



The *PRAXIS*® Study Companion

**Pennsylvania Grades
4–8 Subject
Concentration:
Mathematics
(5158)**



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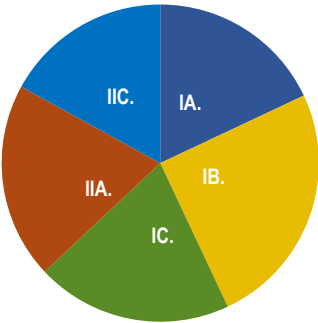
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Pennsylvania Grades 4–8 Subject Concentration: Mathematics (5158)

Test at a Glance

The *Praxis*® Pennsylvania Grades 4–8 Subject Concentration: Mathematics test is designed to measure knowledge and competencies that are important for safe and effective beginning practice as a grades 4–8 math specialist.

Test Name	Pennsylvania Grades 4–8 Subject Concentration: Mathematics		
Test Code	5158		
Time	2 hours		
Number of Questions	60		
Format	Selected-response Numeric Entry		
Calculator	An on-screen scientific calculator is provided.		
Test Delivery	Computer Delivered		
	Content Categories	Approximate Number of Questions	Approximate Percentage of Examination
	I. Arithmetic and Algebra A. Numbers and Operations B. Algebra C. Functions and Their Graphs	11 15 12	18% 25% 20%
	II. Geometry and Data A. Geometry and Measurement B. Probability, Statistics, and Discrete Math	12 10	20% 17%

About The Test

The test taker will be required to understand and work with mathematical concepts, to reason mathematically, to make conjectures, and to see patterns. Additionally, the test taker will be expected to solve problems by integrating knowledge from different areas of mathematics, to use various representations of concepts, to solve problems that have several solution paths, and to develop mathematical models and use them to solve real-world problems.

The test is not designed to be aligned with any particular school mathematics curriculum, but it is intended to be consistent with the recommendations of national studies on mathematics education such as the *Standards for the Preparation of Middle Level Mathematics Teachers* (2020), by the National Council of Teachers of Mathematics (NCTM) and the Council for the Accreditation of Educator Preparation (CAEP), and the Pennsylvania Core Mathematics Standards (2014).

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

On-Screen Scientific Calculator

An on-screen scientific calculator is provided for the computer-delivered test. Please consult the [Praxis Calculator Use web page](#) for further information.

You are expected to know how and when to use the scientific calculator since it will be helpful for some questions. You are expected to become familiar with its functionality before taking the test. To practice using the calculator, [request access to it](#). The calculator may be used to perform calculations, such as exponents, roots, and percents.

Using Your Calculator

Take time to [access the calculator and practice with it](#) so that you are comfortable using the calculator on the test.

There are only some questions on the test for which a calculator is helpful or necessary. First, decide how you will solve a problem, then determine if you need a calculator. For many questions, there is more than one way to solve the problem. Don't use the calculator if you don't need to; you may waste time.

Sometimes answer choices are rounded, so the answer that you get might not match the answer choices in the question. Since the answer choices are rounded, plugging the choices into the question might not produce an exact answer.

Don't round any intermediate calculations. For example, if the calculator produces a result for the first step of a solution, keep the result in the calculator and use it for the second step. If you round the result from the first step and the answer choices are close to each other, you might choose the incorrect answer.

Read the question carefully so that you know what you are being asked to do. Sometimes a result from the calculator is NOT the final answer. If an answer you get is not one of the choices in the question, it may be that you didn't answer the question being asked. Read the question again. It might also be that you rounded at an intermediate step in solving the problem.

Think about how you are going to answer the question before using the calculator. You may only need the calculator in the final step or two. Don't use it more than necessary.

Check the calculator modes (floating decimal versus scientific notation) to see that these are correct for the question being asked.

Make sure that you know how to perform the basic arithmetic operations and calculations (e.g., exponents, roots).

Content Topics

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

Note: The use of “e.g.” to start a list of examples implies that only a few examples are offered and the list is not exhaustive, whereas the use of “i.e.” to start a list of examples implies that the given list of examples is complete.

Discussion Questions

In this section, discussion questions provide examples of content that may be included in the questions you receive on testing day. They are open-ended questions or statements intended to help test your knowledge of fundamental concepts and your ability to apply those concepts to classroom or real-world situations. We do **not** provide answers for the discussion questions but thinking about the answers will help improve your understanding of fundamental concepts and may help you answer a broad range of questions on the test. Most of the questions require you to combine several pieces of knowledge to formulate an integrated understanding and response. They are written to help you gain increased understanding and facility with the test’s subject matter. You may want to discuss these questions with a teacher or mentor.

