates interpretation of texts or sources of information by reflecting on and evaluating others' perspectives

Study Question	Task Targeted by Study Question
Watch a video of an elementary-level class discussion about a text. As you watch, evaluate the teacher's contributions. What role(s) does the teacher play in the discussion? Does the teacher paraphrase student comments, ask clarifying questions, or summarize main points? Which student misunderstandings emerge, and how would you address them as a teacher?	5. Facilitating class discussions and conversations with individual students to elicit or develop their thinking about particular ELA content
Now evaluate the students' contributions in the same video. Which students demonstrate understanding of the text? Which students build meaningfully on each other's contributions? Which students synthesize ideas from the text and their classmates?	7. Evaluating student reading, writing, speaking, and listening to identify specific strengths and/or areas for improvement or instructional focus

H. Presentation of Knowledge and Ideas

Knows how to organize and present information in a style appropriate for the audience and purpose

1. Sequences ideas logically
2. Uses appropriate facts and relevant descriptive details to support main ideas
3. Establishes a line of reasoning and organization
4. Speaks clearly and at an understandable pace
5. Adopts a speaking style, register, and dialect appropriate for the given context
6. Uses digital and visual media displays strategically to enhance expression and comprehensibility of ideas

Study Question	Task Targeted by Study Question
Watch and listen to a few informational speeches written and delivered by upper-elementary students. For each speech, answer the following questions: How logically are the ideas sequenced and organized? How well do the facts and details support the main idea(s)? Is the speech delivered clearly and at an understandable pace? Are the language choices appropriate for the intended audience?	7. Evaluating student reading, writing, speaking, and listening to identify specific strengths and/or areas for improvement or instructional focus
For each speech you used in the exercise above, identify one point made by the speaker that could be strengthened by a visual aid (a diagram, table, photograph, etc.). Then describe or sketch this visual aid. What does your visual aid communicate that is not communicated as effectively through words alone?	10. Responding to student reading, writing, speaking, or listening to target the particular content issue in need of attention

Mathematics—CKT Study Topics

The mathematics component of the Elementary Education: Content Knowledge for Teaching test measures the content knowledge required to do the work of the elementary mathematics curriculum and the specialized content knowledge you must have to teach it. To prepare for the test, you may find it helpful first to review the content topics (e.g., I. Counting and Operations with Whole Numbers) and subtopics (e.g., A. Counting) below, making sure that you're able to do the work commonly required of elementary students. Next, review each subtopic in the context of selected tasks of teaching, using the study questions to guide your review. The list of study questions is intended to help you tap into some of the specialized content knowledge you need to carry out the targeted tasks of teaching, but the list is not exhaustive. For a more thorough review of each subtopic, choose additional tasks of teaching from the complete list below and ask yourself, "What do I need to know about this content to be able to engage in this task of teaching?" Note that some tasks of teaching are used more with some subtopics than with others.

Tasks of Teaching Mathematics

This list includes tasks that are essential for effective teaching of elementary mathematics.

Explanations, Conjectures, and Definitions

1. Giving mathematically valid explanations for a process, conjecture, or relationship
2. Evaluating mathematical explanations for their validity, generalizability, explanatory power, and/or completeness
3. Determining the changes that would improve the validity, generalizability, completeness, and/or precision of a mathematical explanation
4. Evaluating a student conjecture for its validity and/or generalizability on a given domain
5. Evaluating mathematical definitions or other mathematical language for precision, validity, generalizability, usefulness in a particular context, and/or support for an instructional goal

Problems, Examples, and Structure

6. Evaluating mathematical problems for how well they elicit a particular idea, support the use of a particular solution strategy or practice, fit a particular mathematical structure, address the same concept as another problem, or assess a particular student conception or error
7. Writing mathematical problems that fit a particular solution strategy or mathematical structure
8. Evaluating examples for how well they introduce a concept; illustrate an idea or relationship; illustrate the appropriateness of a strategy, procedure, or practice; or address particular student questions, misconceptions, or partial conceptions
9. Generating or identifying nonexamples or counterexamples to highlight a mathematical distinction or to demonstrate why a student conjecture is incorrect or partially incorrect
10. Choosing which mathematical topics are most closely related to a particular instructional goal

Representations and Manipulatives

11. Selecting, creating, or evaluating representations or manipulatives for a mathematical purpose or to show a particular mathematical idea
12. Evaluating 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

Student Strategies and Errors

13. Determining whether student work demonstrates the use of a particular mathematical idea or strategy
14. Determining whether a strategy is mathematically valid or generalizable
15. Interpreting a student's mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error
16. Identifying tasks or situations in which student work or talk that seems mathematically valid might mask incorrect thinking

Content Topics

I. Counting and Operations with Whole Numbers

This list details the mathematics topics critical for elementary students to master.

A. Counting

1. Counts and skip counts whole numbers between 0 and 1,000
2. Counts on, starting with any whole number
3. Connects counting to cardinality
4. Demonstrates understanding of one-to-one correspondence between numbers and objects being counted
5. Subitizes (recognizes small quantities by sight)
6. Identifies relationships between counting and the concept of larger and smaller numbers (i.e., that sets with higher counts are larger than sets with smaller counts)

Study Question	Task Targeted by Study Question
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 particular quantity from a larger quantity, cardinality, conservation of cardinality, and ordinality?	6. Evaluating mathematical problems for how well they elicit a particular idea, support the use of a particular solution strategy or practice, fit a particular mathematical structure, address the same concept as another problem, or assess a particular student conception or error
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?	13. Determining whether student work demonstrates the use of a particular mathematical idea or strategy

B. Operations with Whole Numbers

1. 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
2. Solves mathematical and real-world problems involving the four operations, including solving problems by using properties of operations

Study Question	Task Targeted by Study Question
What are some examples of word problems that can be answered using addition or subtraction and 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 and in which the result is unknown, the initial amount is unknown, or the amount of change is unknown?	6. Evaluating mathematical problems for how well they elicit a particular idea, support the use of a particular solution strategy or practice, fit a particular mathematical structure, address the same concept as another problem, or assess a particular student conception or error
Write a word problem that uses a specified model of division (i.e., measurement or partitive) and a specified interpretation of the remainder (e.g., discard the remainder, remainder forces the answer to the next-highest whole number).	7. Writing mathematical problems that fit a particular solution strategy or mathematical structure

Study Question	Task Targeted by Study Question
<p>Review the take-away and comparison interpretations of subtraction and various strategies for adding and subtracting (e.g., 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? How could you use moves on a Rekenrek to represent the solution? (Note: Other manipulatives to be familiar with include Cuisenaire® rods, interlocking cubes, and bundling sticks.)</p>	<p>12. Evaluating 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</p>
<p>Review some common strategies for multiplication, including finding partial products. How would you use various area models to represent these strategies?</p>	<p>12. Evaluating 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</p>
<p>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?</p>	<p>13. Determining whether student work demonstrates the use of a particular mathematical idea or strategy</p>
<p>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 only work for some whole numbers, and what whole numbers do these strategies work for? Do the same for addition, subtraction, and division strategies.</p>	<p>14. Determining whether a strategy is mathematically valid or generalizable</p>
<p>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 asking him to perform the same operation on other whole numbers?</p>	<p>15. Interpreting a student's mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error</p>

II. Place Value and Decimals

A. Place Value and Decimals

1. Demonstrates a conceptual understanding of the value of the digits in a number
2. Compares multidigit and decimal numbers
3. Rounds multidigit and decimal numbers
4. Composes and decomposes multidigit numbers into groupings and understands why grouping and ungrouping are helpful in performing operations on multidigit and decimal numbers
5. Uses drawings and objects such as manipulatives to represent place value, relating these drawings and objects to numerical equations and written descriptions

Study Question	Task Targeted by Study Question
What are some different strategies students might use to compare multidigit whole numbers or decimal numbers? Which strategies are mathematically valid?	2. Evaluating mathematical explanations for their validity, generalizability, explanatory power, and/or completeness
What are different ways that the number 3.4 could be represented using base ten blocks?	11. Selecting, creating, or evaluating representations or manipulatives for a mathematical purpose or to show a particular mathematical idea
Think of errors that students might make when rounding, comparing, adding, or subtracting decimals. What are some examples of problems in which the error would be evident, and what are some examples of problems in which the error would not be evident?	16. Identifying tasks or situations in which student work or talk that seems mathematically valid might mask incorrect thinking

III. Fractions, Operations with Fractions, and Ratios

A. Fractions, Operations with Fractions, and Ratios

1. 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
2. Demonstrates understanding of characteristics of fractions that are less than one, equal to one, and greater than one
3. Demonstrates understanding of equipartitioning and that it is a building block for understanding fractions as part-whole relationships
4. Demonstrates understanding of fraction equivalence
5. Uses a variety of strategies for comparing fractions
6. Performs operations such as addition, subtraction, multiplication, and division with fractions as well as with fractions and whole numbers, understanding and using 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)
7. Demonstrates understanding of applications of operations on fractions (e.g., scaling)

