



Massachusetts Tests for Educator Licensure[®]

TEST INFORMATION BOOKLET

03 General Curriculum

- Multi-Subject Subtest
- Mathematics Subtest

Effective January 1, 2009

MA-SG-FLD003-05

Massachusetts Department of Elementary and Secondary Education

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Test Information Booklet Order Form

***General Curriculum
(Field 03)***

Test Overview Chart

Test Objectives

Sample Test Items

Answer Keys and Sample Responses

***Test Overview Chart:
General Curriculum (03)***

Multi-Subject Subtest

Subareas	Approximate Number of Multiple-Choice Items	Number of Open-Response Items
Language Arts	18–20	
History and Social Science	17–19	
Science and Technology/Engineering	17–19	
Integration of Knowledge and Understanding		1

Mathematics Subtest

Subareas	Approximate Number of Multiple-Choice Items	Number of Open-Response Items
Numbers and Operations	19–21	
Functions and Algebra	10–12	
Geometry and Measurement	8–10	
Statistics and Probability	4–6	
Integration of Knowledge and Understanding		1

The General Curriculum test comprises separately administered and scored multi-subject and mathematics subtests and is designed to assess the candidate's knowledge of the elementary subject matter required for a Massachusetts Elementary teaching license and other licenses as defined in the *Regulations for Educator Licensure and Preparation Program Approval*, 603 CMR 7.06, "Subject Matter Knowledge Requirements for Teachers." This subject matter knowledge is delineated in the Massachusetts Department of Education's *Regulations*.

In April 2007, the State Board of Education voted to approve an amendment to the *Regulations for Educator Licensure and Preparation Program Approval* (603 CMR 7.00) for the purpose of strengthening preparation and licensing of elementary and special education teachers to teach mathematics. The new regulations are reflected in the Massachusetts Tests for Educator Licensure (MTEL) by means of a revised general curriculum test with a separately scored mathematics subtest as of January 2009.

Test Overview Chart: General Curriculum

The General Curriculum test assesses the candidate's proficiency and depth of understanding of the subject at the level required for a baccalaureate major, according to Massachusetts standards. Candidates are typically nearing completion of or have completed their undergraduate work when they take the test.

The multiple-choice items on the test cover the subareas as indicated in the preceding charts. The open-response items may relate to topics covered in any of the subareas as described by the associated objectives and will typically require breadth of understanding of the elementary field and the ability to relate concepts from different aspects of the field. Responses to the open-response items are expected to be appropriate and accurate in the application of subject knowledge, to provide high-quality and relevant supporting evidence, and to demonstrate a soundness of argument and understanding of the elementary field.

Test Objectives:
General Curriculum (03)

Massachusetts Tests for Educator Licensure® (MTEL®)

**FIELD 03: GENERAL CURRICULUM
 TEST OBJECTIVES**

MULTI-SUBJECT SUBTEST

Subarea	Range of Objectives	Percentage of Subtest		
		Multiple-Choice	Open-Response	Total
Language Arts	01–05	30%		30%
History and Social Science	06–09	30%		30%
Science and Technology/Engineering	10–14	30%		30%
Integration of Knowledge and Understanding	15	—	<u>10%</u>	<u>10%</u>
		90%	10%	100%

MATHEMATICS SUBTEST

Subarea	Range of Objectives	Percentage of Subtest		
		Multiple-Choice	Open-Response	Total
Numbers and Operations	16–19	41%		41%
Functions and Algebra	20–22	22%		22%
Geometry and Measurement	23–24	18%		18%
Statistics and Probability	25–26	9%		9%
Integration of Knowledge and Understanding	27	—	<u>10%</u>	<u>10%</u>
		90%	10%	100%

MULTI-SUBJECT SUBTEST

SUBAREAS:

LANGUAGE ARTS
HISTORY AND SOCIAL SCIENCE
SCIENCE AND TECHNOLOGY/ENGINEERING
INTEGRATION OF KNOWLEDGE AND UNDERSTANDING

LANGUAGE ARTS¹ [30%]

0001 Understand the history and structure of the English language.

For example:

- Identify major developments in the history of the English language (e.g., invention of the printing press, standardization of written language, development of dictionaries).
- Recognize major linguistic origins of the English language (e.g., Anglo-Saxon roots, Celtic influences, Greek and Roman elements).
- Recognize examples of derivatives and borrowings.
- Analyze differences in written English (e.g., level of formality, how dialects are used).
- Recognize fundamental language structures (i.e., morphology, semantics, syntax, and phonology).
- Identify parts of speech (e.g., noun, verb, adjective, preposition).
- Recognize sentence types (e.g., simple, compound, complex) and sentence purposes (e.g., declarative, interrogative).
- Apply knowledge of the rules of English grammar and conventions of edited American English.

1. Knowledge of the following content will be measured on a separate Foundations of Reading test for all prospective early childhood, elementary, and special education teachers: 1) reading theory, research, and practice; 2) development of an oral and reading vocabulary; 3) theories on the relationship between beginning writing and reading; 4) approaches and practices for developing skills in using writing tools; and 5) theories of first- and second-language acquisition and development.

0002 Understand American literature and selected literature from classical and contemporary periods.

For example:

- Recognize historically or culturally significant works, authors, and themes of U.S. literature.
- Demonstrate knowledge of selected literature from classical and contemporary periods.
- Recognize literature of other cultures.
- Recognize elements of literary analysis (e.g., analyzing story elements, interpreting figurative language).
- Demonstrate knowledge of varied focuses of literary criticism (e.g., the author, the context of the work, the response of the reader).

0003 Understand literary genres, elements, and techniques.

For example:

- Demonstrate knowledge of basic literary terminology (e.g., flashback, foreshadowing).
- Recognize characteristics of different genres and types of literature (e.g., folktales, nonfiction, drama, poetry).
- Recognize types of nonfiction (e.g., biography, informational text, documents) and common organizational features of nonfiction (e.g., chronological order, comparison and contrast, illustrations, captions, keys).
- Apply knowledge of elements of fiction (e.g., plot, character, setting, theme, voice).
- Identify types of poetry (e.g., lyric, narrative, haiku).
- Recognize characteristics of poetry and poetic techniques (e.g., meter, rhyme, alliteration, figurative language).
- Recognize types of drama (e.g., comedy, tragedy) and common dramatic devices (e.g., suspense, soliloquy).

0004 Understand literature for children, including genres, literary elements, and literary techniques.

For example:

- Recognize major works and authors of children's literature.
- Recognize genres of children's literature and their characteristics.
- Identify major themes associated with children's literature.
- Analyze rhetorical and literary devices (e.g., analogies, similes, metaphors, symbolism) in children's literature.
- Compare different styles and communicative purposes in children's literature.
- Identify criteria for evaluating children's literature (e.g., reading level, literary quality, richness of vocabulary, student interests, illustrations, gender and cultural bias).
- Analyze excerpts of children's literature in relation to style, theme, or voice.
- Identify uses of children's literature (e.g., enhancing other areas of the curriculum, fostering cross-cultural understanding).

0005 Understand the writing process and formal elements of writing and composition.

For example:

- Demonstrate knowledge of prewriting strategies, including techniques for generating topics and developing ideas (e.g., brainstorming, semantic mapping, outlining, using graphic organizers).
- Identify formal elements of writing (e.g., paragraphing, topic sentences, cohesive transitions).
- Identify revisions of written texts that improve unity, coherence, and logical organization.
- Edit written work to ensure conformity to conventions of edited American English (e.g., grammar, punctuation, spelling, usage).
- Identify techniques and styles for writing for various purposes (e.g., to respond, inform, analyze, persuade, entertain), including factors related to the selection of topic and mode of written expression.
- Recognize intended audience.
- Recognize various techniques to convey meaning (e.g., precise vocabulary, figurative language).

HISTORY AND SOCIAL SCIENCE [30%]

0006 Understand major developments in the history of the United States and the Commonwealth of Massachusetts from precolonial times to the present.