I. Arithmetic and Algebra

A. Numbers and Operations

1. Understands operations and properties of the real number system
 - a. solve problems using addition, subtraction, multiplication, and division of rational numbers
 - b. describe the effect that an operation has on a given number (e.g., adding a negative, dividing by a fraction)
 - c. apply the order of operations
 - d. identify or apply properties of operations on a number system (i.e., commutative, associative, distributive, identity, closure)
 - e. compare, classify, and order real numbers
 - f. perform operations involving exponents, including negative exponents
 - g. simplify and approximate radicals
 - h. use scientific notation to represent and compare numbers
2. Understands the relationships among fractions, decimals, and percents
 - a. convert among fractions, decimals, and percents
 - b. represent fractions, decimals, and percents using various models

3. Understands how to use ratios and proportional relationships to solve problems
 - a. use ratio language and notation to describe a relationship between two quantities
 - b. recognize and represent proportional and inversely proportional relationships between two quantities
 - c. use proportional relationships to solve problems (e.g., rates, scale factors, percents)
 4. Understands how to use basic concepts of number theory (e.g., divisibility, prime factorization, multiples) to solve problems
 - a. recognize characteristics of prime and composite numbers
 - b. recognize characteristics of odd and even numbers
 - c. solve problems involving factors, multiples, and divisibility
 5. Knows how to use estimation strategies to determine the reasonableness of results
 - a. use estimation to solve problems
 - b. estimate absolute and relative error in the numerical answer to a problem
- Can you describe the result when an expression is divided by a proper fraction, or multiplied by a negative number?
 - Do you know what the order of operations is?
 - Identify proper uses of the commutative, associative, distributive, and identity properties.
 - Can you give examples where you might use additive or multiplicative inverses?
 - Identify and determine additive and multiplicative inverses of numbers.
 - Can you explain the difference between a rational and an irrational number?
 - Be able to simplify expressions of the form $(3^2)(3^4)$, $\frac{x^3}{x^5}$, and $\frac{\sqrt{8}}{2}$.
 - Can you give other representations of $x^{\frac{2}{3}}$, $x^{\frac{5}{2}}$, and x^{-2} ?
 - Do you recall that $(x^3)^{-1} = (x)^{-3} = \frac{1}{x^3}$?
 - Can you describe real-life scenarios that are best modeled using expressions containing powers and roots?
 - Be able to recognize and use multiple representations of fractions, decimals, percents, and integers.
 - Can you give examples where different representations would be useful in developing deeper understanding of mathematical concepts?
 - Be able to convert from fractions to decimals, decimals to fractions, and fractions to percents.

Discussion questions: Numbers and Operations

- Be able to correctly solve problems involving the basic operations, including problems with fractions.
- Can you describe common mistakes students make when performing basic operations, including operations with fractions?

- Be able to place fractions and/or decimals in the proper order on the number line.
 - Can you describe the difference between a ratio and a rate?
 - Can you describe several real-world applications of proportional reasoning?
 - Use unit rates, scale factors, map legends, etc., to answer problems.
 - Can you use percents to answer problems involving tax, discounts, gratuities, commissions, etc.?
 - Can you calculate percent change and percent of percents?
 - Be able to express relationships in terms of ratios.
 - Use unit analysis to convert measurement units (e.g., miles per hour to feet per second).
 - Can you find prime factorizations, greatest common factors, and least common multiples?
 - Can you describe real-world contexts where these concepts might be used?
- d. use variables to construct and solve equations in real-world contexts
 - e. translate verbal relationships into algebraic expressions or equations
2. Understands how to recognize and represent linear relationships algebraically
 - a. determine the equation of a line
 - b. recognize and use the basic forms of linear equations
 - c. convert among various forms of linear equations (e.g., slope-intercept, point-slope, standard)
 3. Understands how to solve linear equations and inequalities
 - a. solve one-variable linear equations and inequalities algebraically
 - b. represent solutions to one-variable linear equations and inequalities on number lines and using set-builder notation
 4. Knows how to represent and solve nonlinear equations and inequalities
 - a. solve one-variable nonlinear equations and inequalities (e.g., absolute value, quadratic) algebraically
 - b. represent solutions to one-variable nonlinear equations and inequalities on number lines and using set-builder notation

B. Algebra

1. Understands how to evaluate and manipulate algebraic expressions, equations, and formulas
 - a. perform arithmetic operations on polynomials
 - b. manipulate and perform arithmetic operations on rational expressions
 - c. evaluate, manipulate, and compare algebraic expressions involving radicals and exponents, including negative exponents

5. Knows how to represent and solve systems of equations and inequalities
 - a. represent and solve systems of linear equations and inequalities with two variables algebraically
 - b. represent and solve systems of linear equations and inequalities with two variables graphically
6. Understands how to recognize and represent simple sequences or patterns (e.g., arithmetic, geometric)
 - a. evaluate, extend, or algebraically represent rules involving number patterns
 - b. describe or extend patterns involving shapes or figures

