

MATHEMATICS GRADE 10

Administered Spring 2004

Test by Objectives

Mathematics Chart

LENGTH

Metric

1 kilometer = 1000 meters

1 meter = 100 centimeters

1 centimeter = 10 millimeters

Customary

1 mile = 1760 yards

1 mile = 5280 feet

1 yard = 3 feet

1 foot = 12 inches

CAPACITY AND VOLUME

Metric

1 liter = 1000 milliliters

Customary

1 gallon = 4 quarts

1 gallon = 128 ounces

1 quart = 2 pints

1 pint = 2 cups

1 cup = 8 ounces

MASS AND WEIGHT

Metric

1 kilogram = 1000 grams

1 gram = 1000 milligrams

Customary

1 ton = 2000 pounds

1 pound = 16 ounces

TIME

1 year = 365 days

1 year = 12 months

1 year = 52 weeks

1 week = 7 days

1 day = 24 hours

1 hour = 60 minutes

1 minute = 60 seconds

Mathematics Chart

Perimeter	rectangle	$P = 2l + 2w$ or $P = 2(l + w)$
Circumference	circle	$C = 2\pi r$ or $C = \pi d$
Area	rectangle	$A = lw$ or $A = bh$
	triangle	$A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$
	trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$ or $A = \frac{(b_1 + b_2)h}{2}$
	circle	$A = \pi r^2$
Surface Area	cube	$S = 6s^2$
	cylinder (lateral)	$S = 2\pi rh$
	cylinder (total)	$S = 2\pi rh + 2\pi r^2$ or $S = 2\pi r(h + r)$
	cone (lateral)	$S = \pi rl$
	cone (total)	$S = \pi rl + \pi r^2$ or $S = \pi r(l + r)$
	sphere	$S = 4\pi r^2$
Volume	prism or cylinder	$V = Bh^*$
	pyramid or cone	$V = \frac{1}{3}Bh^*$
	sphere	$V = \frac{4}{3}\pi r^3$
<i>*B represents the area of the Base of a solid figure.</i>		
Pi	π	$\pi \approx 3.14$ or $\pi \approx \frac{22}{7}$
Pythagorean Theorem		$a^2 + b^2 = c^2$
Distance Formula		$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Slope of a Line		$m = \frac{y_2 - y_1}{x_2 - x_1}$
Midpoint Formula		$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$
Quadratic Formula		$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Slope-Intercept Form of an Equation		$y = mx + b$
Point-Slope Form of an Equation		$y - y_1 = m(x - x_1)$
Standard Form of an Equation		$Ax + By = C$
Simple Interest Formula		$I = prt$

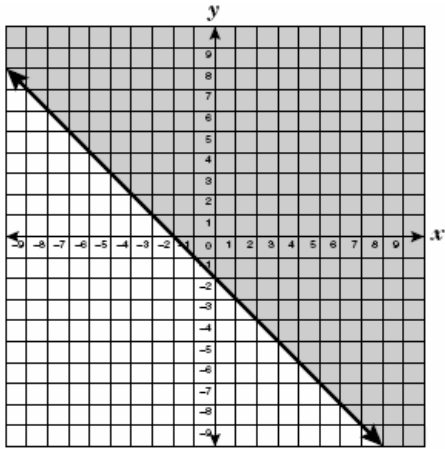
Grade 10

Objective 1: The student will describe functional relationships in a variety of ways.

A(b)(1) **Foundations for functions.** The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways.

(D) The student represents relationships among quantities using [concrete] models, tables, graphs, diagrams, verbal descriptions, equations, and inequalities.

20 Which inequality best describes the graph shown below?



- F $y \geq -2x$
- G $y \geq -x - 2$
- H $y \geq -2x - 2$
- J $y \geq x - 2$

Objective 1: The student will describe functional relationships in a variety of ways.

A(b)(1) **Foundations for functions.** The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways.

(A) The student describes independent and dependent quantities in functional relationships.

23 The volume of a rectangular prism is given by the function $V = lwh$. Which statement is true?

- A The volume of the prism depends on the product of only the length and the width.
- B The volume of the prism depends on the product of only the length and the height.
- C The volume of the prism depends on the product of the length, the width, and the height.
- D The volume of the prism depends on the product of only the width and the height.

Grade 10

Objective 1: The student will describe functional relationships in a variety of ways.

A(b)(1) **Foundations for functions.** The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways.

(B) The student [gathers and records data, or] uses data sets, to determine functional (systematic) relationships between quantities.

35 Troy borrowed money from his father so that he could buy a used car. The table shows the remaining balance, b , of Troy's loan after each payment.

Troy's Loan Balance

Number of Payments, p	Loan Balance, b
1	\$3910
2	\$3685
3	\$3460
4	\$3235
5	\$3010
6	\$2785

Which function can be used to describe this relationship?

- A $b = 3910 + 225p$
- B $b = 4135 - 225p$
- C $b = 2785 + 225p$
- D $b = 3685 - 225p$

Grade 10

Objective 1: The student will describe functional relationships in a variety of ways.

A(b)(1) **Foundations for functions.** The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways.

(C) The student describes functional relationships for given problem situations and writes equations or inequalities to answer questions arising from the situations.

49 A candy company sells chocolate-covered cherries in a box. The empty box weighs 4.2 ounces. Each piece of candy weighs at least 1.8 ounces. Which inequality best describes the total weight in ounces, w , of a box of chocolate-covered cherries in terms of c , the number of candies in the box?

A $w \geq 1.8c + 4.2$

B $w \geq 1.8c - 4.2$

C $w \geq 4.2c + 1.8$

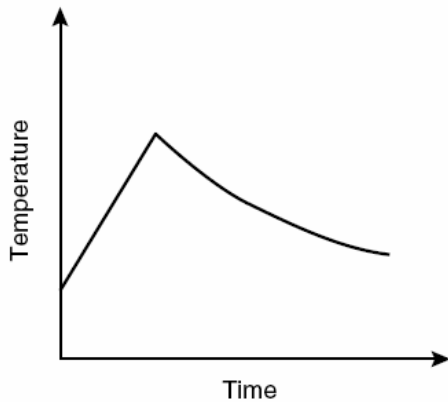
D $w \geq 4.2c - 1.8$

Objective 1: The student will describe functional relationships in a variety of ways.

A(b)(1) **Foundations for functions.** The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways.

(E) The student interprets and makes inferences from functional relationships.