For example:

- Demonstrate knowledge of indigenous peoples before the arrival of Europeans.
- Describe European exploration and the settlement of North America.
- Analyze the causes and effects of the Revolutionary War (e.g., the Stamp Act, the Boston Massacre).
- Recognize key developments in the formation of the national government.
- Examine the origins and events of the Civil War.
- Analyze issues associated with Reconstruction.
- Demonstrate knowledge of the settlement of the West.
- Analyze the transformation of the United States from an agrarian to an industrial economy.
- Compare the Progressive Era and the New Deal.
- Examine the emergence of the United States as a world power (e.g., the era of U.S. overseas expansion, World War I, World War II, the Cold War).
- Demonstrate knowledge of the civil rights and women's movements.
- Analyze U.S. leadership in world affairs from the collapse of the Soviet Union to the present.

0007 Understand the founding documents and governmental systems of the United States and the Commonwealth of Massachusetts; the principles, ideals, rights, and responsibilities of U.S. citizenship; and the fundamental principles and concepts of economics.

For example:

- Identify the purposes of government.
- Demonstrate knowledge of the functions of federal, state, and local governments in the United States.
- Identify the three branches of the U.S. government and analyze their roles and functions.
- Describe various forms of local self-government in Massachusetts and the United States.
- Demonstrate knowledge of how laws are enacted and enforced.
- Analyze the political process in the United States.
- Demonstrate knowledge of the democratic principles and values contained in the Declaration of Independence, the U.S. Constitution, and the Constitution of the Commonwealth of Massachusetts (e.g., the rule of law, due process, majority rule).
- Recognize the responsibilities of U.S. citizens (e.g., paying taxes, jury duty, voting).
- Apply basic economic terms (e.g., scarcity, opportunity cost) to analyze contemporary economic issues.
- Examine the fundamental concepts and principles of capitalism (e.g., private property, profit, supply and demand).

0008 Understand major developments and figures in world history.

For example:

- Identify the characteristics of early human civilizations.
- Demonstrate knowledge of major figures (e.g., Saladin, Julius Caesar, Isaac Newton, Mohandas Gandhi, Elizabeth I), eras, developments, and turning points in world history with stress on Western civilization (e.g., ancient Israel, the emergence of Greek civilization, the rise and fall of the Roman Empire, the Middle Ages, the Renaissance and Reformation, the Age of Exploration, the Scientific Revolution, the Enlightenment, the Age of Revolutionary Change, World Wars I and II).
- Analyze the impact of industrialization, nationalism, immigration, and globalization on modern world history.

0009 Understand basic geographic concepts, phenomena, and processes, and demonstrate knowledge of the major geographic features and regions of the world, the United States, and the Commonwealth of Massachusetts.

For example:

- Demonstrate knowledge of the basic concepts of geography (e.g., location, place, movement).
- Use globes, maps, and other resources to access geographic information.
- Identify global features (e.g., continents, hemispheres, latitude and longitude, poles).
- Recognize the major physical features and regions of Massachusetts, the United States, and world areas.
- Analyze the relationship between geographic factors (e.g., climate, topography) and historical and contemporary developments (e.g., human migrations, patterns of settlement, economic growth and decline).

SCIENCE AND TECHNOLOGY/ENGINEERING [30%]

0010 Understand and apply basic concepts and principles of life science to interpret and analyze phenomena.

For example:

- Identify the basic characteristics and needs of living things (e.g., growth, reproduction, life cycles of common organisms).
- Demonstrate knowledge of the basic concepts and processes related to energy flow in ecosystems and how organisms use energy.
- Demonstrate knowledge of plant structures, functions, and processes (e.g., photosynthesis).
- Demonstrate knowledge of the systems of the human body.
- Recognize the basic principles of genetics and heredity.
- Recognize how species adapt and evolve over time by the process of natural selection.
- Analyze how organisms interact with one another and their environments.

0011 Understand and apply basic concepts and principles of the physical sciences to interpret and analyze phenomena.

For example:

- Demonstrate knowledge of the composition and structure of matter (e.g., atoms, molecules).
- Demonstrate knowledge of the properties and states of matter.
- Recognize forms of energy (e.g., heat, electrical, magnetic, sound, light).
- Analyze how heat energy is transferred (e.g., convection, conduction, radiation).
- Demonstrate knowledge of basic concepts related to the motion of objects (e.g., inertia, momentum).
- Apply the principles of the conservation of matter and energy.
- Recognize the use of simple machines in everyday life.
- Understand how engineering uses the laws of physical science and the properties of matter to solve practical problems.