Discussion questions: Algebra

- Can you demonstrate the similarities between arithmetic operations with real numbers and the corresponding operations with algebraic (symbolic) representations?
- Can you explain how the “FOIL” method of multiplying two binomials is an example of the distributive property of multiplication over addition?
- Are you able to add, subtract, multiply, and divide polynomials?
- Can you add, subtract, multiply, and divide algebraic fractions such as $\frac{6-x}{5x-30}$ or $\frac{c^2+5c}{c^2+12c+35}$?
- Can you simplify $\frac{2b-3ab}{9a^2-4}$?
- Be able to translate verbal expressions and relationships into algebraic expressions and equations.
- Be able to solve linear and quadratic equations.
- Recognize and use the slope-intercept, point-slope, and standard forms of linear equations.
- Can you determine the equation of a line, given any two points on the line?
- Can you determine the equation of a line, given the slope of the line and one point on the line?
- Can you determine the equation of a line if you are given the x- and y-intercepts?
- Be able to solve linear equations for a given variable. For example, can you solve the equation $y = mx + b$ for x ?
- Can you solve quadratic equations and equations and inequalities containing absolute values of algebraic expressions?
- Can you identify quadratic equations that can be solved by factoring?
- Can you use the quadratic formula to solve quadratic equations?
- Can you solve equations such as $|2x + 4| = 12$ and $|2x - 5| = 3x + 4$?
- Can you solve inequalities, such as $|-3x + 4| > 15$, and graph their solutions?
- Can you graph the solution to an inequality in one variable on a number line?
- Can you describe what the graph of the solution of an inequality in two variables (in the xy -plane) looks like?
- Can you describe, in words, what it means to be the algebraic solution of a system of linear equations?

- Can you describe, in words, what it means to be the graphical solution of a system of linear equations?
- Be able to find the value of a term in a sequence or pattern.
- Be able to write an expression or equation that represents a sequence or pattern.
- Be able to extend patterns of shapes to solve problems.

C. Functions and Their Graphs

1. Understands how to identify, define, and evaluate functions
 - a. use function notation
 - b. determine whether a relation is a function
 - c. evaluate functions for given values (algebraically, graphically, tabular)
2. Knows how to determine and interpret the domain and the range of functions represented numerically, graphically, or algebraically
 - a. determine the domain and range of a given table of values
 - b. determine the domain and range from a given graph of a function
 - c. determine the domain and range of a given function that is represented algebraically
 - d. interpret domain and range in real-world settings
3. Understands basic characteristics of linear functions (e.g., slope, intercepts)
 - a. determine the slope of a given linear function
 - b. interpret slope as a constant rate of change
 - c. determine the x- and y-intercepts of a given linear function
 - d. interpret the x- and y-intercepts of a given linear function
4. Understands the relationships among functions, tables and graphs
 - a. determine and interpret the x- and y-intercepts of a nonlinear function
 - b. given a graph (e.g., linear, quadratic, absolute value, simple exponential), determine an equation that best represents the graph
 - c. determine the graphical properties and sketch a graph given an equation of a linear, quadratic, absolute value, or simple exponential function
5. Knows how to analyze and represent functions that model given information
 - a. develop a model (e.g., graph, equation, table) of a given set of conditions
 - b. evaluate whether a particular mathematical model (e.g., graph, equation, table) can be used to describe a given set of conditions
 - c. interpret a particular mathematical model (e.g., graph, equation, table)

Discussion Questions: Functions and Their Graphs

- Can you give an algebraic definition of a function?
- Can you decide if a given set of conditions determines a function?
- Can you explain why $\{(1,2), (2,0), (-1,-2), (1,3)\}$ is not a function, but $\{(1,-1), (2,-2), (3,5), (4,10), (5,12)\}$ is a function?
- Be able to identify the graph of a function by performing the vertical line test.
- Can you explain why $y = x^2$ is the graph of a function of x , while $x = y^2$ is not the graph of a function of x ?
- Be able to evaluate functions represented in algebraic, graphical, or tabular form for given values in their domains.
- Be able to find the domain (x -values) and range (y -values) of a function.
- Be able to find the slope and intercepts of a linear equation and interpret the slope and intercepts in the context of a real-world problem.
- When given a linear, quadratic, or exponential equation, be able to describe some important characteristics of the graph of the equation (e.g., x - and y -intercepts).
- Given the graph of a line, a parabola, a step function, an absolute value function, or an exponential function, be able to select the equation that best represents the graph.
- Can you identify a graph, equation (e.g., linear, quadratic, exponential), or table that matches a given description of a function?
- Given a quadratic equation of the form $y = ax^2 + bx + c$, can you describe the shape of the graph of the equation? Can you explain what characteristic of the graph is determined by whether the coefficient a is positive or negative?
- Can you describe and sketch the graph of the function $y = |x|$?
- Can you identify the intervals of increase and decrease of a function?
- Can you identify the axis of symmetry of the graph of a quadratic function?
- Can you identify the roots of a quadratic equation from its graph?
- Given one representation (algebraic, numeric, geometric, or verbal) of a situation, be able to provide other representations or models of the situation.
- Can you describe a situation that is best modeled by a linear equation? By a quadratic equation? By an exponential equation?