51 The graph below best represents which of the following relationships between temperature and time?



- A Oven temperature while a cake is baking
- B Temperature of water that is heated on a stove, removed, and then allowed to cool
- C Temperature of a container of hot tea after placing several cubes of ice in it
- D Room temperature of a gym after the air conditioner is turned on

Grade 10

Objective 2: The student will demonstrate an understanding of the properties and attributes of functions.

A(b)(4) **Foundations for functions.** The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations.

(B) The student uses the commutative, associative, and distributive properties to simplify algebraic expressions.

1 Simplify the algebraic expression $5(x + 3)(x + 2) - 3(x^2 + 2x + 1)$.

- A $2x^2 + 7$
- B $2x^2 + 27$
- C $2x^2 + 7x + 7$
- D $2x^2 + 19x + 27$

Objective 2: The student will demonstrate an understanding of the properties and attributes of functions.

A(b)(3) **Foundations for functions.** The student understands how algebra can be used to express generalizations and recognizes and uses the power of symbols to represent situations.

(B) Given situations, the student looks for patterns and represents generalizations algebraically.

4 Which expression can be used to find the values of $s(n)$ in the table below?

n	1	2	3	4	5	6
$s(n)$	5	8	11	14	?	?

- F $3n$
- G $5n$
- H $n + 4$
- J $3n + 2$

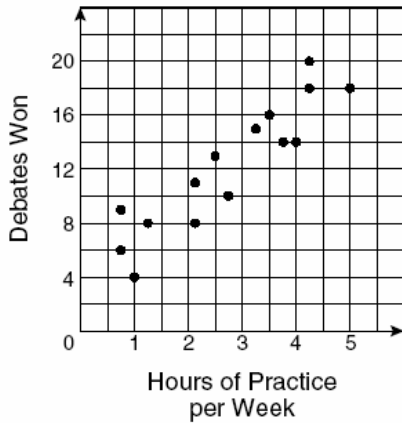
Grade 10

Objective 2: The student will demonstrate an understanding of the properties and attributes of functions.

A(b)(2) **Foundations for functions.** The student uses the properties and attributes of functions.

(D) In solving problems, the student [collects and] organizes data, [makes and] interprets scatterplots, and models, predicts, and makes decisions and critical judgments.

12 The coaches of a group of debate teams answered a survey about hours of debate team practice and number of team wins. The graph shows the results of this survey.



Based on these results, if a team practices 4 hours per week next season, which is the best estimate of the number of debates the team can expect to win?

- F** 1
- G** 12
- H** 16
- J** 20

Grade 10

Objective 2: The student will demonstrate an understanding of the properties and attributes of functions.

A(b)(4) **Foundations for functions.** The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations.

(B) The student uses the commutative, associative, and distributive properties to simplify algebraic expressions.

25 Which expression is equivalent to $5(x^2 - 4x) - (x + 1)$?

- A $5x^2 - 21x + 1$
- B $5x^2 - 5x - 1$
- C $5x^2 - 21x - 1$
- D $5x^2 - 5x + 1$

Objective 2: The student will demonstrate an understanding of the properties and attributes of functions.

A(b)(3) **Foundations for functions.** The student understands how algebra can be used to express generalizations and recognizes and uses the power of symbols to represent situations.

(A) The student uses symbols to represent unknowns and variables.

32 Mrs. Franklin received a 7% raise at her job. If she was earning x dollars per year before, how much is she earning now?

- F $x + 7$
- G $x + 0.07$
- H $x + 0.7x$
- J $x + 0.07x$

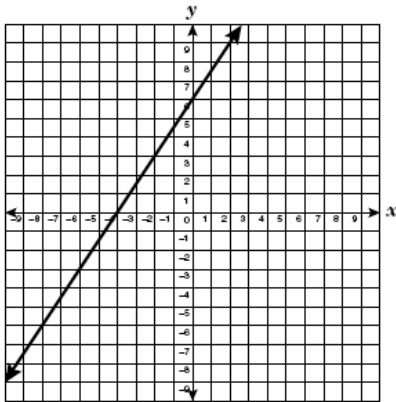
Grade 10

Objective 3: The student will demonstrate an understanding of linear functions.

A(c)(2) **Linear functions.** The student understands the meaning of the slope and intercepts of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations.

(E) The student determines the intercepts of linear functions from graphs, tables, and algebraic representations.

6 Which coordinate points represent the x - and y -intercepts of the graph shown below?



- F $(0, -4)$ and $(6, 0)$
- G $(-4, 0)$ and $(0, 6)$
- H $(6, 0)$ and $(-4, 0)$
- J $(0, 6)$ and $(0, -4)$

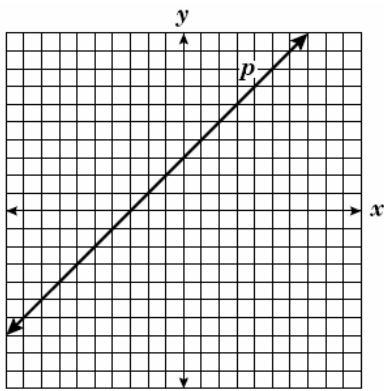
Grade 10

Objective 3: The student will demonstrate an understanding of linear functions.

A(c)(2) **Linear functions.** The student understands the meaning of the slope and intercepts of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations.

(C) The student investigates, describes, and predicts the effects of changes in m and b on the graph of $y=mx + b$.

8 What will happen to the slope of line p if the line is shifted so that the y -intercept increases and the x -intercept remains the same?



- F The slope will change from positive to negative.
- G The slope will change from negative to positive.
- H The slope will increase.
- J The slope will decrease.

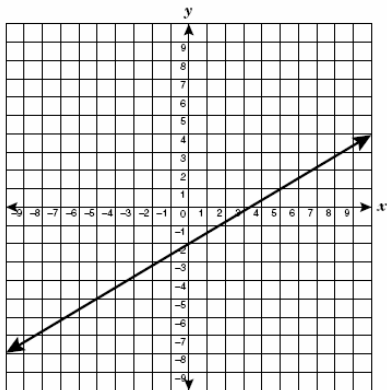
Grade 10

Objective 3: The student will demonstrate an understanding of linear functions.

A(c)(2) **Linear functions.** The student understands the meaning of the slope and intercepts of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations.

(A) The student develops the concept of slope as rate of change and determines slopes from graphs, tables, and algebraic representations.

26 What is the rate of change of the graph below?



- F** 3.5
- G** 1.67
- H** 0.6
- J** -1.67

Grade 10

Objective 3: The student will demonstrate an understanding of linear functions.

A(c)(2) **Linear functions.** The student understands the meaning of the slope and intercepts of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations.

(D) The student graphs and writes equations of lines given characteristics such as two points, a point and a slope, or a slope and -intercept.