Study Question	Task Targeted by Study Question
Choose some common algorithms for working with fractions (e.g., “butterfly/cross multiply” method to compare fractions, invert and multiply to divide fractions). Then explain why each algorithm is mathematically valid.	1. Giving mathematically valid explanations for a process, conjecture, or relationship
Choose two fractions to multiply. Then explain how you could use an area model to represent the product of the two fractions.	1. Giving mathematically valid explanations for a process, conjecture, or relationship
Consider some key concepts of fractions (e.g., fractions are divided into equal parts, how to find equivalent fractions). What wording would need to be included in an explanation to correctly address the concept?	3. Determining the changes that would improve the validity, generalizability, completeness, and/or precision of a mathematical explanation
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; 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?	4. Evaluating a student conjecture for its validity and/or generalizability on a given domain
What are different ways to name the fraction $\frac{7}{10}$ (e.g., seven divided by ten, seven to ten)? What mathematical meaning is emphasized by each way to name the fraction?	5. Evaluating mathematical definitions or other mathematical language for precision, validity, generalizability, usefulness in a particular context, and/or support for an instructional goal
How can benchmark numbers, such as, $\frac{1}{2}$, be used when comparing fractions or performing operations with fractions?	8. Evaluating examples for how well they introduce a concept; illustrate an idea or relationship; illustrate the appropriateness of a strategy, procedure, or practice; or address particular student questions, misconceptions, or partial conceptions

Study Question	Task Targeted by Study Question
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?	11. Selecting, creating, or evaluating representations or manipulatives for a mathematical purpose or to show a particular mathematical idea
Look at some samples of student work showing 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?	13. Determining whether student work demonstrates the use of a particular mathematical idea or strategy
Look at different strategies students have used to compare, multiply, or divide fractions. Determine whether the strategy works no matter what fractions are in the problem, and if not, what the limitations are.	14. Determining whether a strategy is mathematically valid or generalizable
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?	15. Interpreting a student's mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error
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 problem asking him to add fractions? Do the same for subtraction, multiplication, and division problems with fractions.	15. Interpreting a student's mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error

IV. Early Equations and Expressions, Measurement, and Geometry

A. Early Equations and Expressions

1. 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
2. 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
3. Follows the standard order of operations (including the use of parentheses and the distributive property of multiplication over addition)
4. Demonstrates awareness of different interpretations of the word “variable,” including the ideas of quantities that are unknown (which underlies understanding how to solve equations) and quantities that vary (which can be connected to patterns and will support later understanding of functional relationships)
5. Uses the less-than and greater-than relational symbols ($<$, $>$) to compare quantities

Study Question	Task Targeted by Study Question
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?	2. Evaluating mathematical explanations for their validity, generalizability, explanatory power, and/or completeness
Think of different ways that the number of squares in the outside border of an $n \times n$ square can be found without counting. Can you write an expression in terms of n to represent each method?	11. Selecting, creating, or evaluating representations or manipulatives for a mathematical purpose or to show a particular mathematical idea
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.	15. Interpreting a student’s mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error

B. Measurement

1. Describes measurable attributes of objects
2. Compares two objects with a common measurable attribute
3. Chooses appropriate measurement tools and uses the tools to take measurements
4. Calculates and estimates perimeter, area, volume, and measurements of angles in mathematical and real-world problems
5. Converts between measurement units

Study Question	Task Targeted by Study Question
What are some activities that can be used when introducing students to measurement? What measurement concepts are related to these activities?	6. Evaluating mathematical problems for how well they elicit a particular idea, support the use of a particular solution strategy or practice, fit a particular mathematical structure, address the same concept as another problem, or assess a particular student conception or error
Identify the examples that illustrate a measurement concept (e.g., direct measurement versus indirect measurement, standard units versus informal units).	8. Evaluating examples for how well they introduce a concept; illustrate an idea or relationship; illustrate the appropriateness of a strategy, procedure, or practice; or address particular student questions, misconceptions, or partial conceptions
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 student's understanding of the concepts assessed in the problem?	15. Interpreting a student's mathematical error, including anticipating how it would replicate across similar problems, and choosing other work samples that demonstrate the same error

C. Geometry

1. Demonstrates understanding of shapes and their attributes
2. Composes and decomposes shapes
3. Draws shapes based on specific attributes such as number of angles and number of equal faces
4. Demonstrates understanding of lines, line segments, rays, and angles in two-dimensional figures
5. Classifies two-dimensional figures based on properties

Study Question	Task Targeted by Study Question
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?	4. Evaluating a student conjecture for its validity and/or generalizability on a given domain
Think of different classifications of quadrilaterals (e.g., parallelogram, trapezoid, rectangle). What are some assumptions students might make about the characteristics of all the quadrilaterals in that classification? What, if any, are examples that would demonstrate that those assumptions are incorrect?	9. Generating or identifying nonexamples or counterexamples to highlight a mathematical distinction or to demonstrate why a student conjecture is incorrect or partially incorrect

Science—CKT Study Topics

The science component of the Elementary Education: Content Knowledge for Teaching test measures the content knowledge required to do the work of the elementary science curriculum and the specialized content knowledge you must have to teach it. To prepare for the test, you may find it helpful first to review the topics (e.g., I. Earth and Space Sciences) and subtopics (e.g., A. Earth's Place in the Universe) below, making sure that you're able to do the work commonly required of elementary students. Next, review each subtopic in the context of selected tasks of teaching, using the study questions to guide your review. The list of study questions is intended to help you tap into some of the specialized content knowledge you need to carry out the targeted tasks of teaching, but the list is not exhaustive. For a more thorough review of each subtopic, choose additional tasks of teaching from the complete list below, and ask yourself, "What do I need to know about this content to be able to engage in this task of teaching?" Note that some tasks of teaching are used more with some subtopics than with others.

Tasks of Teaching Science

This list includes tasks that are essential for effective teaching of elementary science.

Scientific Instructional Goals, Big Ideas, and Topics

Study Question	Task Targeted by Study Question
Given grade-level guides for a topic, district curriculum for the topic, state level standards for science, and Next Generation Science Standards, select and justify appropriate goals for that topic in this grade level.	1. Selecting or sequencing age-appropriate, grade-level instructional goals or big ideas for a topic
Given a specific activity, identify the underlying big idea or instructional goal.	2. Identifying the big idea or instructional goal of an instructional activity
Given a specific instructional goal, determine which science idea is most closely connected to this goal.	3. Choosing which science ideas or instructional activities are most closely related to a particular instructional goal
Given a specific science activity, determine which science idea is most closely connected to this activity.	4. Linking science ideas to one another and to particular activities, models, and representations within and across lessons

Scientific Investigations and Demonstrations

Study Question	Task Targeted by Study Question
Given a set of scientific investigations or demonstrations, determine which best address particular scientific concepts, practices, or cross-cutting concepts and articulate why that is the case.	1. Selecting investigations or demonstrations that facilitate understanding of disciplinary core ideas, scientific practices, or crosscutting concepts
Given a set of possible scientific questions, determine which question will best lead to an empirical investigation with salient evidence relevant to the question. Identify scientific (testable) and nonscientific (nontestable) questions.	2. Evaluating investigation questions for quality (e.g., testable, empirical)
Given a set of tools, select which tool is best for addressing a specific investigation question. Given a student-generated selection of ways to measure and/or observe a phenomenon, evaluate which will provide a way to answer a question.	3. Determining the variables, techniques, or tools that are appropriate for use by students to address a specific investigation question
Given a student-generated observation, determine what needs to be done to improve its thoroughness and/or quality at a particular grade level. Compare various student-generated observations for their accuracy and appropriateness in terms of addressing a particular scientific question. Given a set of observations made by students, choose which observations are critical for linking the investigation to a disciplinary core idea (i.e., what are the essential observations that the teacher should make sure students are making).	4. Critiquing scientific procedures, data, observations, or results for their quality, accuracy, or appropriateness
Given several possible sources of online investigations, critique their focus on central scientific concepts, their use of scientific investigation practices, and their appropriateness for the grade level intended.	5. Evaluating and selecting media for engaging students in virtual investigations not possible in firsthand situations
Given a set of data/observations, suggest a way to help a student identify patterns revealed by the data.	6. 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)