II. Geometry and Data

A. Geometry and Measurement

1. Understands how to solve problems involving perimeter and area of plane figures
 - a. calculate and interpret perimeter and area of geometric shapes
 - b. calculate changes in perimeter and area as the dimensions of geometric shapes change
 - c. use correct units of measurement in problems involving perimeter and area
2. Knows how to solve problems involving surface area and volume of solids
 - a. calculate and interpret surface area and volume of geometric shapes
 - b. calculate changes in surface area and volume as the dimensions of a solid change
 - c. use correct units of measurement in problems involving surface area and volume
 - d. use two-dimensional representations of three-dimensional objects to visualize and solve problems
3. Understands the concepts of similarity and congruence
 - a. determine whether two figures are similar or congruent
 - b. use similarity and congruence to solve problems with two-dimensional and three-dimensional figures
 - c. use proper notation when solving problems involving similarity and congruence
4. Knows the properties of lines (e.g., parallel, perpendicular, intersecting) and angles
 - a. solve problems involving parallel, perpendicular, intersecting, and skew lines
 - b. apply angle relationships (e.g., vertical, supplementary, alternate interior) to solve problems
 - c. use proper notation when solving problems involving lines and angles
5. Understands properties of triangles
 - a. solve problems involving sides (e.g., Pythagorean theorem) and angles
 - b. recognize characteristics of special triangles (e.g., isosceles, right, 30-60-90)
6. Knows properties of quadrilaterals (e.g., rectangle, rhombus, trapezoid) and other polygons
 - a. identify geometric properties of various quadrilaterals and the relationships among them (e.g., parallelogram, trapezoid)
 - b. solve problems involving sides, angles, or diagonals of polygons
7. Understands properties of circles
 - a. solve problems involving circumference and area of a circle
 - b. solve problems involving diameter and radius of a circle
 - c. solve basic problems involving central angles, arcs, chords, and sectors

8. Knows how to interpret geometric relationships in the xy -plane (e.g., transformations, distance, midpoint)
 - a. identify the characteristics of ordered pairs located in quadrants and on the axes of the coordinate plane
 - b. use coordinate geometry to represent and identify the properties of geometric shapes (e.g., Pythagorean theorem, area of a rectangle)
 - c. determine the distance between two points
 - d. determine the midpoint of a line segment given its endpoints
 - e. interpret and solve problems involving transformations (i.e., translations, reflections, rotations, dilations)
9. Understands systems of measurement (e.g., metric, customary)
 - a. solve measurement and estimation problems involving time, length, temperature, volume, and mass in both United States customary and metric systems
 - b. convert units within the United States customary system or the metric system
 - c. convert units between the United States customary and metric systems
10. Is familiar with how geometric constructions are made
 - a. identify formal geometric constructions made with a variety of tools and methods (e.g., copying a segment, bisecting an angle, constructing parallel and perpendicular lines)
11. Is familiar with the basic concepts of right triangle trigonometry
 - a. use trigonometric ratios in right triangles to solve problems

Discussion questions: Geometry and Measurement

- Be able to compute and apply basic formulas for deriving perimeter and area for various figures.
- Can you find the area of a square when its perimeter is given?
- Can you describe real-life applications that involve finding perimeter or area?
- Be able to compute and apply basic formulas for volume and surface area of various figures.
- Can you describe real-life applications that involve finding surface area or volume?
- Can you use the fact that the lengths of corresponding sides of similar polygons are proportional to solve problems involving missing measurements?
- Be able to identify congruent triangles using the triangle congruence theorems and postulates, such as Side-Angle-Angle or Side-Angle-Side.

- Do you recall the relationships between the ratio of corresponding sides of similar figures and the corresponding ratios of perimeters, areas, and volumes of the similar figures?
- Be able to identify congruent and supplementary angles given two parallel lines and a transversal.
- Do you recall the different types of triangles, such as isosceles, equilateral, scalene, acute, right, and obtuse?
- Be able to find missing lengths of sides or measures of angles in triangles.
- Can you find the length of a side of a right triangle when the other two sides are given?
- Do you recall the triangle inequality?
- Do you know how to find the medians, angle bisectors, and altitudes of a triangle?
- Be able to identify and use special characteristics of the square, rectangle, rhombus, parallelogram, and trapezoid to solve problems involving lengths of sides and measures of angles.
- Be able to recognize distinctions among the different types of quadrilaterals.
- Be able to find missing angle measures or side lengths in polygons with more than four sides.
- Be able to find the measures of interior and exterior angles of regular polygons.
- Be able to compute and apply basic formulas for finding circumference, area, diameter, or radius of a circle.
- Do you recall the relationship between the central angle of a sector, the length of the sector's arc, and the circumference of the circle?
- Do you recall the relationship between the central angle of a sector, the area of the sector, and the area of the circle?
- Be able to find the distance between any two points in the xy -plane.
- Be able to find the coordinates of the midpoint of a line segment.
- Be able to reflect, rotate, translate, and dilate figures in the xy -plane.
- Be able to identify images of points that have been reflected, rotated, and/or translated in the xy -plane.
- Be able to solve measurement problems in context.
- Use provided conversion factors and/or formulas to solve measurement problems.
- Can you convert centimeters to meters, inches to feet, and hours to seconds?
- Can you construct a flow chart of the steps in a geometric construction?
- Can you justify why a particular construction produces the desired results?
- Can you use right triangle trigonometry to find measures of angles and lengths of sides of right triangles?