0012 Understand and apply basic concepts and principles of the earth and space sciences to interpret and analyze phenomena.

For example:

- Analyze the forces that shape the earth's surface (e.g., erosion, weathering, volcanism, plate tectonics).
- Demonstrate knowledge of the rock cycle and soil formation.
- Recognize the structure of the earth and atmosphere.
- Demonstrate knowledge of factors that affect weather and climate.
- Identify the physical characteristics of oceans (e.g., currents, waves).
- Analyze the components and processes of the hydrologic cycle.
- Demonstrate knowledge of the structure of the solar system.
- Recognize the relationships among objects in the solar system (e.g., the moon's effect on the earth, the change of seasons).

0013 Understand the foundations of scientific thought; the historical development of major scientific ideas and technological discoveries; and the relationships among scientific discoveries, technological developments, and society.

For example:

- Demonstrate knowledge of the development of scientific thinking (e.g., during ancient times, during the Scientific Revolution of the seventeenth century).
- Recognize the importance of observation and evidence in the development of scientific knowledge.
- Recognize major scientific and technological discoveries and inventions.
- Analyze cultural and historical factors that have promoted or discouraged scientific discovery and technological innovation.

0014 Understand the principles and procedures of scientific inquiry and experimentation; the relationships among science, technology, and engineering; and the principles of engineering design.

For example:

- Demonstrate knowledge of the basic concepts and processes of scientific experimentation (e.g., hypothesis, control, variable, replication of results, collection and communication of scientific information).
- Demonstrate knowledge of health and safety measures related to scientific inquiry and experimentation.
- Recognize the relationships among science, technology, and engineering.
- Demonstrate knowledge of the processes of engineering design (e.g., research, design and development, testing, evaluation and redesign).

INTEGRATION OF KNOWLEDGE AND UNDERSTANDING [10%]

In addition to answering multiple-choice items, candidates will prepare a written response to a question addressing content summarized in the objective below.

0015 Prepare an organized, developed analysis on a topic related to History and Social Science or to Science and Technology/Engineering.

(Refer to objectives 0006 through 0014 and associated descriptive statements.)

MATHEMATICS SUBTEST

SUBAREAS:

NUMBERS AND OPERATIONS
FUNCTIONS AND ALGEBRA
GEOMETRY AND MEASUREMENT
STATISTICS AND PROBABILITY
INTEGRATION OF KNOWLEDGE AND UNDERSTANDING

Candidates should not only know how to do elementary mathematics, but should understand and be able to explain to students, in multiple ways, why the mathematics makes sense.

NUMBERS AND OPERATIONS [41%]

0016 Understand the number system and the concept of place value.

For example:

- Analyze the structures and properties of the base-10 and other numeral systems (e.g., expanded form of a number, visual representations of place value, numeration systems of ancient cultures).
- Recognize decimal expansions.
- Use scientific notation in the real world.
- Analyze procedures (e.g., rounding, regrouping) for estimation.
- Determine the reasonableness of estimates.
- Identify subsets of the real numbers (e.g., integer, rational, irrational) and their characteristics.

0017 Understand integers, fractions, decimals, percents, and mixed numbers.

For example:

- Understand the meanings and models of integers, fractions, decimals, percents, and mixed numbers and apply them to the solution of word problems.
- Analyze and convert among various representations of numbers (e.g., graphic, numeric, symbolic, verbal).
- Use number lines.
- Compare, sort, order, and round numbers.
- Recognize equivalent representations of numbers (e.g., fractions, decimals, percents).

0018 Understand and apply principles of number theory.

For example:

- Identify prime and composite numbers and their characteristics.
- Find the prime factorization of a number and recognize its uses.
- Demonstrate knowledge of the divisibility rules and why they work.
- Find the least common multiple (LCM) and greatest common factor (GCF) of a set of numbers.
- Apply the LCM and GCF in real-world situations.