Study Question	Task Targeted by Study Question
<p>Given two or more scientific resources, determine which one best explains a scientific concept for students at a particular grade level.</p> <p>Given two or more scientific resources, determine which one best engages students with relevant phenomena.</p> <p>Given two or more scientific resources, identify potential misconceptions students may form if given these resources.</p> <p>Given two or more scientific resources, determine which one best develops and uses scientific ideas.</p> <p>Given two or more scientific resources, determine which one best promotes students' thinking about phenomena, experiences, and knowledge.</p>	<p>1. 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</p>
<p>Given several resources available to support science instructional goals for a particular grade level, identify those with the most valid and accurate basis for those goals and make an argument about why those resources are better than others.</p>	<p>2. Choosing resources that support the selection of accurate, valid, and age-appropriate goals for science learning</p>

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

Study Question	Task Targeted by Study Question
<p>Given a set of student ideas, determine which contains a misconception regarding the intended scientific learning.</p> <p>Given a set of student ideas, determine which one reveals the best understanding of a specific scientific concept and articulate why that particular idea represents a better understanding than any of the others in the set.</p> <p>Given a misconception, identify the nature of the misconception, the correct conception, and the possible source of the misconception.</p>	<p>1. Analyzing student ideas for common misconceptions regarding intended scientific learning</p>
<p>Given a specific science idea or practice, select diagnostic items, activities, or phenomena that would help to elicit student thinking and identify specific student misconceptions related to the idea or practice.</p> <p>Given a specific scientific concept, determine which sequence of questions would best elicit student ideas and misconceptions about this concept.</p> <p>Given a set of ideas from one student, identify what sequence of probing questions would best elicit information to reveal a misconception.</p>	<p>2. Selecting diagnostic items and eliciting student thinking about scientific ideas and practices to identify common student misconceptions and the basis for those misconceptions</p>
<p>Given a specific misconception (or student response that is evidence of a misconception), identify an appropriate instructional activity that would best confront and/or challenge the student misconception.</p> <p>Given a set of scientific investigations or demonstrations, determine which one most successfully addresses common student misconceptions and provides evidence to provoke change in students' students' ideas.</p> <p>Given a scientific resource, identify potential misconceptions students may form if given this resource.</p>	<p>3. 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</p>
<p>Given a student-generated explanation, identify the features of that explanation that are similar or different from a scientific explanation.</p>	<p>4. Identifying the connections between students' talk and work, and scientists' talk and work</p>

Scientific Language, Discourse, Vocabulary, and Definitions

Study Question	Task Targeted by Study Question
<p>Given a set of scientific definitions, determine which one is most accurate or complete.</p> <p>Given a scientific concept, identify the scientific language that illustrates the concept most precisely.</p>	<p>1. Selecting scientific language that is precise, accurate, grade-appropriate, and illustrates key scientific concepts</p>
<p>Given several scientific definitions, determine which language or vocabulary might confuse students because of its meaning in everyday communication.</p>	<p>2. Anticipating scientific language and vocabulary that may be difficult for students</p>
<p>Given two examples of students participating in scientific discourse, determine which example has fewer flaws and weaknesses and be able to articulate what those differences are.</p> <p>Given an example of classroom discourse, determine when students are or are not communicating in scientific ways.</p> <p>Given two examples of students using evidence to back up a scientific claim, identify which example has fewer gaps and weaknesses and explain why.</p>	<p>3. Supporting and critiquing students' participation in and use of verbal and written scientific discourse and argumentation</p>
<p>Given an excerpt from a classroom discussion, determine which talk moves are most effective for supporting students in critiquing explanations.</p>	<p>4. 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.</p>

Scientific Explanations (includes claim, evidence, and reasoning)

Study Question	Task Targeted by Study Question
<p>Given multiple explanations, determine with one is more accurate or generalizable.</p> <p>Given a student-generated explanation, determine how to modify the explanation to better align to a scientific explanation and be able to articulate the basis for that determination.</p> <p>Given various scientific explanations, decide which one is most accessible to students.</p> <p>Given various student-generated explanations, guide students to determine which statement best uses appropriate scientific ideas and evidence to support the claim and be able to articulate that determination.</p> <p>Given a student-generated explanation, identify an area in which the student is having difficulty (e.g., claim is inconsistent with evidence, uses irrelevant science concepts to link claim and reasoning, no reasoning used).</p>	<p>1. Critiquing student-generated explanations or descriptions for their generalizability, accuracy, precision, or consistency with scientific evidence</p>
<p>Given a specific phenomenon, select a scientific explanation that is accurate and accessible to students at a particular grade level.</p>	<p>2. Selecting explanations of scientific phenomena that are accurate and accessible to students</p>

Scientific Models and Representations (analogies, similes; metaphors, simulations, illustrations, diagrams, data tables, performances, videos, animations, graphs, examples)

Study Question	Task Targeted by Study Question
<p>Given a scientific representation, explain how it can be used to explain a scientific phenomenon.</p> <p>Given an instructional goal, select a representation that is well matched to that goal.</p> <p>Given a set of scientific representations, decide which one is most accessible to students at a particular grade level.</p> <p>Given a set of data, select an appropriate representation and display data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships.</p> <p>Given a representation of a scientific model, determine a strength, and/or limitation (including the reinforcement of misconceptions) of using this representation to illustrate a particular concept.</p> <p>Given a scientific idea/concept/topic, determine ways in which a model (or models) can be used (a) to introduce a topic to students versus (b) to teach/model for students how to develop a scientific model that represents their ideas and/or their collected observations/data.</p>	<p>1. Evaluating or selecting scientific models and representations that predict or explain scientific phenomena or address instructional goals</p>
<p>Given a scenario where the teacher is using a content representation, identify ways in which students could modify or critique the representation.</p>	<p>2. Engaging students in using, modifying, creating, and critiquing scientific models and representations that are matched to an instructional goal</p>
<p>Given a student-generated model or representation, identify which scientific concepts the student understands or misunderstands.</p>	<p>3. Evaluating student models or representations for evidence of scientific understanding</p>
<p>Given a proposed model or representation, propose a sequence of questions to elicit students' understanding of the model's essential features.</p> <p>Given students' proposed changes to a model, generate questions to elicit students' understanding of the evidence for the model and reasoning about why the model should be changed.</p> <p>Given a student model, generate questions requiring students to make predictions about what would happen when a variable changes.</p>	<p>4. Generating or selecting diagnostic questions to evaluate student understanding of specific models or representations</p>
<p>Given a scientific model, identify which student idea best evaluates the model's strengths.</p>	<p>5. Evaluating student ideas about what makes for good scientific models and representations</p>

Content Topics

This list details the science topics critical for elementary students to master.

I. Earth and Space Sciences

A. Earth's Place in the Universe

This topic area focuses on observable motions of the Sun, Moon, and stars as well as quick and slow events on Earth and the resulting patterns that occur.

By collecting observations of the Sun, Moon, and stars, predictable patterns, such as the Sun's rising and setting and stars being more visible at night, are described and used to answer scientific questions. Graphical displays of collected data reveal these patterns. This topic area targets explanations (e.g., Earth rotates about an axis with a fixed orientation and orbits around the Sun) for seasonal patterns of sunrise and sunset, the seasonal appearance of some stars, daily changes in the relative amount of light, and the length and direction of shadows.

This topic area also uses local, regional, and global patterns of rock formations to construct and support explanations about the changes in landscapes over time. These changes are a results of events that occur very rapidly, such as earthquakes, and others that occur so slowly that a person would not directly observe the change as it happens, such as erosion of rocks.

1. The Universe and Its Stars
 - a. use observations of the Sun, Moon, and stars to describe patterns that can be predicted.
 - b. support an argument that the apparent brightness of the Sun and stars is due to their relative distances from Earth.
2. Earth and the Solar System
 - a. make observations at different times of year to relate the amount of daylight to the time of year.
 - b. represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

3. The History of the Planet Earth
 - a. use information from several sources to provide evidence that Earth events can occur quickly or slowly.
 - b. identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

B. Earth's Systems

This topic area focuses on Earth's materials and systems, such as plate tectonics, the influence of water, weather and climate, and biogeology.

Investigations determine the effects of weathering or the rate of erosion by the motion of water, ice, wind, and living things on the shape of Earth's materials (e.g., rocks, soils, and sediment). This topic area targets the distribution patterns of volcanoes and earthquakes, which can be described by examining maps or graphical displays of Earth's features, such as mountains, volcanoes, and ocean ridges and trenches. Maps of natural features, and graphs and maps showing the amount and location of salt water or freshwater in Earth's reservoirs (lakes, streams, oceans) can be made to better understand the nature of Earth's land features and water resources, respectively. Design solutions that slow or prevent wind or water from changing the shape of the land are generated and evaluated. Models and maps are used to describe ways that Earth systems (geosphere, biosphere, hydrosphere, atmosphere) affect Earth's surface materials and processes.