B. Probability, Statistics, and Discrete Math

1. Understands how to interpret, analyze, and represent data presented in a variety of displays
 - a. analyze and interpret various displays of data (e.g., box plots, histograms, scatterplots, stem-and-leaf plots)
 - b. draw conclusions based on graphical displays (e.g., misleading representation of data, line of best fit, interpolation)
 - c. choose appropriate graphs based on data (e.g., represent data accurately, choose correct types of graphs)
2. Knows how to develop, use, and evaluate probability models
 - a. use counting techniques (e.g., the counting principle, permutations, combinations) to answer questions involving a finite sample space
 - b. solve probability problems involving independent and dependent events
 - c. use geometric probability to solve problems
3. Understands concepts associated with measures of central tendency and dispersion (spread)
 - a. solve for the mean and weighted average of given sets of data
 - b. determine and interpret mean, median, and mode in a variety of problems
 - c. determine and interpret common features of sets of data (e.g., range, outliers)
 - d. choose appropriate measures of central tendency to represent given sets of data
 - e. recognize standard deviations on the normal curve
4. Is familiar with how to use visual representations to model and solve problems
 - a. use and interpret simple diagrams (e.g., Venn diagrams, flowcharts) to solve problems
5. Is familiar with logical reasoning and proofs
 - a. evaluate the truth of conditional relationships expressed as if-then statements
 - b. use if-then statements to construct simple valid arguments
 - c. draw inductive and deductive conclusions within mathematical contexts
 - d. complete simple algebraic and geometric proofs
 - e. identify errors in simple algebraic and geometric proofs

Discussion questions: Probability, Statistics, and Discrete Math

- Can you decide which form of data representation is appropriate for different purposes and explain why the choice is appropriate?
- Be able to understand and present data in various forms, including tables, charts, histograms, line graphs, bar graphs, double bar graphs, double line graphs, circle graphs, scatterplots, stem-and-leaf plots, line plots, and box plots.
- Be able to use interpolation and extrapolation to make predictions based on real-world data.
- Be able to compare distributions from two populations.
- Be able to solve problems by actually counting individual outcomes or by using counting techniques.
- Can you identify all possible outcomes from tossing a pair of number cubes?
- Can you describe two problems that can be solved using counting methods: one in which order is important (permutations) and one in which it is not (combinations)?
- Be able to construct or interpret a tree diagram that models a sample space.
- Be able to solve probability problems involving independent and dependent events.
- Be able to find and interpret common measures of central tendency, including arithmetic mean, weighted mean, median, and mode.
- Be able to know which measure of central tendency is most meaningful to use in a given situation.
- Be able to find and interpret common measures of dispersion such as range, interquartile range, and outliers.
- Be able to use Venn diagrams to answer problems.
- Do you recall how to form the contrapositive of an if-then statement?
- Can you recognize examples of deductive reasoning and examples of inductive reasoning?

Pennsylvania Grades 4–8 Subject Concentration: Mathematics (5158) Sample Test Questions

Sample Questions

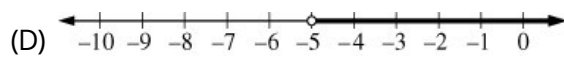
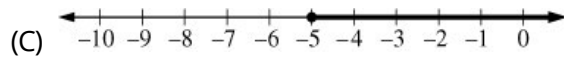
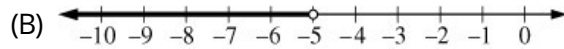
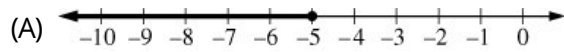
The sample questions that follow illustrate the kinds of questions on the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with explanations follow the questions.

Directions: The test consists of a variety of selected-response questions, where you select one or more answer choices, and questions where you enter a numeric answer in a box.

1. Which of the following sets of numbers must be included with the set of whole numbers $\{0, 1, 2, 3, \dots\}$ to achieve closure under subtraction?
 - (A) The set of negative integers
 - (B) The set of negative rational numbers
 - (C) The set of positive integers
 - (D) The set of positive rational numbers
2. The average number of passengers who use a certain airport each year is 350 thousand. A newspaper mistakenly reported the number as 350 million. The number reported in the newspaper was how many times as large as the actual number?
 - (A) 10
 - (B) 100
 - (C) 1,000
 - (D) 10,000
3. Ernesto bought 2 sport coats for \$88.95 each. One of the coats needed alterations that cost \$15.50. If a 6% sales tax is applied to the cost of the coats but not to the alterations, which of the following is closest to the total cost for the sport coats and the alterations?
 - (A) \$190
 - (B) \$200
 - (C) \$205
 - (D) \$215

$$-4x + 1 \geq 21$$

4. Which of the following represents the solution set for the inequality shown?

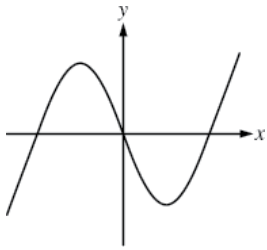


5. What is the units of 3^{43} ?

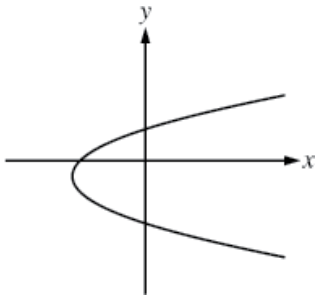
- (A) 1
- (B) 3
- (C) 7
- (D) 9

6. Which of the following graphs in the xy -plane represents the graph of a function?

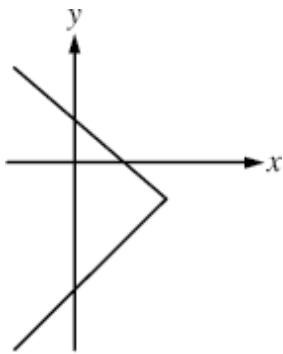
(A)