0019 Understand operations on numbers.

For example:

- Understand the meaning and models of operations on numbers (e.g., integers, fractions, decimals).
- Analyze and justify standard and nonstandard computational algorithms and mental math techniques (e.g., by application of the arithmetic properties, such as commutative, associative, distributive).
- Evaluate the validity of nonstandard or unfamiliar computational strategies.
- Recognize and analyze various representations (e.g., graphic, pictorial, verbal) of number operations.
- Recognize relationships among operations (e.g., addition and subtraction, addition and multiplication, multiplication and exponentiation).
- Identify and apply the arithmetic properties and the transitive properties of equality and inequality.
- Apply the order of operations.
- Apply the laws of exponents.
- Demonstrate fluency in arithmetic computation, including operations on fractions.
- Interpret the concept of absolute value.
- Apply appropriate strategies (e.g., proportional thinking, ratios) to estimate quantities in real-world situations.
- Solve problems using arithmetic operations with various representations of numbers.

FUNCTIONS AND ALGEBRA [22%]

0020 Understand algebra as generalized arithmetic.

For example:

- Recognize and apply the concepts of variable, function, equality, and equation to express relationships algebraically.
- Manipulate simple algebraic expressions and solve linear equations and inequalities.
- Justify algebraic manipulations by application of the properties of equality, the order of operations, the number properties, and the order properties.
- Use algebra to solve word problems involving fractions, ratios, proportions, and percents.
- Identify variables and derive algebraic expressions that represent real-world situations.

0021 Understand the concept of function.

For example:

- Understand the definition of function and various representations of functions (e.g., input/output machines, tables, graphs, mapping diagrams, formulas).
- Recognize and extend patterns using a variety of representations (e.g., verbal, numeric, pictorial, algebraic).
- Identify and analyze direct and inverse relationships in tables, graphs, algebraic expressions and real-world situations.
- Use qualitative graphs to represent functional relationships in the real world.
- Translate among different representations (e.g., tables, graphs, algebraic expressions, verbal descriptions) of functional relationships.

0022 Understand linear functions and linear equations.

For example:

- Recognize the formula and graph of a linear function.
- Distinguish between linear and nonlinear functions.
- Find a linear equation that represents a graph.
- Analyze the relationships among proportions, constant rates, and linear functions.
- Interpret the meaning of the slope and the intercepts of a linear equation that models a real-world situation.
- Select the linear equation that best models a real-world situation.

GEOMETRY AND MEASUREMENT [18%]

0023 Understand and apply concepts of measurement.

For example:

- Estimate and calculate measurements using customary, metric, and nonstandard units of measurement.
- Use unit conversions and dimensional analysis to solve measurement problems.
- Derive and use formulas for calculating the lengths, perimeters, areas, volumes, and surface areas of geometric shapes and figures.
- Determine how the characteristics (e.g., area, volume) of geometric figures and shapes are affected by changes in their dimensions.
- Solve a variety of measurement problems (e.g., time, temperature, rates, average rates of change) in real-world situations.

0024 Understand and apply concepts of geometry.

For example:

- Classify and analyze polygons using attributes of sides and angles, including real-world applications.
- Classify and analyze three-dimensional figures using attributes of faces, edges, and vertices.
- Analyze and apply geometric transformations (e.g., translations, rotations, reflections, dilations); relate them to concepts of symmetry, similarity, and congruence; and use these concepts to solve problems.
- Match three-dimensional figures and their two-dimensional representations (e.g., nets, projections, perspective drawings).
- Recognize and apply connections between algebra and geometry (e.g., the use of coordinate systems, the Pythagorean theorem).

STATISTICS AND PROBABILITY [9%]

0025 Understand descriptive statistics.

For example:

- Use measures of central tendency (e.g., mean, median, mode) and spread to describe and interpret real-world data.
- Select appropriate ways to present data and communicate statistical information (e.g., tables, graphs, line plots, Venn diagrams).
- Analyze and interpret various graphic and nongraphic data representations (e.g., frequency distributions, percentiles).
- Compare different data sets.