This topic area also includes the use of observations about local weather conditions to make claims about patterns, such as the typical weather conditions expected at different times (seasons) and different areas (climates).

1. Earth Materials and Systems
 - a. compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
2. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
 - a. develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

3. Plate Tectonics and Large-Scale System Interactions
 - a. develop a model to represent the shapes and kinds of land and bodies of water in an area.
 - b. analyze and interpret data from maps to describe patterns of Earth's features.
4. The Roles of Water in Earth's Surface Processes
 - a. obtain information to identify where water is found on Earth and that it can be solid or liquid.
 - b. describe and graph the amounts and percentages of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
5. Weather and Climate
 - a. use and share observations of local weather conditions to describe patterns over time.
 - b. represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
 - c. obtain and combine information to describe climates in different regions of the world.
6. Biogeology
 - a. construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
 - b. make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

C. Earth and Human Activity

This topic area focuses on the relationships between living things and the natural resources they depend on as well as the impact of natural hazards.

Simple models can be used to present relationships between plants and animals and their habitats. This topic area targets an understanding that human activity, such as changes to landforms, diversion of water, and the addition of substances to the air, can negatively affect the world around us. Information collected on how the use of energy and fuels derived from natural resources affects the environment is used to make informed decisions about the use of both renewable and nonrenewable natural resources, and ways to reduce the impact of human activities on environments.

This topic area also addresses how forecasts can be used to prepare for severe weather events. Examples include (1) making claims about the merits of a design to reduce the impact of a weather-related hazard, (2) describing evidence about the design solution, and (3) evaluating evidence to determine if the solution adequately addresses the effects of the weather hazard. This process can also be applied to other natural hazards, such as earthquakes, tsunamis, and volcanic eruptions.

1. Natural Resources
 - a. use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.
 - b. obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.
2. Natural Hazards
 - a. ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.
 - b. make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.
 - c. generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
3. Human Impacts on Earth Systems
 - a. communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
 - b. obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

II. Life Sciences

A. From Molecules to Organisms: Structures and Processes

This topic area focuses on how plants and animals use their internal and external structures for survival, growth, behavior, and reproduction, as well as to process information.

Observations from studying how organisms use their body parts in different ways and for different purposes can be used to design a device to solve a specific human problem, such as designing clothing for protection or warmth. These observations can support an argument that these internal and external structures function and interact to support survival, growth, behavior, and reproduction.

This topic area explores the similarities and differences in the life cycles of plants and animals. Models describe life cycles of organisms and promote the understanding of the relationships among the components of the life cycles. The models can be used to identify the similarities and differences of various life cycles and to make predictions as to what would happen if components of the life cycles were altered.

This topic area also includes claims about how organisms obtain the energy and materials needed for survival. Plants need air, water, and light to produce plant matter and to grow. Animals eat plants, other animals, or both in order to obtain the materials and energy they need for growth, survival, and reproduction. Observations, models and other sources of evidence can be used to identify these patterns and relationships and support these claims.

Models promote an understanding of the sense receptors animals use to receive different types of information from the environment. This information is processed by the brain and leads to appropriate actions, such as vocalizations, feeding activities, and protective reactions.

1. Structure and Function
 - a. use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
 - b. construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
2. Growth and Development of Organisms
 - a. read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
 - b. develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
3. Organization for Matter and Energy Flow in Organisms
 - a. use observations to describe patterns of what plants and animals (including humans) need to survive.
 - b. support an argument that plants get the materials they need for growth chiefly from air and water.
 - c. use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.
4. Information Processing
 - a. use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
 - b. use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

B. Ecosystems: Interactions, Energy, and Dynamics

This topic area focuses on ecosystems—interdependent relationships, movement and cycling of matter, transfer of energy, and social interactions.

Investigations can be planned and conducted to determine that plants need light and water to grow. This topic area explores ways that interactions help organisms survive. Models, such as using pollen sticks to mimic the fuzzy bodies of bees, show how animals facilitate seed dispersal or plant pollination. Models describe the movement of materials in a system that allow species to meet their needs and identify the relevant components of the system (plants, animals, decomposers, matter, other environmental factors), and the role of each component. The models can be used to determine how changes such as the effect of a newly introduced species or a change in the environment affect the system.

This topic area also targets evidence, data, or models to support the claim that some animals form groups, and that being a member of a group helps each member survive. For example, groups experience more success in defending themselves and can make

faster, more effective adjustments to harmful changes in their ecosystem than animals acting alone.

1. Interdependent Relationships in Ecosystems
 - a. plan and conduct an investigation to determine whether plants need sunlight and water to grow.
 - b. develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
 - c. develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
2. Cycles of Matter and Energy Transfer in Ecosystems
 - a. develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
 - b. develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
3. Ecosystem Dynamics, Functioning, and Resilience
 - a. make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
4. Societal Interactions and Group Behavior
 - a. construct an argument that some animals form groups that help members survive.

C. Heredity: Inheritance and Variation of Traits

This topic area focuses on the conditions that influence characteristics (traits), including both inherited and environmental factors.

The claim that young plants and animals are similar to their parents – leaves from the same kind of plant are the same shape but can differ in size; a particular breed of dog looks like its parents but is not exactly the same – can be articulated and supported using data collected by comparing traits of plant and animal parents and offspring. This data can be used to identify relevant patterns of similarities and differences between parents and offspring in plants and animals that indicate traits are inherited and can vary.

Similarly, this topic area addresses evidence that can be collected to support the claim that many inherited traits can be influenced by the environment. For

example, normally tall plants grown with insufficient water are stunted, and a pet dog that is given too much food and little exercise may become overweight.

1. Inheritance of Traits and Variation of Traits
 - a. make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
 - b. analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.
 - c. use evidence to support the explanation that traits can be influenced by the environment.

D. Biological Evolution: Unity and Diversity

This topic area focuses on evolution and the variability of organisms, over time, within a population, and in different habitats.

Fossil data associated with various geologic layers at a site provide evidence of environments that used to exist long ago, such as a tropical forest or an ocean. Fossil evidence can be used to describe ancient environments that supported species no longer present in the current environment and to construct arguments about why these extinct species could not survive in a changed environment.

This topic area targets using evidence about the variation of characteristics within a population, such as protective coloration among insects or the presence of thorns among plants, to develop an understanding that some individuals are better suited to survive and reproduce in their environment than others. This evidence supports the observations that (1) each environment has its own mix of organisms (diversity), (2) specific traits would give an organism a survival advantage in a given environment, and (3) a specific change in the environment would lead to a change in the relative advantage of different traits.

This topic area also addresses the effect of human activity on the environment and involves analyzing solutions to mitigate the influence of a selected activity. Examples include (1) mitigating pollution from waste disposal by recycling or composting and (2) reducing the diversion of water for agriculture through various water conservation policies.

1. Evidence of Common Ancestry and Diversity
 - a. analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
2. Natural Selection
 - a. use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
3. Adaptation
 - a. construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
4. Biodiversity and Humans
 - a. make observations of plants and animals to compare the diversity of life in different habitats.
 - b. make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

III. Physical Sciences

A. Matter and Its Interactions

This topic area focuses on matter—its structures and properties, the physical and chemical changes that can occur to it, and the particles that make it up.

Investigations can be carried out to observe, measure, and identify various materials according to their properties, such as reflectiveness, color, and hardness. This topic area targets reversible and irreversible changes that happen to materials from heating, cooling, and mixing of substances. Evidence can be used to categorize changes such as those observed when (1) heating butter or an egg, or (2) freezing water or a leaf.

Investigations address whether substances that interact in a chemical reaction become new substances with different properties. Evidence from these investigations can support an argument that the overall weight of the materials is conserved regardless of what change occurs, including the apparent disappearance of materials. This topic area also addresses the idea that objects are made of small pieces that can be taken apart and recombined form a new object and the idea that all matter consists of

particles that are so small as to be invisible. Students are expected to develop a particle model that could explain why adding an invisible gas to a balloon increases its volume, or sugar added to a glass of water seems to disappear.

1. Structure and Properties of Matter
 - a. plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
 - b. analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
 - c. make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
 - d. develop a model to describe that matter is made of particles too small to be seen.
 - e. measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
 - f. make observations and measurements to identify materials based on their properties.
2. Chemical Reactions
 - a. construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
 - b. measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
 - c. conduct an investigation to determine whether the mixing of two or more substances results in new substances.

B. Motion and Stability: Forces and Interactions

This topic area focuses on forces, motion, and the interaction of objects—pushes and pulls, balanced and unbalanced forces, and patterns of motion.