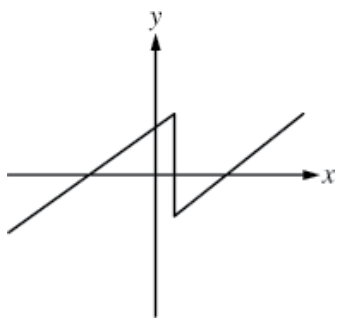
(B)



(C)



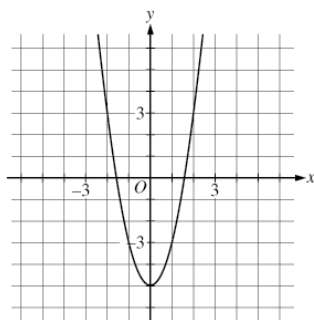
(D)



For the following question, enter your answer in the answer boxes.

7. The graph of linear function f passes through the points $(-3, 11)$ and $(7, -4)$. What is the slope of the graph of f ?

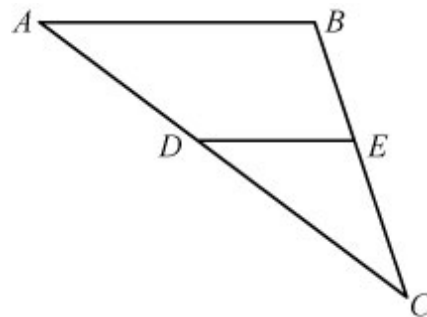
Give your answer as a fraction.



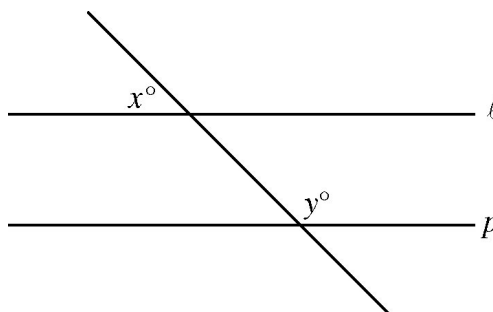
8. The figure shows the graph of a quadratic equation in the xy -plane. Which of the following is an equation of the graph?
- (A) $y = x^2 - 5$
(B) $y = x^2 + 5$
(C) $y = 2x^2 - 5$
(D) $y = 2x^2 + 5$

x	y
-4	-2
-3	$-\frac{3}{2}$
-2	-1
-1	$-\frac{1}{2}$
0	0

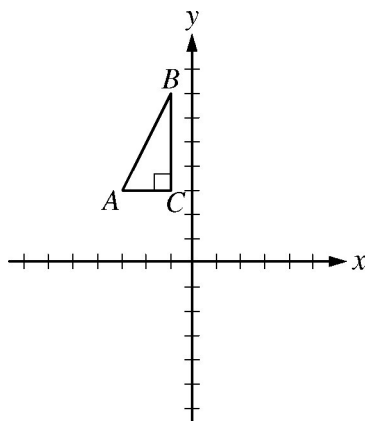
9. Which of the following is true about the data in the table shown?
- (A) As x decreases, y increases.
 - (B) As x increases, y does not change.
 - (C) As x increases, y decreases.
 - (D) As x increases, y increases.
10. On a map, $\frac{1}{2}$ inch corresponds to an actual distance of 5 miles. If a rectangular region on the map measures $1\frac{1}{2}$ inches by 4 inches, how many square miles of actual area does this region represent?
- (A) 450 square miles
 - (B) 500 square miles
 - (C) 550 square miles
 - (D) 600 square miles



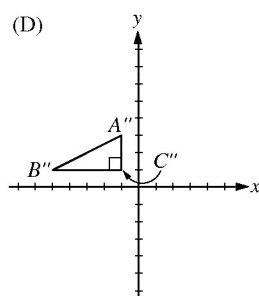
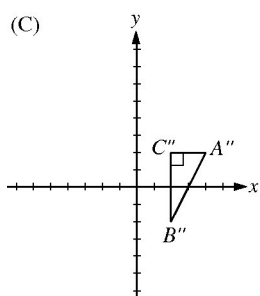
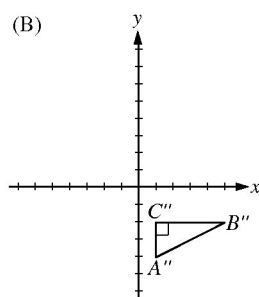
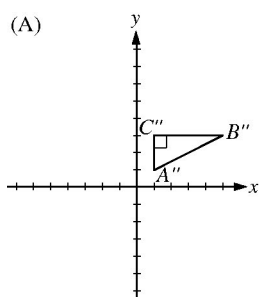
11. In triangle ABC shown, $\angle A = 21^\circ$, $AD = 15$, $DE = 12$, and \overline{AB} is parallel to \overline{DE} . What is the value of AC ?
- (A) 20.0
 (B) 23.6
 (C) 31.8
 (D) 35.0