44 Which equation describes the line that passes through the point (4, 7) and is parallel to the line represented by the equation $-3x + y = 4$?

F $y = -3x + 19$

G $y = 3x - 5$

H $y = \frac{1}{3}x + 5\frac{2}{3}$

J $y = -\frac{1}{3}x + 8\frac{1}{3}$

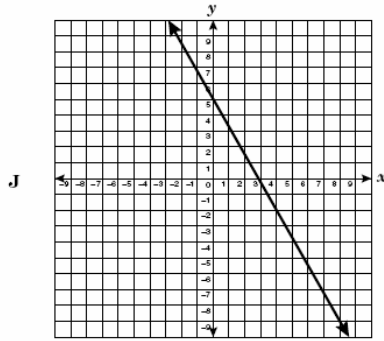
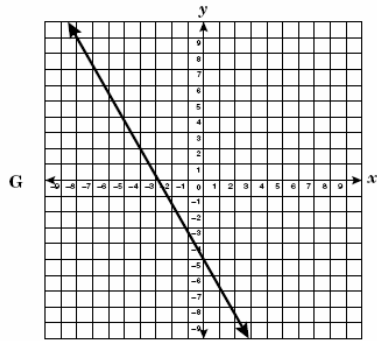
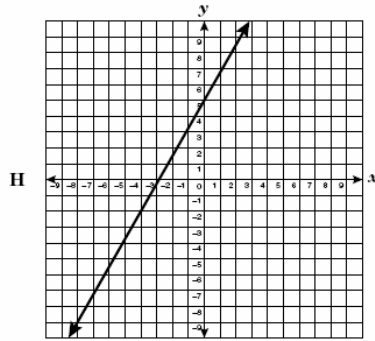
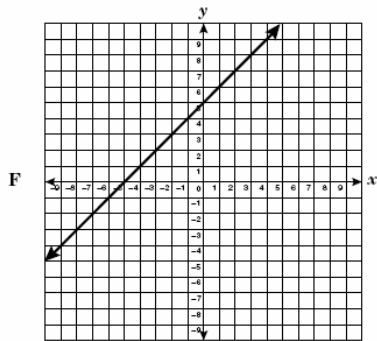
Grade 10

Objective 3: The student will demonstrate an understanding of linear functions.

A(c)(1) **Linear functions.** The student understands that linear functions can be represented in different ways and translates among their various representations.

(C) The student translates among and uses algebraic, tabular, graphical, or verbal descriptions of linear functions.

52 Which graph best represents the function $y = -1.75x + 5$?



Grade 10

Objective 4: The student will formulate and use linear equations and inequalities.

A(c)(3) **Linear functions.** The student formulates equations and inequalities based on linear functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.

(A) The student analyzes situations involving linear functions and formulates linear equations or inequalities to solve problems.

14 Rita put some hummingbird feeders in her backyard. The table shows the number of hummingbirds that Rita saw compared to the number of feeders.

Bird-Watching

Number of Feeders	Number of Hummingbirds
1	3
2	5
3	7
4	9
5	11

Which equation best describes the relationship between h , the number of hummingbirds, and f , the number of feeders?

F $h = 2f + 1$

G $f = 2h + 1$

H $h = f + 2$

J $f = \frac{h + 1}{2} + 1$

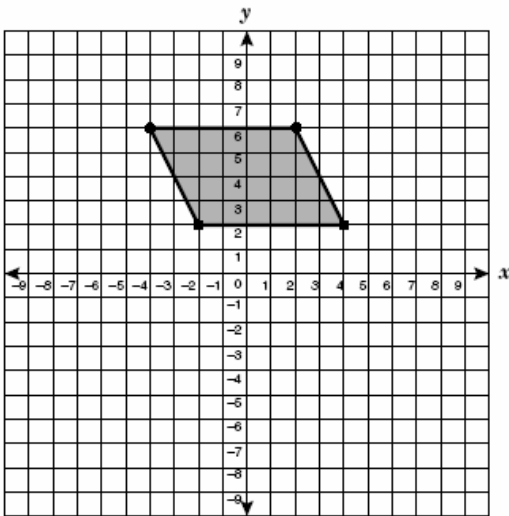
Grade 10

Objective 4: The student will formulate and use linear equations and inequalities.

A(c)(3) Linear functions. The student formulates equations and inequalities based on linear functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.

(A) The student analyzes situations involving linear functions and formulates linear equations or inequalities to solve problems.

18 A shaded parallelogram is graphed on the coordinate grid below.



Which of the following functions describes a line that would include an edge of the shaded parallelogram?

- F** $y = -2x + 5$
- G** $y = -2x - 2$
- H** $y = -2x + 9$
- J** $y = -2x - 1$

Grade 10

Objective 4: The student will formulate and use linear equations and inequalities.

A(c)(4) **Linear Functions.** The student formulates systems of linear equations from problem situations, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.

(B) The student solves systems of linear equations using [concrete] models, graphs, tables, and algebraic methods.

24 What is the x -coordinate of the solution to the system of linear equations below?

$$4x + 5y = 8$$

$$2x - 3y = -18$$

- F -4
- G -3
- H 3
- J 4

Objective 4: The student will formulate and use linear equations and inequalities.

A(c)(3) **Linear functions.** The student formulates equations and inequalities based on linear functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.

(C) For given contexts, the student interprets and determines the reasonableness of solutions to linear equations and inequalities.

46 In 1998 the enrollment at a community college was approximately 2500 students. In 2002 the enrollment had increased to 3250 students. If the enrollment continues to increase at this rate, what is a reasonable projection of enrollment for 2010?

- F 4750
- G 5750
- H 6250
- J 9000

Grade 10

Objective 4: The student will formulate and use linear equations and inequalities.

A(c)(4) **Linear Functions.** The student formulates systems of linear equations from problem situations, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation

(A) The student analyzes situations and formulates systems of linear equations to solve problems.

54 Chase and Sara went to the candy store. Chase bought 5 pieces of fudge and 3 pieces of bubble gum for a total of \$5.70. Sara bought 2 pieces of fudge and 10 pieces of bubble gum for a total of \$3.60. Which system of equations could be used to determine the cost of 1 piece of fudge, f , and 1 piece of bubble gum, g ?

F $5f + 3g = 3.60$
 $2f + 10g = 5.70$

G $5f + 2g = 5.70$
 $3f + 10g = 3.60$

H $f + g = 22$
 $7f + 13g = 9.30$

J $5f + 3g = 5.70$
 $2f + 10g = 3.60$

Grade 10

Objective 5: The student will demonstrate an understanding of quadratic and other nonlinear functions.