Investigations determine the effects of varying strengths and directions of pushes and pulls on the motion of objects, such as stopping a rolling ball with a barrier, using a ramp to increase the speed of a marble, and two toy cars colliding with each other. The forces exerted on an object can change its speed and/or direction of motion, keep it at rest, or start it in

motion. An object's pattern of motion can be used to predict future motion, such as the motion of a pushed swing.

This topic area also addresses the cause and effect of interactions between two objects that are not in contact with each other. This might involve electrical forces between a charged comb and someone's hair or magnetic forces between a magnet and some nails. Evidence is collected to argue that the gravitational force of Earth always pulls objects downward toward the center of the planet. Example include: (1) dropping objects from the second story of a building, and (2) observing the movement of a ball on an inclined ramp.

1. Forces and Motion
 - a. plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
 - b. analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.
 - c. plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
 - d. make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
2. Types of Interactions
 - a. plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
 - b. plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
 - c. ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
 - d. define a simple design problem that can be solved by applying scientific ideas about magnets.
 - e. support an argument that the gravitational force exerted by Earth on objects is directed down.

C. Energy

This topic area focuses on energy—its definition, conservation, and transfer, and how it is captured, stored, and released by physical and chemical processes.

Evidence is used to construct explanations about the relationship between the speed and energy of an object and how energy is transferred from place to place by means such as sound, light, heat, and electrical currents. Sunlight warms the surface of Earth, and solutions can be designed to solve the problem of reducing that warming effect where needed (e.g., umbrellas and awnings).

This topic area also addresses the transfer in energy due to the change in speed or direction that occurs when objects interact. Models can be used to predict the outcomes of certain collisions between objects such as pool balls, marbles, and toy cars. Devices are designed that convert one form of energy (e.g., light energy) to another (e.g., electrical energy). Models such as energy and matter diagrams and food webs describe how energy in food sources used by animals for movement, growth, and repair came from the Sun and was captured by plants for use and storage.

1. Definition of Energy, Conservation of Energy and Energy Transfer
 - a. use evidence to construct an explanation relating the speed of an object to the energy of that object.
 - b. make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
 - c. ask questions and predict outcomes about the changes in energy that occur when objects collide.
 - d. apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
2. Relationship between Energy and Forces
 - a. ask questions and predict outcomes about the changes in energy that occur when objects collide.
3. Energy in Chemical Processes and Everyday Life
 - a. apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

- b. use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the Sun.

D. Waves and Their Application in Technologies for Information Transfer

This topic area focuses on observing the behavior of waves, studied through activities relating to light, sound, and waves in water.

This topic area addresses the observation that light travels in a straight line and that objects can only be seen when illuminated or when they emit light. Observations could be made of objects in the dark being illuminated by lights, such as a person entering a dark room and lighting a candle. Investigations explore the effect of placing various types of objects in the path of a light source. Opaque, transparent, and translucent objects allow all or some of the light through, and mirrors reflect the light. A model shows why only light from objects that enters the eyes can be seen, explaining, for example, why an object can be seen through a window, but not through a brick wall, or why a mirror can allow objects to be seen around corners or over fences.

This topic area explores the nature of mechanical waves. Investigations determine that vibrating materials, such as a tuning fork or a guitar string, produce sound waves. These waves can make other objects vibrate, as demonstrated by placing a vibrating tuning fork into a container of water. The physical waves formed on the surface of the water can be characterized by amplitude (wave height) and wavelength (distance between successive wave peaks).

This topic area also studies how information can be carried by waves. Wave characteristics lead to the design of devices that use a pattern of light or sound to send information over a distance, such as Morse code.

1. Wave Properties
 - a. plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
 - b. develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

2. Electromagnetic Radiation
 - a. make observations to construct an evidence-based account that objects can be seen only when illuminated.
 - b. plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.
 - c. develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
3. Information Technologies and Instrumentation
 - a. use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.
 - b. generate and compare multiple solutions that use patterns to transfer information.

IV. Engineering, Technology, and the Application of Science

This topic area focuses on introducing students in the earliest grades to the term “problem” as indicating a situation that people want to change.

Students can use tools and materials to solve simple problems, use different representations to convey solutions, and compare different solutions to a problem and determine which is best. Students in all grade levels are not expected to come up with original solutions; instead, the emphasis is on thinking through the needs or goals that need to be met and determining which solutions best meet those needs and goals.

At the upper elementary grades, this topic area engages students in more formalized problem solving. Students define a problem using criteria for success and constraints or limits of possible solutions. Students research and consider multiple possible solutions to a given problem. Generating and testing solutions also becomes more rigorous as the students learn to optimize solutions by revising and retesting to obtain the best possible design.

A. Defining and Delimiting an Engineering Problem

1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

2. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

B. Developing Possible Solutions

1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

C. Optimizing the Design Solution

1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
2. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Social Studies Study Topics

The social studies component of the Elementary Education: Content Knowledge for Teaching test covers History, Government and Citizenship, Human and Physical Geography, and Economics.

It was designed to align with Standard 2e of the Program Standards for Elementary Teacher Preparation published by NCATE (National Council for Accreditation of Teacher Education):

Candidates know, understand, and use the major concepts and modes of inquiry from the social studies—the integrated study of history, geography, the social sciences, and other related areas—to promote elementary students’ abilities to make informed decisions as citizens of a culturally diverse democratic society and interdependent world.

The social studies component of the test focuses on understanding important social, economic, cultural, and political concepts; geographical thinking; the workings of governmental systems; important historical events; and contributions of notable individuals within their historical and cultural context. The areas within social studies are mutually enriching and interdependent, and

many of the questions on the test will require knowledge and integration of two or more areas.

Note that most states’ standards for kindergarten through grade 12 learning include standards that address individual state histories. Since this test, like almost all of the *Praxis* Subject Assessments, is used in a number of states, there are no specific state history questions.

Please note that the study questions do not directly reflect the test content. They are intended to help you plan for topics that are likely to appear on the exam.

I. History

A. Understands the Concepts of Chronology

Be able to recognize and identify:

1. vocabulary related to time
2. identify causes and effects of historical events
3. change over time
4. Be able to create and interpret timeline and recognize change over time

B. Understands How Various Sources Provide Information about the Past and Present

Be able to identify

1. primary and secondary sources
2. the ways in which multiple representations/sources can be used to understand one event
3. Understand how to assess the validity and credibility of sources
4. Determine whether a primary or secondary source is appropriate for a given instructional goal.

C. Understands the Contributions of Classical Civilizations such as China, Egypt, Greece, and Rome

1. Be able to recognize major characteristics and contributions of these civilizations, make connections and comparisons among them, and interpret visual or written selections relating to them.

D. Understands the Characteristics of Indigenous Peoples in North America before European Exploration

1. The numerous unique and well-developed Native American cultures in North America
2. Causes, purposes, and results of exploration and colonization of North America by Spain, France, and England
3. Interactions between the Native Americans and the Europeans

4. Decisions made by the United States government in the nineteenth century concerning Native Americans
 5. Colonial culture, society, religion, economy, and political institutions from the perspective of various inhabitants: large landowners, farmers, artisans, women, slaves, and colonial leaders
 6. The story of the “Trail of Tears,” including the Removal Act (broken treaties, massacres, conflicts, and displacement of Native Americans)
- E. Understands the Causes and Effects of European Exploration and the Colonization of North America**
1. The timeline, settlement patterns, and reasons for exploration and colonization of the United States
 2. The major characteristics of the Thirteen Colonies
 3. Significant contributions of explorers
- F. Understand How Conflict between the American Colonies and Great Britain Led to American Independence Events, People, and Trends; Make Connections and Comparisons Among Them; and Interpret Visual or Written Selections Relating to Them.**
1. Causes of the American Revolution
 2. Key individuals and their roles and major beliefs: King George, John Adams, George Washington, Thomas Jefferson, Benjamin Franklin
- G. Understands the Development of the United States Government**
1. Major ideas in the Declaration of Independence and their impact
 2. Major ideas in the Articles of Confederation
 3. The Constitution, how and when it came into being, including major compromises, and the addition of the Bill of Rights
 4. The origin of political parties in the United States
- H. Understands Political, Economic, and Social Changes that Occurred in the United States During the Nineteenth Century.**
1. Westward expansion: Louisiana Purchase, Lewis and Clark expedition, and the acquisition of Florida, Texas, Oregon, and California
 2. Origins of slavery in the United States, how it is addressed in the United States Constitution, and slavery’s effects on political, social, religious, economic, and cultural developments among African Americans and in American society generally
3. Impact of technological and agricultural innovations before the Civil War— Whitney’s cotton gin, McCormick’s reaper, Fulton’s steamboat, and the steam locomotive
 4. Reasons for and consequences of waves of immigration from Europe in the nineteenth century
 5. Civil War and Reconstruction
 - a. the economic and cultural differences between North and South
 - b. the abolitionist movement
 - c. the women’s movement
 - d. the Fugitive Slave Act and the Dred Scott case
 - e. key roles and actions of Abraham Lincoln, Jefferson Davis, Frederick Douglass, William Lloyd Garrison, Harriet Tubman, Harriet Beecher Stowe, and John Brown
 - f. key events leading to declaration of secession and war
 - g. major points in the Gettysburg Address, Emancipation Proclamation, and the basic provisions and impact of the 13th, 14th, and 15th Amendments to the United States
 - h. impact of Reconstruction policies on the South then and now
 - i. segregation after the Civil War, including the Supreme Court decision in Plessy v. Ferguson
 6. Business and labor after the Civil War
 - a. bankers and entrepreneurs Andrew Carnegie, John D. Rockefeller, and J.P. Morgan: their industries and the changes in American business that they represented
 - b. urban conditions (living conditions, child labor, social stratification)
 - c. waves of immigrants after the Civil War
- I. Understands Important Developments in the United States during the Twentieth and Twenty-First Centuries**
- Be able to recognize characteristics of these events, people, and trends; make connections and comparisons among them; and interpret visual or written selections relating to them.