12. In the figure shown, line ℓ and line p are parallel, and $y = 3x$. What is the value of x ?
- (A) 30
 (B) 45
 (C) 60
 (D) 75

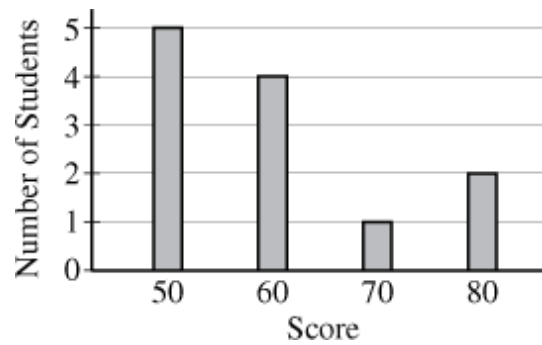


13. Which of the following figures results if right triangle ABC , shown in the preceding figure, is reflected across the y -axis and then rotated clockwise about point C' by 90 degrees?



14. If a student takes a test consisting of 20 true-false questions and randomly guesses at all of the answers, what is the probability that all 20 guesses will be correct?

- (A) $\left(\frac{1}{2}\right)^{20}$
 (B) $\frac{1}{2(20)}$
 (C) $\frac{1}{20}$
 (D) $\frac{1}{2}$



15. Twelve students took a quiz in a certain science class. The graph shows the quiz scores and the number of students that received each score. What is the average (arithmetic mean) of the 12 scores?
- (A) 55
(B) 57
(C) 60
(D) 65

Answers

1. Option (A) is correct. To achieve closure under subtraction, when two numbers in a set are subtracted, the difference must also be a number in the set. If two integers x and y are subtracted, the answer is a positive integer when $x > y$, a negative integer when $x < y$, and 0 when $x = y$. The set of whole numbers is made up of the positive integers and 0, so the negative integers are needed to achieve closure under subtraction.

2. Option (C) is correct. The number of passengers who use the airport each year, 350 thousand, can be written as 350,000, and 350 million can be written as 350,000,000. Since $350,000,000 \div 350,000 = 1,000$, the number reported in the newspaper was 1,000 times the actual number.

3. Option (C) is correct. Based on the information in the question, calculate the total cost: $(\$88.95)(2)(1.06) + \$15.50 = \$204.07$. The choice that is closest to the total cost is \$205.

4. Option (A) is correct. To determine which choice represents the solution set for the inequality, subtract 1 from each side of the inequality and then divide each side of the inequality by -4 . Remember that when multiplying or dividing both sides of an inequality by a negative number, the direction of the inequality symbol needs to be reversed. Thus, the equivalent inequality is $x \leq -5$. The choice that represents the set of all real numbers less than or equal to -5 is option (A).

5. Option (C) is correct. In order to solve this problem, the sequence of powers 3^n in relation to the exponent n needs to be examined.

n	3^n	Units Digit
0	1	1
1	3	3
2	9	9
3	27	7
4	81	1
5	243	3
6	729	9
7	2,187	7
8	6,561	1

Note that the units digit of 3^4 is 1, which is equal to the units digit of 3^0 , and then the sequence of units digits repeats itself in sets of four, with the following pattern (where k is some positive integer):

- If n is of the form $n = 4k$, the units digit of 3^n is 1.
- If n is of the form $n = 4k + 1$, the units digit of 3^n is 3.
- If n is of the form $n = 4k + 2$, the units digit of 3^n is 9.
- If n is of the form $n = 4k + 3$, the units digit of 3^n is 7.

In the problem, the value of the exponent is 43, and since $43 = 4 \times 10 + 3$, the units digit of 3^{43} is the same as the units digit of 3^3 , which is 7.

6. Option (A) is correct. The vertical line test can be used to see whether a graph in the xy -plane represents the graph of a function. The test consists of taking a vertical line and moving it across the graph in the xy -plane. If the vertical line touches the graph at only one point across the entire graph, then that graph is the graph of a function. As you move left to right over the graph in choice option (A), a vertical line would only contact the graph at a single point across the entire graph; thus it is the graph of a function. As you move left to right over the graph in option (B), a vertical line would touch at two points over most of the graph; hence it is not a function. Option (C) is not a function for the same reason that option (B) is not a function. Option (D) is not a function because of the vertical part of the graph to the right of the y -axis.

7. The correct answer is $-\frac{3}{2}$. The slope of a linear function can be found by substituting into the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$, where m is the slope and (x_1, y_1) and (x_2, y_2) are two points on the linear function. Substituting the given points into the formula gives $m = \frac{-4 - 11}{7 - (-3)} = \frac{-15}{10} = -\frac{3}{2}$.

Please note that the negative sign can be entered in either box, and you do not need to simplify the fraction to receive credit for the correct answer.