A(d)(1) **Quadratic and other nonlinear functions.** The student understands that the graphs of quadratic functions are affected by the parameters of the function and can interpret and describe the effects of changes in the parameters of quadratic functions.

(B) The student investigates, describes, and predicts the effects of changes in a on the graph of $y=ax^2$.

17 What is the effect on the graph of the equation $y = -4x^2$ when the equation is changed to $y = 4x^2$?

- A The graph of $y = 4x^2$ is translated 8 units down.
- B The graph of $y = 4x^2$ is a reflection of $y = -4x^2$ across the x -axis.
- C The graph of $y = 4x^2$ is translated 8 units up.
- D The graph of $y = 4x^2$ is a reflection of $y = -4x^2$ across the y -axis.

Objective 5: The student will demonstrate an understanding of quadratic and other nonlinear functions.

A(d)(3) **Quadratic and other nonlinear functions.** The student understands there are situations modeled by functions that are neither linear nor quadratic and models the situations.

(A) The student uses [patterns to generate] the laws of exponents and applies them in problemsolving situations.

33 Which expression is equivalent to $\frac{27x^{-2}y^6}{3x^5y^2z^0}$?

A $\frac{9x^7y^4}{z}$

B $\frac{y^4}{9x^3}$

C $\frac{9y^4}{x^7}$

D $\frac{9y^4}{x^7z}$

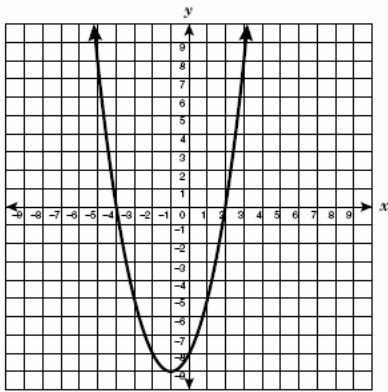
Grade 10

Objective 5: The student will demonstrate an understanding of quadratic and other nonlinear functions.

A(d)(2) **Quadratic and other nonlinear functions.** The student understands there is more than one way to solve a quadratic equation and solves them using appropriate methods.

B) The student relates the solutions of quadratic equations to the roots of their functions.

40 What are the roots of the function graphed below?



- F (-1, -9) and (0, -8)
- G (0, -4) and (2, 0)
- H (-4, 0) and (2, 0)
- J (0, 2) and (0, -4)

Objective 5: The student will demonstrate an understanding of quadratic and other nonlinear functions.

A(d)(1) **Quadratic and other nonlinear functions.** The student understands that the graphs of quadratic functions are affected by the parameters of the function and can interpret and describe the effects of changes in the parameters of quadratic functions.

(C) The student investigates, describes, and predicts the effects of changes in c on the graph of $y=x^2 + c$.

45 How does the graph of $y = x^2$ differ from the graph of $y = x^2 - 4$?

- A The graph of $y = x^2 - 4$ is wider than the graph of $y = x^2$.
- B The graph of $y = x^2 - 4$ is shifted to the left of the graph of $y = x^2$.
- C The graph of $y = x^2 - 4$ is shifted down from the graph of $y = x^2$.
- D The graph of $y = x^2 - 4$ is narrower than the graph of $y = x^2$.

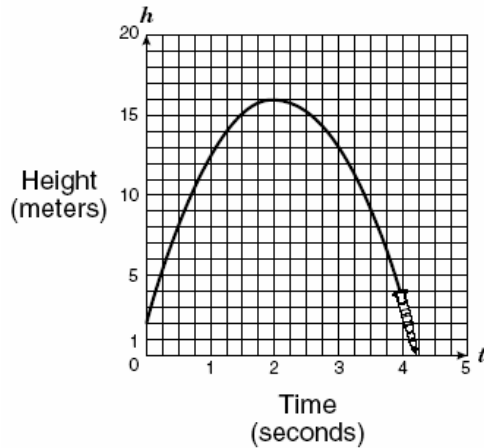
Grade 10

Objective 5: The student will demonstrate an understanding of quadratic and other nonlinear functions.

A(d)(1) **Quadratic and other nonlinear functions.** The student understands that the graphs of quadratic functions are affected by the parameters of the function and can interpret and describe the effects of changes in the parameters of quadratic functions.

D) For problem situations, the student analyzes graphs of quadratic functions and draws conclusions.

55 The graph below shows h , the height in meters of a model rocket, versus t , the time in seconds after the rocket is launched. From the graph, what conclusion can be made about the flight of the rocket?



- A** The rocket reached its maximum height after 2.5 seconds.
- B** At 0 seconds the rocket was 2 meters off the ground.
- C** The height of the rocket was 0 meters when it was launched.
- D** The rocket was in flight for 5 seconds.

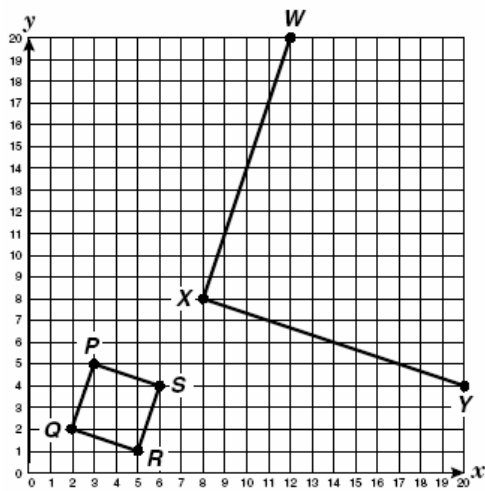
Grade 10

Objective 6: The student will demonstrate an understanding of geometric relationships and spatial reasoning.

(8.6) **Geometry and spatial reasoning.** The student uses transformational geometry to develop spatial sense. The student is expected to

(B) graph dilations, reflections, and translations on a coordinate plane.

10 At what coordinates should vertex Z be placed to create a quadrilateral $WXYZ$ that is similar to quadrilateral $PQRS$?