0026 Understand and apply basic concepts of probability.

For example:

- Calculate the probabilities of simple and compound events and of independent and dependent events.
- Recognize and apply the concept of conditional probability.
- Recognize the difference between experimentally and theoretically determined probabilities in real-world situations.
- Apply knowledge of combinations and permutations to the computation of probabilities.

INTEGRATION OF KNOWLEDGE AND UNDERSTANDING [10%]

In addition to answering multiple-choice items, candidates will prepare a written response to a question addressing content summarized in the objective below.

0027 Apply mathematical knowledge and reasoning to communicate multiple solutions in detail to a problem involving two or more of the following subareas: Numbers and Operations, Functions and Algebra, Geometry and Measurement, and Statistics and Probability.

(Refer to objectives 0016 through 0026 and associated descriptive statements.)

Sample Test Items:
General Curriculum (03)
Multi-Subject Subtest

1. Which of the following characteristics is most closely associated with the works of Latin American authors Gabriel García Márquez (*One Hundred Years of Solitude*) and Isabel Allende (*The House of Spirits*)?
- A. a focus more on the structure of the text than on content
 - B. the exploration of idealistic perceptions of humankind
 - C. an emphasis on presenting events objectively without moral judgment
 - D. the blending of fantastic and realistic narrative elements

2. A freewriting activity would be most helpful for students who typically demonstrate difficulty with which of the following aspects of an essay-writing process?
- A. using appropriate sentence structures and transitions
 - B. organizing the information into paragraphs
 - C. generating a thesis statement and supporting details
 - D. identifying grammatical weaknesses

3. Literacy tests and poll taxes were used in many states during Reconstruction primarily because they could be used to:
- A. discourage land ownership by African Americans.
 - B. establish new institutions of higher education.
 - C. deprive African Americans of voting rights.
 - D. avoid the redistribution of wealth across all economic classes.

4. **Read the description below; then answer the question that follows.**

The Alps mountain system extends from Nice, France, on the Mediterranean Riviera in a curving arc northeast through northern Italy, southeast France, Switzerland, southern Germany, Austria, and into Albania. The highest elevations are topped with ice and snow throughout the year, and the cooler northern slopes are covered with green forests, while warmer southern slopes are often cleared for grazing and farming.

Which of the following concepts of geography is the focus of the description above?

- A. location
- B. region
- C. area
- D. habitat

5. Use the information below to answer the question that follows.

Several years ago, scientists noticed a dramatic decline in the number of males in a species of butterfly native to islands in the South Pacific. The decline was caused by a bacterial infection that selectively killed males before they hatched. The proportion of males in the population had dropped to 1% over the course of several years. When scientists returned a year later, they were happily surprised. In the single year it takes the butterfly to go through 10 generations, the proportion of males had risen to 39%. Scientists initially thought that the bacteria were no longer infecting the population but discovered the bacteria unchanged and still present in the population.

Which of the following is the most likely reason that the male butterflies became less susceptible to the bacterial infection?

- A. The male butterflies that survived had genes that protected them from the infection and their genes spread throughout the population as they were the only reproductive males.
- B. A new mutation that protected the male butterflies from the infection developed in their genes as a consequence of the bacteria's constant presence in their cells.
- C. The males that survived the original attack by the bacteria developed stronger immune systems to fight the infection that they then passed on to their offspring.
- D. A genetic change in the female butterflies triggered by the low percentage of male offspring caused the mothers to produce a much greater proportion of male offspring.

6. **Use the information below to complete the exercise that follows.**

During the sixteenth, seventeenth, and eighteenth centuries, England operated under an economic system called mercantilism. The colonies of North America and the West Indies were instrumental to the success of the English mercantile system of trade.

Using your knowledge of mercantilism, the Triangular Trades, and this period in history:

- briefly discuss two ways the colonies of North America and the West Indies were affected by England's mercantile system; and
- explain one way English mercantilism and the Triangular Trades benefited England at the expense of its colonies.