1. America's role in the First World War and postwar isolationism
2. Women's suffrage (the movement and the amendment)
3. The Great Depression and the New Deal—causes of the Depression; impact on various groups in the United States; Franklin D. Roosevelt and the New Deal (Works Progress Administration; Social Security; National Labor Relations Board)
4. America's role in the Second World War and consequences at home and abroad
5. Civil rights movement, women's movement, peace movement
6. Development of computers and information systems and the impact on the economy and jobs

Study Questions: History

- 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.
- What types of sources (e.g., primary, secondary) might best help a student explain the First Amendment?
- What was "Manifest Destiny" and how did it influence the expansion of United States territory?
- Make your own "immigration timeline" of the nineteenth century, noting the decades during which immigrants from various countries or regions came to the United States in large numbers.
- What was the Supreme Court's decision in *Brown v. Board of Education of Topeka*?

II. Government and Citizenship

Descriptions or excerpts will be given, accompanied by questions asking about these issues.

- A. Understands the Concepts of Family and Community**
- B. Understands the Purposes and Functions of Government**

Questions comparing various levels of government and their responsibilities will be asked.

1. Major responsibilities of state governments
2. Relationship between state governments and the federal government
3. Major responsibilities of local governments

C. Understands the various levels of government

Questions comparing various levels of government and their responsibilities will be asked.

1. Major responsibilities of state governments
2. Relationship between state governments and the federal government
3. Major responsibilities of local governments

D. Understands the various forms of government

Be able to identify major characteristics of these forms of government and differentiate among them.

1. Parliamentary systems
2. Federalism
3. Oligarchy
4. Monarchy
5. Democracy
6. Dictatorship

E. Understands Important Ideas in the Declaration of Independence and in the Constitution, Including the Bill of Rights

Questions involving excerpts from the Declaration of Independence or Constitution or questions about major ideas in these documents may be asked, in addition to specific roles and responsibilities in the federal government.

1. The major values, beliefs, principles expressed in the Declaration of Independence, Constitution, and the Bill of Rights
2. The "separation of powers" among the three branches of the federal government and the major responsibilities of each branch

F. Understands the Characteristics of Responsible Citizenship

Descriptions or excerpts will be given, accompanied by questions asking about these topics.

1. The meaning and importance of the following rights of democratic citizens: freedom of speech, religion, press, assembly, petition, and privacy

2. Citizens' legal obligations (to obey the law, serve as juror, and pay taxes) and civic-minded

Study Questions: Government and Citizenship

- Compare the major features of a democratic government with those of other forms of government.
- Why were the Mayflower Compact, the Declaration of Independence, and Magna Carta such milestone documents in the political history of the world?
- What is the purpose of the system of checks and balances the United States government?
- What are some examples of checks and balances?
- How has the United States Constitution impacted the relationship between the federal government and the states (e.g., the 10th Amendment, the Commerce Clause)?

III. Human and Physical Geography

A. Understands the Concepts of Location, Distance, and Direction

1. Be able to read and interpret different kinds of maps and images (physical, topographical and political)
2. Be familiar with longitude and latitude and their purposes.
3. Be able to locate the equator and the International Dateline.
4. Know the kinds of geographic features that make up the Earth (continents, oceans, seas, rivers, bays, mountain ranges, plateaus, valleys, plains, ice caps, tundra, forest, grassland, desert, island).
5. Be able to locate on a map major regions, countries, and cities of the world.
6. Be familiar with the ways in which regions are categorized (e.g., political, physical, cultural).

B. Understands Physical Characteristics of Place and How They Affect Human Activities and Settlement Patterns

Be able to answer definitional questions or questions that require making connections involving these systems and other social studies areas.

1. The fundamental forces at work in cyclical systems like seasons, weather, and climate.
2. The basic mechanisms and consequences of physical changes that have short-term effects

on Earth, including floods, droughts, and snowstorms.

3. The basic mechanisms and consequences of physical changes that have long-term effects on Earth, including earthquakes (plate tectonics) and natural erosion.
4. Factors affecting settlement patterns—why some places are densely populated and others sparsely populated

C. Understands Human Characteristics of Place and How Humans Adapt to Variations in the Physical Environment

Be able to answer definitional questions or questions that require making connections involving these phenomena and other social studies areas.

1. Major population trends in the United States in the nineteenth and twentieth centuries
 - a. immigration patterns and their causes and effects
2. Parts of the country that grew faster than others in the twentieth century
3. Distinctions between developing and developed (industrialized) nations; the relative wealth of the largest nations
4. Major trade relationships, especially those between the United States and other nations in the late twentieth and early twenty-first centuries

Be able to answer definitional questions or questions that require making connections between these relationships and other social studies areas.

1. The impact of the environment on human systems such as essentials like food, clothing, and shelter transportation and recreation economic and industrial systems
2. Effects of human-initiated changes on the environment, construction of houses, roads, and cities
 - a. human-initiated fire
 - b. water and air pollution
 - c. waste disposal
 - d. logging, deforestation, erosion, and desertification
 - e. global warming
 - f. ozone-layer depletion
3. Natural resources—what they are and why they matter

4. Renewable and nonrenewable resources, energy, mineral, food, and land resources
5. Ecosystems and why understanding ecosystems is important

D. Understands Similarities and Differences Between and Among People

Be able to answer conceptual questions or questions that require making connections between these relationships and other social studies areas.

1. Differences and similarities in material and nonmaterial culture (e.g., religion, food, language)
2. The ways in which being a member of a different culture might affect social interactions with members of the dominant culture

Study Questions: Geography

- What kinds of maps are most useful for the following tasks: determining state and country borders, determining land elevation, and locating specific places?

IV. Economics

Questions about major concepts and definitions may be asked. Visual or written selections may be given, accompanied by questions about these concepts.

A. Understands How Human Needs Are Met

1. The ways in which human needs are met through production, purchasing, and trading/exchange of goods and services
2. How and why people consider costs and benefits when making economic choices
3. How scarcity influences economic decisions

B. Understands the concepts of goods and services and the roles of producers and consumers

1. Resources
2. Cost
3. Opportunity cost
4. Goods versus services
5. Supply and demand
6. Trade and barter
7. Specialization

C. Understands the Purposes of Earning, Spending, and Saving Money.

1. Money is earned through work
 - a. Be able to identify characteristics of various jobs
 - b. Explain the relationship between work and goods and services
2. Understand and explain the relationship between and consequences of saving and spending money
3. Opportunity costs of spending
4. Understand and describe the basic services that banks and financial institutions provide
5. Understand that different currencies exist globally

D. Understands How Businesses Operate

1. Supply and demand and how they affect profits
2. Explain and describe the role of an entrepreneur
3. Explain and describe the interactions between an individual, a business, and the government

E. Understands the Patterns of Economic Activities in the United States and the World

1. Reasons governments levy taxes
2. Government's role in maintaining the country's currency
3. National debt
4. Federal Reserve System

Study Questions: Economics

- How can a teacher best help a student differentiate between a want and a need?
- Describe an example of opportunity cost.