- F** (24, 16)
- G** (24, 24)
- H** (20, 20)
- J** (16, 24)

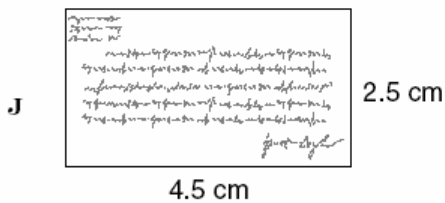
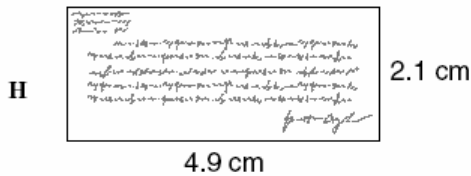
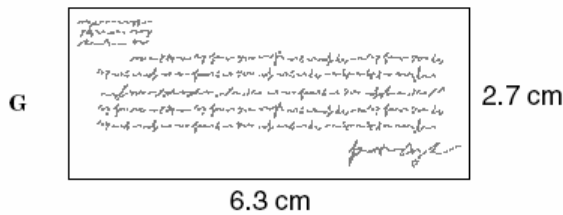
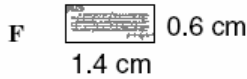
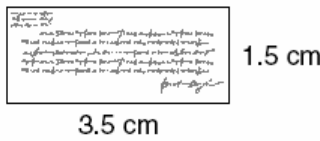
Grade 10

Objective 6: The student will demonstrate an understanding of geometric relationships and spatial reasoning.

(8.6) Geometry and spatial reasoning. The student uses transformational geometry to develop spatial sense. The student is expected to

(A) generate similar shapes using dilations including enlargements and reductions;

16 A copy machine can enlarge or reduce letters proportionately. Which would not be an enlargement or reduction of the letter below?



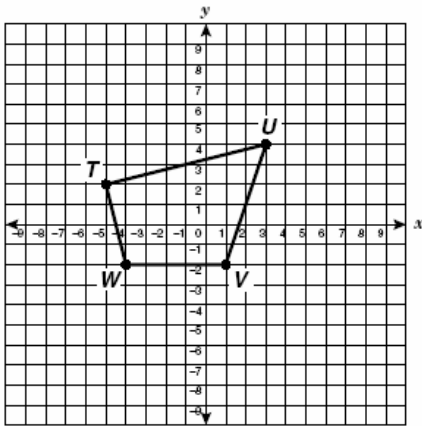
Grade 10

Objective 6: The student will demonstrate an understanding of geometric relationships and spatial reasoning.

(8.6) Geometry and spatial reasoning. The student uses transformational geometry to develop spatial sense. The student is expected to

(B) graph dilations, reflections, and translations on a coordinate plane.

28 If quadrilateral $TUVW$ is reflected across the x -axis to become quadrilateral $T'U'V'W'$, what will be the coordinates of W' ?



- F** $(-4, -2)$
- G** $(-4, 2)$
- H** $(2, -4)$
- J** $(4, -2)$

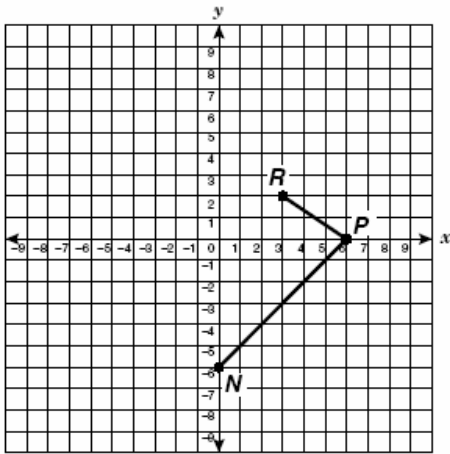
Grade 10

Objective 6: The student will demonstrate an understanding of geometric relationships and spatial reasoning.

(8.7) Geometry and spatial reasoning. The student uses geometry to model and describe the physical world. The student is expected to

(D) locate and name points on a coordinate plane using ordered pairs of rational numbers.

37 A portion of isosceles trapezoid $NPRT$ is shown on the grid below.



At what coordinates should vertex T be placed to make NP parallel to RT in order to complete isosceles trapezoid $NPRT$?

- A $(-2, -2)$
- B $(-3, -2)$
- C $(-2, -3)$
- D $(-4, -5)$

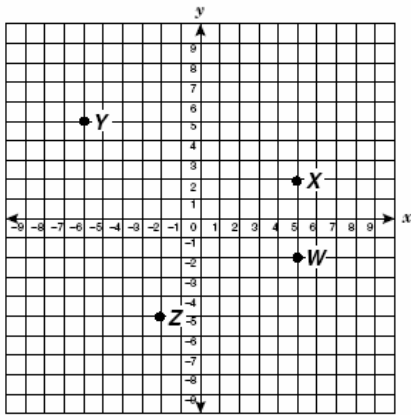
Grade 10

Objective 6: The student will demonstrate an understanding of geometric relationships and spatial reasoning.

(8.7) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world. The student is expected to

(D) locate and name points on a coordinate plane using ordered pairs of rational numbers.

48 Which point on the grid satisfies the conditions $x \geq 5$ and $y < -1$?



- F** *W*
- G** *X*
- H** *Y*
- J** *Z*

Grade 10

Objective 7: The student will demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.

(8.7) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world. The student is expected to

B) use geometric concepts and properties to solve problems in fields such as art and architecture

9 The blueprint dimensions for a newly constructed house are proportional to the house's actual dimensions. On the blueprints the house's foundation measures 75 centimeters long by 40 centimeters wide. If the house's foundation measures 15 meters long, what is the foundation's actual width?

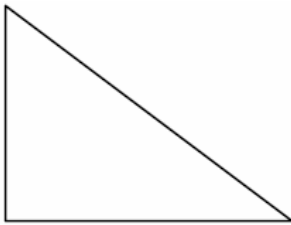
- A 8 m
- B 28.1 m
- C 50 m
- D 200 m

Objective 7: The student will demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.

(8.7) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world. The student is expected to

(C) use pictures or models to demonstrate the Pythagorean Theorem.

36 Look at the right triangle shown below. Which of the following could be the triangle's dimensions?



- F 12, 16.8, 18.2
- G 5.4, 10.6, 16
- H 1.2, 1.6, 2
- J 8, 10, 12.5

Grade 10

Objective 7: The student will demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.

(8.7) Geometry and spatial reasoning. The student uses geometry to model and describe the physical world. The student is expected to

(B) use geometric concepts and properties to solve problems in fields such as art and architecture

41 Near the downtown area of a city, there is a vacant triangular plot of land with sides that measure 22 feet, 27 feet, and 17 feet. If the city council decides to plant an oak tree in the corner with the smallest angle, where should the tree be planted?

- A** In the corner opposite the side that is 17 feet
- B** In the corner opposite the side that is 22 feet
- C** In the corner opposite the side that is 27 feet
- D** In the center of the triangular plot

Objective 7: The student will demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.