Sample Test Items:
General Curriculum (03)
Mathematics Subtest

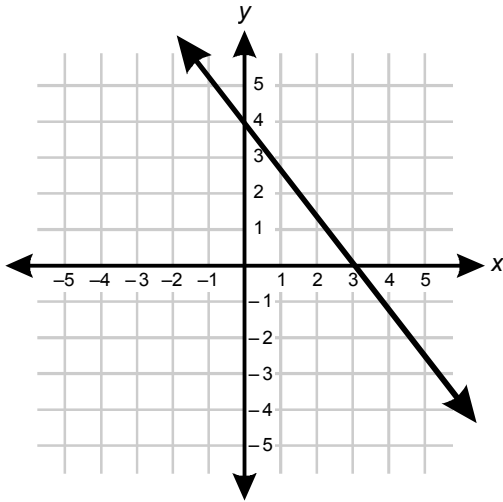
1. Use the table below to answer the question that follows.

Richter Magnitude	Energy Units Released
5	1.8×10^6
4	5.6×10^4

The Richter scale is a system used by geologists for measuring the severity of earthquakes. What is the difference, expressed to two significant digits, between the amount of energy released by an earthquake of Richter magnitude 5 and an earthquake of magnitude 4?

- A. 3.8×10^2 units
- B. 1.7×10^5 units
- C. 3.8×10^5 units
- D. 1.7×10^6 units
2. Which of the following decimals is equal to $\frac{1}{50} + \frac{1}{2,000} + \frac{9}{1,000,000}$?
- A. 0.0020509
- B. 0.002509
- C. 0.0205009
- D. 0.020509

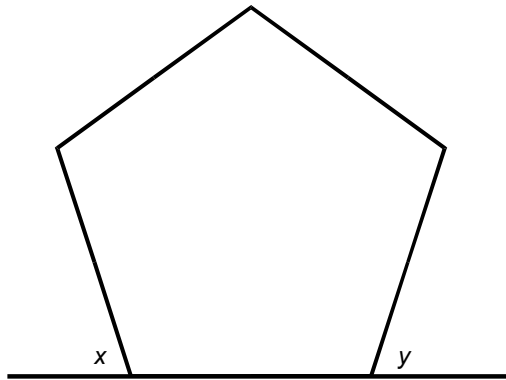
3. Use the graph below to answer the question that follows.



The graph of which of the following equations is a line parallel to the line graphed above?

- A. $y = -\frac{4}{3}x + \frac{7}{3}$
- B. $y = \frac{4}{3}x + \frac{5}{3}$
- C. $y = -\frac{3}{4}x - \frac{1}{2}$
- D. $y = \frac{3}{4}x - \frac{3}{2}$

4. Use the diagram below to answer the question that follows.



The polygon shown above is regular. What is the sum of angles x and y ?

- A. 108°
- B. 120°
- C. 132°
- D. 144°
5. A part-time salesperson works 2 days per week at a store that is open Monday through Friday. If the workdays are randomly assigned, what is the probability that the salesperson will work on Monday and Tuesday?
- A. $\frac{1}{20}$
- B. $\frac{1}{10}$
- C. $\frac{2}{5}$
- D. $\frac{2}{3}$

6. Use the information below to complete the exercise that follows.

Elementary school students are asked to solve the following problem.

A desk drawer contains 5 pens for every 3 pen caps. There are 10 more pens than pen caps in the drawer. How many pens are in the drawer?

Student response:

$$5p = 3c$$

$$p = c - 10$$

$$5(c - 10) = 3c$$

$$5c - 50 = 3c$$

$$2c = 50$$

$$c = 25$$

$$p = c - 10 = 15 \quad \text{There are 15 pens in the drawer.}$$

Use your knowledge of mathematics to create a response in which you analyze the elementary school student's work and provide an alternative solution to the problem. In your response, you should:

- correct any errors or misconceptions evident in the elementary school student's work and explain why the response is not mathematically sound (be sure to provide a correct solution, show your work, and explain your reasoning); and
- solve the problem using an alternative method that could enhance the elementary school student's conceptual understanding of ratios in the context of the problem.