Study Question	Task Targeted by Study Question
<p>Given a student work sample such as a historical timeline, be able to identify misconceptions and choose an appropriate response to correct the misinformation.</p> <p>Given an instructional goal, determine how to best differentiate instruction to help students of different ability levels to achieve the goal.</p> <p>Make your own timeline 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 on your timeline in the correct century, then describe important trends in political, diplomatic, social, religious, artistic, and economic history.</p>	<p>1. Anticipating student thinking in relation to social studies content</p>
<p>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.</p> <p>Given a quotation or excerpt and several potential student interpretations, identify which interpretation is most accurate.</p> <p>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 and a newspaper article reporting on the same battle in the Civil War.</p>	<p>2. Selecting, adapting, and creating sources to support particular social studies instructional goals</p>
<p>This task reflects social studies teachers' knowledge of straightforward content, such as:</p> <p>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?</p> <p>Name some ways the Constitution affects our lives today.</p>	<p>3. Demonstrating understanding of social studies content in order to apply social studies concepts and skills in instruction</p>

Study Question	Task Targeted by Study Question
<p>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.</p> <p>Write a plan for scaffolding students' understanding of the American Revolution.</p> <p>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 form of government in the United States.</p> <p>Develop an activity around the following question: How has the United States Constitution impacted the relationship between the federal government and the states (e.g., the 10th Amendment, the Commerce Clause)?</p>	<p>4. Designing learning experiences to promote student understanding of social studies content and processes in the school and in the community</p>
<p>Given a student work sample or discussion snippet, provide feedback to increase student comprehension. Then choose an appropriate method to assess student understanding.</p> <p>Evaluate a student argument or rationale to determine the student's level of understanding and to determine strengths and weaknesses to help target instruction.</p>	<p>5. Evaluating student ideas evident in work, talk, actions, and interactions to identify strengths and areas for instructional focus</p>

7. Review Smart Tips for Success

Follow test-taking tips developed by experts

Learn from the experts. Take advantage of the following answers to questions you may have and practical tips to help you navigate the *Praxis* test and make the best use of your time.

Should I guess?

Yes. Your score is based on the number of questions you answer correctly, with no penalty or subtraction for an incorrect answer. When you don't know the answer to a question, try to eliminate any obviously wrong answers and then guess at the correct one. Try to pace yourself so that you have enough time to carefully consider every question.

Can I answer the questions in any order?

You can answer the questions in order or skip questions and come back to them later. If you skip a question, you can also mark it so that you can remember to return and answer it later. Remember that questions left unanswered are treated the same as questions answered incorrectly, so it is to your advantage to answer every question.

Are there trick questions on the test?

No. There are no hidden meanings or trick questions. All of the questions on the test ask about subject matter knowledge in a straightforward manner.

Are there answer patterns on the test?

No. You might have heard this myth: the answers on tests follow patterns. Another myth is that there will never be more than two questions in a row with the correct answer in the same position among the choices. Neither myth is true. Select the answer you think is correct based on your knowledge of the subject.

Can I write on the scratch paper I am given?

Yes. You can work out problems on the scratch paper, make notes to yourself, or write anything at all. Your scratch paper will be destroyed after you are finished with it, so use it in any way that is helpful to you. But make sure to select or enter your answers on the computer.

Smart Tips for Taking the Test

- 1. Skip the questions you find extremely difficult.** Rather than trying to answer these on your first pass through the test, you may want to leave them blank and mark them so that you can return to them later. Pay attention to the time as you answer the rest of the questions on the test, and try to finish with 10 or 15 minutes remaining so that you can go back over the questions you left blank. Even if you don't know the answer the second time you read the questions, see if you can narrow down the possible answers, and then guess. Your score is based on the number of right answers, so it is to your advantage to answer every question.

- 2. Keep track of the time.** The on-screen clock will tell you how much time you have left. You will probably have plenty of time to answer all of the questions, but if you find yourself becoming bogged down, you might decide to move on and come back to any unanswered questions later.
- 3. Read all of the possible answers before selecting one.** For questions that require you to select more than one answer, or to make another kind of selection, consider the most likely answers given what the question is asking. Then reread the question to be sure the answer(s) you have given really answer the question. Remember, a question that contains a phrase such as “Which of the following does NOT ...” is asking for the one answer that is NOT a correct statement or conclusion.
- 4. Check your answers.** If you have extra time left over at the end of the test, look over each question and make sure that you have answered it as you intended. Many test takers make careless mistakes that they could have corrected if they had checked their answers.
- 5. Don’t worry about your score when you are taking the test.** No one is expected to answer all of the questions correctly. Your score on this test is not analogous to your score on the *GRE*® or other tests. It doesn’t matter on the *Praxis* tests whether you score very high or barely pass. If you meet the minimum passing scores for your state and you meet the state’s other requirements for obtaining a teaching license, you will receive a license. In other words, what matters is meeting the minimum passing score. You can find passing scores for all states that use the *Praxis* tests at www.ets.org/praxis/institutions/scores/passing/ or on the web site of the state for which you are seeking certification/licensure.
- 6. Use your energy to take the test, not to get frustrated by it.** Getting frustrated only increases stress and decreases the likelihood that you will do your best. Highly qualified educators and test development professionals, all with backgrounds in teaching, worked diligently to make the test a fair and valid measure of your knowledge and skills. Your state painstakingly reviewed the test before adopting it as a licensure requirement. The best thing to do is concentrate on answering the questions.

8. Check on Testing Accommodations

See if you qualify for accommodations that may make it easier to take the Praxis test

What if English is not my primary language?

Praxis tests are given only in English. If your primary language is not English (PLNE), you may be eligible for extended testing time. For more details, visit www.ets.org/praxis/register/plne_accommodations/.

What if I have a disability or other health-related need?

The following accommodations are available for *Praxis* test takers who meet the Americans with Disabilities Act (ADA) Amendments Act disability requirements:

- Extended testing time
- Additional rest breaks
- Separate testing room
- Writer/recorder of answers
- Test reader
- Sign language interpreter for spoken directions only
- Perkins Braille
- Braille slate and stylus
- Printed copy of spoken directions
- Oral interpreter
- Audio test
- Braille test
- Large print test book
- Large print answer sheet
- Listening section omitted

For more information on these accommodations, visit www.ets.org/praxis/register/disabilities.

Note: Test takers who have health-related needs requiring them to bring equipment, beverages, or snacks into the testing room or to take extra or extended breaks must request these accommodations by following the procedures described in the *Bulletin Supplement for Test Takers with Disabilities or Health-Related Needs* (PDF), which can be found at https://www.ets.org/s/praxis/pdf/bulletin_supplement_test_takers_with_disabilities_health_needs.pdf.

You can find additional information on available resources for test takers with disabilities or health-related needs at www.ets.org/disabilities.

9. Do Your Best on Test Day

Get ready for test day so you will be calm and confident

You followed your study plan. You prepared for the test. Now it's time to prepare for test day.

Plan to end your review a day or two before the actual test date so you avoid cramming. Take a dry run to the test center so you're sure of the route, traffic conditions, and parking. Most of all, you want to eliminate any unexpected factors that could distract you from your ultimate goal—passing the *Praxis* test!

On the day of the test, you should:

- be well rested
- wear comfortable clothes and dress in layers
- eat before you take the test
- bring an acceptable and valid photo identification with you
- be prepared to stand in line to check in or to wait while other test takers check in

You can't control the testing situation, but you can control yourself. Stay calm. The supervisors are well trained and make every effort to provide uniform testing conditions, but don't let it bother you if the test doesn't start exactly on time. You will have the allotted amount of time once it does start.

You can think of preparing for this test as training for an athletic event. Once you've trained, prepared, and rested, give it everything you've got.

What items am I restricted from bringing into the test center?

You cannot bring into the test center personal items such as:

- handbags, knapsacks, or briefcases
- water bottles or canned or bottled beverages
- study materials, books, or notes
- pens, pencils, scrap paper, or calculators
- any electronic, photographic, recording, or listening devices

Personal items are not allowed in the testing room and will not be available to you during the test or during breaks. You may also be asked to empty your pockets. At some centers, you will be assigned a space to store your belongings, such as handbags and study materials. Some centers do not have secure storage space available, so please plan accordingly.

Test centers assume no responsibility for your personal items.

If you have health-related needs requiring you to bring equipment, beverages or snacks into the testing room or to take extra or extended breaks, you need to request accommodations in advance. Procedures for requesting accommodations are described in the [Bulletin Supplement for Test Takers with Disabilities or Health-related Needs \(PDF\)](#).

Note: All cell phones, smart phones (e.g., Android® devices, iPhones®, etc.), and other electronic, photographic, recording, or listening devices are strictly prohibited from the test center. If you are seen with such a device, you will be dismissed from the test, your test scores will be canceled, and you will forfeit your test fees. If you are seen *using* such a device, the device will be confiscated and inspected. For more information on what you can bring to the test center, visit www.ets.org/praxis/test_day/bring.

Are You Ready?

Complete this checklist to determine whether you are ready to take your test.