(8.7) Geometry and spatial reasoning. The student uses geometry to model and describe the physical world. The student is expected to

(B) use geometric concepts and properties to solve problems in fields such as art and architecture

50 Mr. Harrison wants to calculate the cost of buying a carpet to cover his rectangular living room floor. He knows the cost per square foot of carpet, and he knows the length, width, and height of the living room. Which geometric formula should Mr. Harrison use to determine the cost of the carpet he needs?

- F** $c^2 = a^2 + b^2$
- G** $V = Bh$
- H** $A = lw$
- J** $P = 2l + 2w$

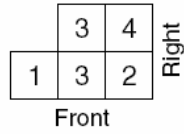
Grade 10

Objective 7: The student will demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.

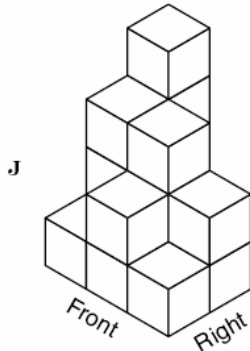
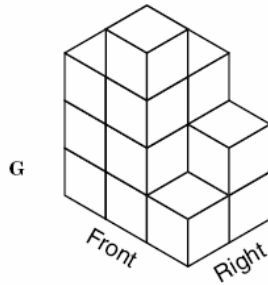
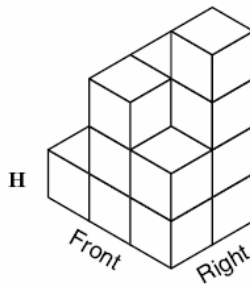
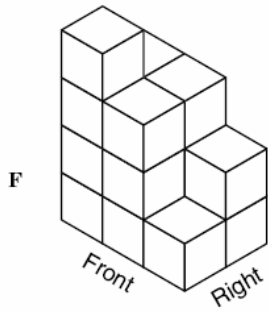
(8.7) Geometry and spatial reasoning. The student uses geometry to model and describe the physical world. The student is expected to

(A) draw solids from different perspectives;

56 The drawing shows the top view of a structure built with cubes as well as the number of cubes in each column of the structure.



Which 3-dimensional view represents the same structure?



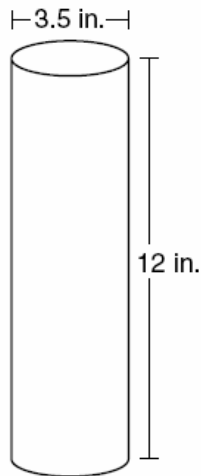
Grade 10

Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.

(8.8) **Measurement.** The student uses procedures to determine measures of solids. The student is expected to

(C) estimate answers and use formulas to solve application problems involving surface area and volume.

13 The owners of Neatly Packaged Company make a cylindrical container that has the dimensions shown below.



What is the approximate lateral surface area available for the package label?

- A** 131.95 in.²
- B** 151.19 in.²
- C** 263.89 in.²
- D** 115.45 in.²

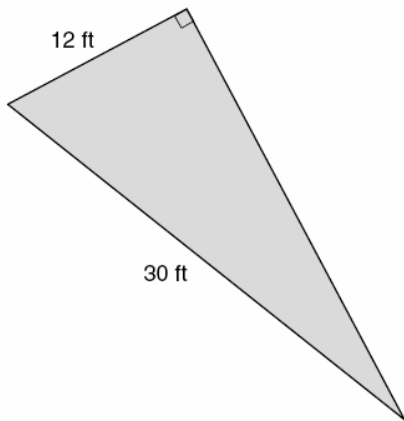
Grade 10

Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.

(8.9) **Measurement.** The student uses indirect measurement to solve problems. The student is expected to

(A) use the Pythagorean Theorem to solve real-life problems.

15 Mrs. Cheung hired a landscaping service to plant a row of bushes around her triangular backyard.



If the bushes must be planted 3 feet apart, approximately how many bushes are needed for Mrs. Cheung's backyard?

- A** 23
- B** 25
- C** 28
- D** 32

Grade 10

Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.

(8.10) **Measurement.** The student describes how changes in dimensions affect linear, area, and volume measures. The student is expected to

(A) describe the resulting effects on perimeter and area when dimensions of a shape are changed proportionally;

21 If the dimensions of a rectangle with a perimeter of 24 inches are tripled, what will be the perimeter in inches of the new rectangle?

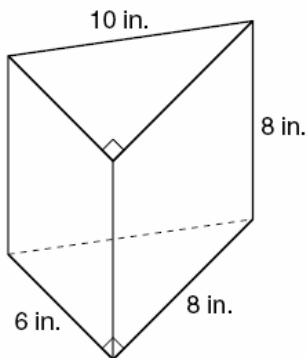
Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.

(8.8) **Measurement.** The student uses procedures to determine measures of solids. The student is expected to

(B) connect models to formulas for volume of prisms, cylinders, pyramids, and cones;

27 A triangular prism is shown below.



What is the volume of this triangular prism?

- A 192 in.³
- B 240 in.³
- C 384 in.³
- D 480 in.³

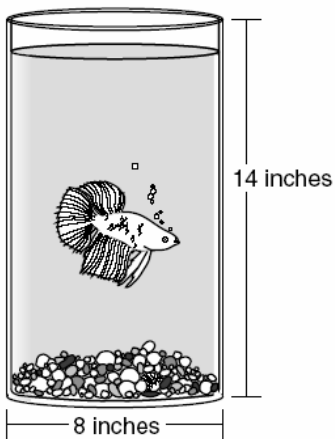
Grade 10

Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.

(8.8) **Measurement.** The student uses procedures to determine measures of solids. The student is expected to

(B) connect models to formulas for volume of prisms, cylinders, pyramids, and cones;

30 Steven has a cylindrical fish tank with a diameter of 8 inches and a height of 14 inches. He placed some rocks that took up 50 cubic inches at the bottom of the tank. Then he filled the tank with springwater to 2 inches from the top. Which is the best strategy for determining the volume of water the fish has for swimming?