8. Option (C) is correct. Since the graph of the equation intersects the y -axis at the point $(0, -5)$, the constant term in the equation must be -5 . One method to determine the coefficient of the x^2 term is to substitute the coordinates from another point on the graph into the equation $y = ax^2 - 5$ and solve for a . Then, using the point $(2, 3)$, it can be determined that $3 = a(2^2) - 5$, so $4a - 5 = 3$. To solve this equation for a , add 5 to both sides of the equation, and then divide both sides of the equation by 4, which leads to the answer $a = 2$, which means that the equation of the graph is $y = 2x^2 - 5$.

9. Option (D) is correct. As x moves from -4 to 0 (that is, from left to right on the number line), its value increases. Similarly, the value of y increases from -2 to 0 . Thus, it can be seen that as x increases, y increases.

10. Option (D) is correct. It is given that $\frac{1}{2}$ inch on the map corresponds to an actual distance of 5 miles, so 1 inch on the map represents an actual distance of 10 miles. Thus, $1\frac{1}{2}$ inches on the map represents an actual distance of $1\frac{1}{2} \times 10 = 15$ miles, and 4 inches on the map represents an actual distance of $4 \times 10 = 40$ miles. Thus, a rectangular region on the map measuring $1\frac{1}{2}$ inches by 4 inches represents an actual rectangular region measuring 15 miles by 40 miles. To find the actual area, in square miles, multiply the two dimensions, 15 miles and 40 miles. The actual area is 600 square miles.

11. Option (D) is correct. Since \overline{AB} is parallel to \overline{DE} , triangle ABC is similar to triangle DEC , which means the ratios of the lengths of corresponding sides of the two triangles are equal. Since $AC = AD + DC$ and the lengths of \overline{AB} , \overline{AD} , and \overline{DE} are given, the proportion $\frac{AC}{DC} = \frac{AB}{DE}$ can first be used to find the value of DC , which can then be used to find the value of AC . Substituting into the proportion gives $\frac{15 + DC}{DC} = \frac{21}{12}$. Therefore, $12(15 + DC) = 21DC \Rightarrow 180 + 12DC = 21DC \Rightarrow 180 = 9DC \Rightarrow DC = 20$. Then, since $AC = AD + DC$, it can be determined that $AC = 35$.

12. Option (B) is correct. The properties of angles associated with parallel and transversal lines can be used to show that the angle with measure x degrees and the angle with measure y degrees are supplementary angles. Recall that the sum of the measures of supplementary angles is 180° . That is, $x + y = 180$. It is given that $y = 3x$. Substituting for y , you get $4x = 180$. Hence, $x = 45$.

13. Option (A) is correct. When triangle ABC is reflected across the y -axis, the figure formed is located in quadrant I and is the mirror image of the given figure. Rotating the triangle 90 degrees clockwise about vertex C' yields the figure in option (A).

14. Option (A) is correct. The probability that the student guesses any one answer correctly is $\frac{1}{2}$, and since the student is randomly guessing, the guesses are independent events, so $\frac{1}{2}$ needs to be multiplied by itself 20 times. Thus, the probability of guessing all 20 answers correctly is $\left(\frac{1}{2}\right)^{20}$.

15. Option (C) is correct. Based on the information in the graph, the average of the 12 scores is $\frac{(5)(50)+(4)(60)+(1)(70)+(2)(80)}{12} = \frac{720}{12} = 60$.

Understanding Question Types

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

Understanding Selected-Response and Numeric-Entry Questions

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

However, interactive question types may also ask you to respond doing the following:

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

Remember that with every question, you will get clear instructions.

Understanding Constructed-Response Questions

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

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

Following are a few sample essay topics to review:

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

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

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

General Assistance For The Test

***Praxis*® Interactive Practice Test**

This full-length *Praxis*® practice test lets you practice answering one set of authentic test questions in an environment that simulates the computer-delivered test.

- Timed just like the real test
- Correct answers with detailed explanations
- Practice test results for each content category

ETS provides a free interactive practice test with each test registration. You can learn more [here](#).

Doing Your Best

Strategy and Success Tips

Effective *Praxis* test preparation doesn't just happen. You'll want to set clear goals and deadlines for yourself along the way. Learn from the experts. Get practical tips to help you navigate your *Praxis* test and make the best use of your time. Learn more at [Strategy and Tips for Taking a *Praxis* Test](#).

Develop Your Study Plan

Planning your study time is important to help ensure that you review all content areas covered on the test. View a sample plan and learn how to create your own. Learn more at [Develop a Study Plan](#).

Helpful Links

[Ready to Register](#) – How to register and the information you need to know to do so.

[Disability Accommodations](#) – Testing accommodations are available for test takers who meet ETS requirements.

[PLNE Accommodations \(ESL\)](#) – If English is not your primary language, you may be eligible for extended testing time.

[What To Expect on Test Day](#) – Knowing what to expect on test day can make you feel more at ease.

[Getting Your Scores](#) – Find out where and when you will receive your test scores.

[State Requirements](#) – Learn which tests your state requires you to take.

[Other Praxis Tests](#) – Learn about other *Praxis* tests and how to prepare for them.

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