- Do you know the testing requirements for the license or certification you are seeking in the state(s) where you plan to teach?
- Have you followed all of the test registration procedures?
- Do you know the topics that will be covered in each test you plan to take?
- Have you reviewed any textbooks, class notes, and course readings that relate to the topics covered?
- Do you know how long the test will take and the number of questions it contains?
- Have you considered how you will pace your work?
- Are you familiar with the types of questions for your test?
- Are you familiar with the recommended test-taking strategies?
- Have you practiced by working through the practice questions in this study companion or in a study guide or practice test?
- If constructed-response questions are part of your test, do you understand the scoring criteria for these questions?
- If you are repeating a *Praxis* test, have you analyzed your previous score report to determine areas where additional study and test preparation could be useful?

If you answered “yes” to the questions above, your preparation has paid off. Now take the *Praxis* test, do your best, pass it—and begin your teaching career!

10. Understand Your Scores

Understand how tests are scored and how to interpret your test scores

Of course, passing the *Praxis* test is important to you so you need to understand what your scores mean and what your state requirements are.

What are the score requirements for my state?

States, institutions, and associations that require the tests set their own passing scores. Visit www.ets.org/praxis/states for the most up-to-date information.

If I move to another state, will my new state accept my scores?

The *Praxis* tests are part of a national testing program, meaning that they are required in many states for licensure. The advantage of a national program is that if you move to another state that also requires *Praxis* tests, you can transfer your scores. Each state has specific test requirements and passing scores, which you can find at www.ets.org/praxis/states.

How do I know whether I passed the test?

Your score report will include information on passing scores for the states you identified as recipients of your test results. If you test in a state with automatic score reporting, you will also receive passing score information for that state.

A list of states and their passing scores for each test are available online at www.ets.org/praxis/states.

What your *Praxis* scores mean

You received your score report. Now what does it mean? It's important to interpret your score report correctly and to know what to do if you have questions about your scores.

Visit http://www.ets.org/s/praxis/pdf/sample_score_report.pdf to see a sample score report.

To access *Understanding Your Praxis Scores*, a document that provides additional information on how to read your score report, visit www.ets.org/praxis/scores/understand.

Put your scores in perspective

Your score report indicates:

- Your score and whether you passed
- The range of possible scores
- The raw points available in each content category
- The range of the middle 50 percent of scores on the test

If you have taken the same *Praxis* test or other *Praxis* tests over the last 10 years, your score report also lists the highest score you earned on each test taken.

Content category scores and score interpretation

Questions on the *Praxis* tests are categorized by content. To help you in future study or in preparing to retake the test, your score report shows how many raw points you earned in each content category. Compare your “raw points earned” with the maximum points you could have earned (“raw points available”). The greater the difference, the greater the opportunity to improve your score by further study.

Score scale changes

ETS updates *Praxis* tests on a regular basis to ensure they accurately measure the knowledge and skills that are required for licensure. When tests are updated, the meaning of the score scale may change, so requirements may vary between the new and previous versions. All scores for previous, discontinued tests are valid and reportable for 10 years, provided that your state or licensing agency still accepts them.

These resources may also help you interpret your scores:

- *Understanding Your Praxis Scores* (PDF), found at www.ets.org/praxis/scores/understand
- The *Praxis* passing scores, found at <https://www.ets.org/praxis/institutions/scores/passing/>
- State requirements, found at www.ets.org/praxis/states

Appendix: Other Questions You May Have

Here is some supplemental information that can give you a better understanding of the *Praxis* tests.

What do the *Praxis* tests measure?

The *Praxis* tests measure the specific knowledge and skills that beginning teachers need. The tests do not measure an individual's disposition toward teaching or potential for success, nor do they measure your actual teaching ability. The assessments are designed to be comprehensive and inclusive but are limited to what can be covered in a finite number of questions and question types. Teaching requires many complex skills that are typically measured in other ways, including classroom observation, video recordings, and portfolios.

Ranging from Agriculture to World Languages, there are more than 80 *Praxis* tests, which contain selected-response questions or constructed-response questions, or a combination of both.

Who takes the tests and why?

Some colleges and universities use the *Praxis* Core Academic Skills for Educators tests (Reading, Writing, and Mathematics) to evaluate individuals for entry into teacher education programs. The assessments are generally taken early in your college career. Many states also require Core Academic Skills test scores as part of their teacher licensing process.

Individuals entering the teaching profession take the *Praxis* content and pedagogy tests as part of the teacher licensing and certification process required by many states. In addition, some professional associations and organizations require the *Praxis* Subject Assessments for professional licensing.

Do all states require these tests?

The *Praxis* tests are currently required for teacher licensure in approximately 40 states and United States territories. These tests are also used by several professional licensing agencies and by several hundred colleges and universities. Teacher candidates can test in one state and submit their scores in any other state that requires *Praxis* testing for licensure. You can find details at www.ets.org/praxis/states.

What is licensure/certification?

Licensure in any area—medicine, law, architecture, accounting, cosmetology—is an assurance to the public that the person holding the license possesses sufficient knowledge and skills to perform important occupational activities safely and effectively. In the case of teacher licensing, a license tells the public that the individual has met predefined competency standards for beginning teaching practice.

Because a license makes such a serious claim about its holder, licensure tests are usually quite demanding. In some fields, licensure tests have more than one part and last for more than one day. Candidates for licensure in all fields plan intensive study as part of their professional preparation. Some join study groups, others study alone. But preparing to take a licensure test is, in all cases, a professional activity. Because a licensure test surveys a broad body of knowledge, preparing for a licensure test takes planning, discipline, and sustained effort.

Why does my state require the *Praxis* tests?

Your state chose the *Praxis* tests because they assess the breadth and depth of content—called the “domain”—that your state wants its teachers to possess before they begin to teach. The level of content knowledge, reflected in the passing score, is based on recommendations of panels of teachers and teacher educators in each subject area. The state licensing agency and, in some states, the state legislature ratify the passing scores that have been recommended by panels of teachers.

How were the tests developed?

ETS consulted with practicing teachers and teacher educators around the country during every step of the *Praxis* test development process. First, ETS asked them what knowledge and skills a beginning teacher needs to be effective. Their responses were then ranked in order of importance and reviewed by hundreds of teachers.

After the results were analyzed and consensus was reached, guidelines, or specifications, for the selected-response and constructed-response tests were developed by teachers and teacher educators. Following these guidelines, teachers and professional test developers created test questions that met content requirements and [*ETS Standards for Quality and Fairness*](#).*

When your state adopted the research-based *Praxis* tests, local panels of teachers and teacher educators evaluated each question for its relevance to beginning teachers in your state. During this “validity study,” the panel also provided a passing-score recommendation based on how many of the test questions a beginning teacher in your state would be able to answer correctly. Your state’s licensing agency determined the final passing-score requirement.

ETS follows well-established industry procedures and standards designed to ensure that the tests measure what they are intended to measure. When you pass the *Praxis* tests your state requires, you are proving that you have the knowledge and skills you need to begin your teaching career.

How are the tests updated to ensure the content remains current?

Praxis tests are reviewed regularly. During the first phase of review, ETS conducts an analysis of relevant state and association standards and of the current test content. State licensure titles and the results of relevant job analyses are also considered. Revised test questions are then produced following the standard test development methodology. National advisory committees may also be convened to review and revise existing test specifications and to evaluate test forms for alignment with the specifications.

How long will it take to receive my scores?

Scores for tests that do not include constructed-response questions are available on screen immediately after the test. Scores for tests that contain constructed-response questions or essays aren’t available immediately after the test because of the scoring process involved. Official score reports are available to you and your designated score recipients approximately two to three weeks after the test date for tests delivered continuously, or two to three weeks after the testing window closes for other tests. See the test dates and deadlines calendar at www.ets.org/praxis/register/dates_centers for exact score reporting dates.

Can I access my scores on the web?

All test takers can access their test scores via My *Praxis* Account free of charge for one year from the posting date. This online access replaces the mailing of a paper score report.

The process is easy—simply log into My *Praxis* Account at www.ets.org/praxis and click on your score report. If you do not already have a *Praxis* account, you must create one to view your scores.

Note: You must create a *Praxis* account to access your scores, even if you registered by mail or phone.

*[*ETS Standards for Quality and Fairness*](#) (2014, Princeton, N.J.) are consistent with the [*Standards for Educational and Psychological Testing*](#), industry standards issued jointly by the American Educational Research Association, the American Psychological Association, and the National Council on Measurement in Education (2014, Washington, D.C.).

Your teaching career is worth preparing for, so start today!
Let the *Praxis*® *Study Companion* guide you.

To search for the *Praxis* test prep resources
that meet your specific needs, visit:

www.ets.org/praxis/testprep

To purchase official test prep made by the creators
of the *Praxis* tests, visit the ETS Store:

www.ets.org/praxis/store

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