- F** $\pi(8)^2(14) - 50$
- G** $\pi(8)^2(14 - 2) - 50$
- H** $\pi(4)^2(14 - 2) - 50$
- J** $\pi(14 - 2)^2(4) - 50$

Grade 10

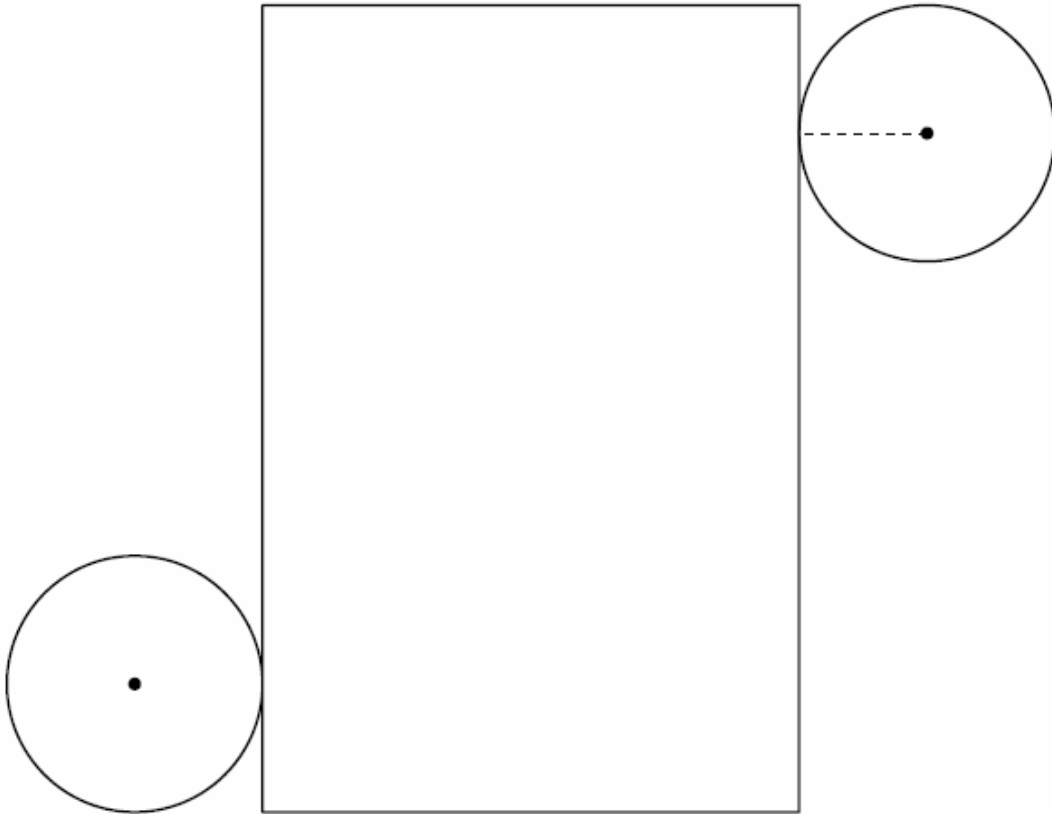
Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.

(8.8) **Measurement.** The student uses procedures to determine measures of solids. The student is expected to

(A) find surface area of prisms and cylinders using [concrete] models and nets (twodimensional models);

SCALE OF DRAWING IS ALTERED IN ELECTRONIC TRANSFER.

38 The net of a cylinder is shown below. Use the ruler on the Mathematics Chart to measure the dimensions of the cylinder to the nearest tenth of a centimeter.



Which of the following best represents the total surface area of this cylinder?

- F** 142 cm^2
- G** 93 cm^2
- H** 23 cm^2
- J** 14 cm^2

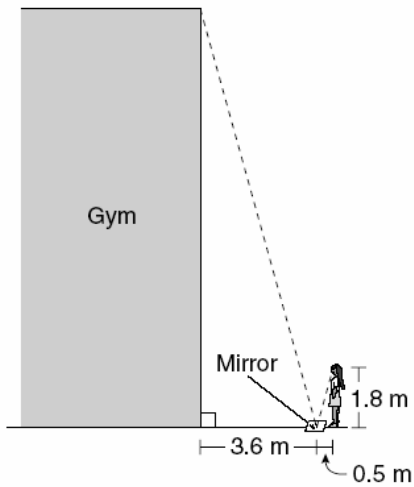
Grade 10

Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.

(8.9) **Measurement.** The student uses indirect measurement to solve problems. The student is expected to

(B) use proportional relationships in similar shapes to find missing measurements.

42 To estimate the height of her school's gym, Nicole sights the top of the gym wall in a mirror that she has placed on the ground. The mirror is 3.6 meters from the base of the gym wall.



Nicole is standing 0.5 meter from the mirror, and her height is about 1.8 meters. What is the height of the gym wall?

- F** 1 m
- G** 5.9 m
- H** 7.2 m
- J** 12.96 m

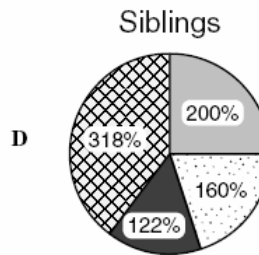
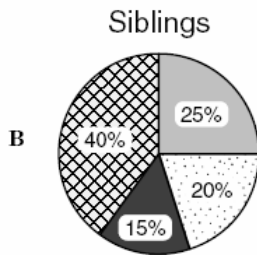
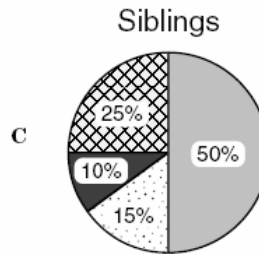
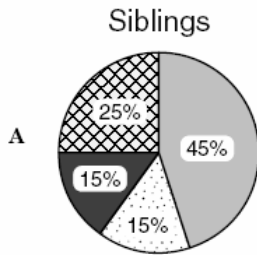
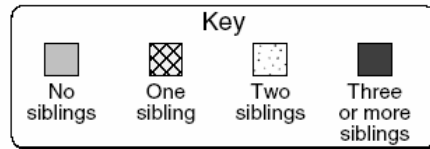
Grade 10

Objective 9: The student will demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.

(8.12) **Probability and statistics.** The student uses statistical procedures to describe data. The student is expected to

(C) construct circle graphs, bar graphs, and histograms, with and without technology.

3 Of the 800 students at a local high school, 200 students have no siblings, 318 students have one sibling, 160 students have two siblings, and the rest of the students have three or more siblings. Use the key below to find the circle graph that best represents this information.



Grade 10

Objective 9: The student will demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.

(8.3) **Patterns, relationships, and algebraic thinking.** The student identifies proportional relationships in problem situations and solves problems. The student is expected to

(B) estimate and find solutions to application problems involving percents and proportional relationships such as similarity and rates.

29 Of the 32 students in Mrs. Zane’s class, 25% have brown hair. Of the remaining students, 12.5% have red hair. How many students in Mrs. Zane’s class have red hair?

- A 3
- B 4
- C 21
- D Not here

Objective 9: The student will demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.

(8.12) **Probability and statistics.** The student uses statistical procedures to describe data. The student is expected to

(A) select the appropriate measure of central tendency to describe a set of data for a particular purpose;

34 Nicholas earned the following grades on his science exams: 83, 88, 87, and 83. If Nicholas scores a 90 on his last exam, which measure of central tendency will give him the highest score?