Answer Keys and Sample Responses: General Curriculum (03)

Multi-Subject Subtest

Question Number	Correct Response	Test Objective
1.	D	Understand American literature and selected literature from classical and contemporary periods.
2.	C	Understand the writing process and formal elements of writing and composition.
3.	C	Understand major developments in the history of the United States and the Commonwealth of Massachusetts from precolonial times to the present.
4.	B	Understand basic geographic concepts, phenomena, and processes, and demonstrate knowledge of the major geographic features and regions of the world, the United States, and the Commonwealth of Massachusetts.
5.	A	Understand and apply basic concepts and principles of life science to interpret and analyze phenomena.

The sample response below reflects a strong knowledge and understanding of the subject matter.

The mercantile system benefited the mother country at the expense of the colonies. In the case of the American colonies, they provided huge quantities of raw materials like cotton, tobacco, and lumber, which England got tax-free to ship back home and turn into finished products. The West Indies had a similar situation, in that they provided England with an abundance of spices and sugar cane -- which was turned into raw sugar, molasses and rum -- most of which they weren't allowed to keep. The colonists had to turn virtually all of their resources over to England.

Furthermore, England maintained a monopoly on trade with her colonies, prohibiting the colonies from turning their own raw materials into finished products and from selling either raw materials or manufactured goods to other countries. They had to wait and buy goods only from England -- at a high cost and with very high import taxes added on. This went on for so long that England made great advances in manufacturing and industrialization while the colonies became more and more dependent on England for basic supplies. As a result, the mercantile system made England richer and richer while the colonies became poorer and poorer.

England traded some of her manufactured goods with Africa in exchange for slaves, which they crowded onto ships going to the American colonies. British troops also captured natives in the West Indies and turned them into slaves. Using slave labor in the colonies allowed England to further lower the cost of producing the raw materials to be exported back home. However, this "triangular trade" began a long history of using black persons as slave labor -- not only to plant and harvest crops like cotton, tobacco, and sugar cane, but also to run the households of the rich -- a legacy it has been extremely difficult for our country to overcome. It created what has been a continuing difference between the work and wages of blacks and whites, as well as racial differences in political, educational, and social opportunities.

Mathematics Subtest

Question Number	Correct Response	Test Objective
1.	D	Understand the number system and the concept of place value.
2.	D	Understand integers, fractions, decimals, percents, and mixed numbers.
3.	A	Understand linear functions and linear equations.
4.	D	Understand and apply concepts of geometry.
5.	B	Understand and apply basic concepts of probability.

The sample response below reflects a strong knowledge and understanding of the subject matter.

The proportion described by the first sentence is $\frac{P}{C} = \frac{5}{3}$, so the correct first equation is $5c = 3p$, not $5p = 3c$. Also, the student made an error when she wrote $p = c - 10$ because that would mean there are 10 more caps than pens when the problem actually states that there are 10 more pens than caps.

The correct solution would be:

$$p = c + 10$$

$$5c = 3p$$

$$5c = 3(c + 10)$$

$$5c = 3c + 30$$

$$\text{since } 3c + 2c = 5c, 2c \text{ must} = 30$$

$$\text{so } c = 15$$

$$p = c + 10$$

$$p = 15 + 10$$

$$p = 25$$

There are 25 pens in the drawer.

An alternate way to solve the problem would be to make a visual display:

ppppp/ccc difference of 2

ppppp/ccc

ppppp/ccc

ppppp/ccc

ppppp/ccc

ppppp/ccc difference of 4

ppppp/ccc difference of 8

ppppp/ccc

ppppp/ccc

ppppp/ccc

ppppp/ccc

ppppp/ccc difference of 6

ppppp/ccc

ppppp/ccc

ppppp/ccc difference of 10

This way the student can better visualize the number of pens and the number of caps in the drawer, and how many it would take to make a difference of 10. It shows how the ratio of 5 to 3 is maintained as the number of pens and caps rises. The more you look at the display, the more patterns you see. For example, the difference between 5 and 3 is 2. In order to have a difference of 10 you'd have to multiply that difference of 2 five times over. Therefore, you'd have to multiply the pens and caps 5 times: 5 pens \times 5 = 25, 3 caps \times 5 = 15. There are 25 pens in the drawer.