- F Mode
- G Median
- H Range
- J Mean

Grade 10

Objective 9: The student will demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.

(8.13) **Probability and statistics.** The student evaluates predictions and conclusions based on statistical data. The student is expected to

(B) recognize misuses of graphical or numerical information and evaluate predictions and conclusions based on data analysis.

39 The table below shows the population and the area in square miles of some U.S. states. Which statement best describes the relationship between the population and the area of a state?

State	Population	Area (square miles)
Alaska	626,932	591,004
California	33,871,648	155,973
Florida	15,982,378	58,560
Montana	902,105	147,137
New Jersey	8,414,350	7,836
Texas	20,851,830	267,338

- A** The larger a state's area, the larger its population is.
- B** No relationship can be determined from the data in the table.
- C** New Jersey has the smallest population of the states in the table because it has the smallest area.
- D** Texas is the largest U.S. state.

Grade 10

Objective 9: The student will demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.

(8.11) **Probability and statistics.** The student applies concepts of theoretical and experimental probability to make predictions. The student is expected to

(B) use theoretical probabilities and experimental results to make predictions and decisions.

43 The table below shows the results of a number cube being rolled.

Outcome	Frequency
1	6
2	2
3	2
4	3
5	2
6	0

Based on these results, what is the experimental probability of rolling a 1?

- A** 2.5%
- B** $1/6$
- C** $2/5$
- D** 0.6

Grade 10

Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.

(8.14) **Underlying processes and mathematical tools.** The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. The student is expected to

(A) identify and apply mathematics to everyday experiences, to activities in and outside of school, with other disciplines, and with other mathematical topics

2 Mr. Harmon is planning to sell his house and wants to paint all the rooms. A can of paint costs \$12.95 plus 7.75% sales tax and covers about 476 square feet. What other information is needed to determine the number of cans of paint Mr. Harmon needs to purchase?

- F The number of rooms in the house
- G The area in square feet to be painted
- H The total cost of each can of paint
- J The name of the store where Mr. Harmon will buy the paint

Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.

(8.14) **Underlying processes and mathematical tools.** The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. The student is expected to

C) select or develop an appropriate problem-solving strategy from a variety of different types, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem.

5 A rectangle has an area of 144 square inches and a perimeter of 50 inches. What are the dimensions of the rectangle?

- A 10 in. by 15 in.
- B 9 in. by 16 in.
- C 8 in. by 18 in.
- D 4 in. by 36 in.

Grade 10

Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.

(8.14) **Underlying processes and mathematical tools.** The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. The student is expected to

(B) use a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness;

7 The school drama club plans to attend a Shakespeare festival in 6 weeks. The total cost per person is \$185.75. The club has \$296 in its account and will divide the money equally among the 8 members who attend the festival. Troy is planning to attend the festival and has already saved \$55. How much more money does Troy need in order to cover his cost to attend the festival?

- A \$93.75
- B \$110.25
- C \$148.75
- D Not here

Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.

(8.16) **Underlying processes and mathematical tools.** The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to

(A) make conjectures from patterns or sets of examples and nonexamples;

11 Linda owns a set of seven wrenches. The wrenches come in consecutive increments of $\frac{1}{8}$ inch. Linda has misplaced a wrench. The sizes she has are $\frac{1}{8}$ inch, $\frac{1}{4}$ inch, $\frac{1}{2}$ inch, $\frac{5}{8}$ inch, $\frac{3}{4}$ inch, and $\frac{7}{8}$ inch. Which size wrench is missing from Linda's set?

- A $\frac{3}{16}$ in.
- B $\frac{3}{8}$ in.
- C $\frac{11}{16}$ in.
- D Not here

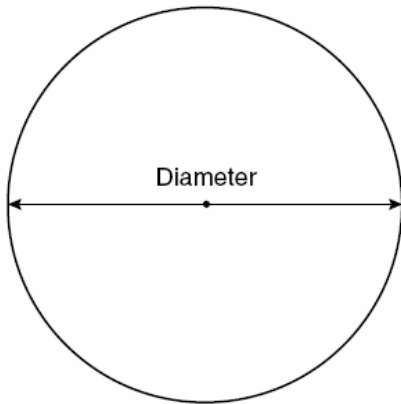
Grade 10

Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.

(8.15) **Underlying processes and mathematical tools.** The student communicates about Grade 8 mathematics through informal and mathematical language, representations, and models. The student is expected to

(A) communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models.

19 A circle and its diameter are shown below.



The value of π is the result of which of the following ratios comparing a circle's circumference to its diameter?

- A $\frac{C}{r}$
- B $\frac{d}{C}$
- C $\frac{r^2}{C}$
- D $\frac{C}{d}$

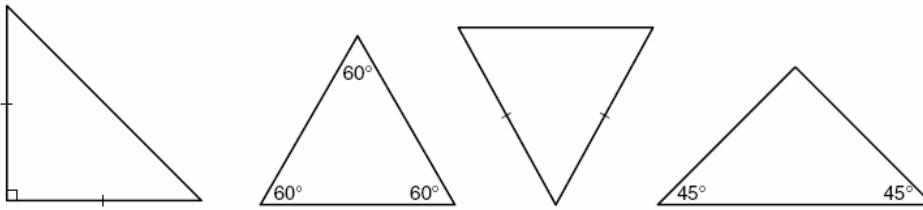
Grade 10

Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.

(8.16) **Underlying processes and mathematical tools.** The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to

(B) validate his/her conclusions using mathematical properties and relationships.

22 Which statement about the triangles below is true?



- F All the triangles are scalene.
- G All the triangles are equiangular.
- H All the triangles are equilateral.
- J All the triangles are isosceles.

Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.

(8.14) **Underlying processes and mathematical tools.** The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. The student is expected to

(B) use a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness;

31 In the system of equations $4x + 2y = 10$ and $3x + 7y = -18$, which expression can be correctly substituted for y in the equation $3x + 7y = -18$?

- A $10 - 2x$
- B $10 + 2x$
- C $5 - 2x$
- D $5 + 2x$

Grade 10

Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.

(8.16) **Underlying processes and mathematical tools.** The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to

(A) make conjectures from patterns or sets of examples and nonexamples;

47 A pattern exists as a result of raising i , an imaginary number, to n , an integer greater than or equal to 1.

Powers of i

i^n ($n \geq 1$)	Solution
i^1	$\sqrt{-1}$
i^2	-1
i^3	$-i$
i^4	1
i^5	$\sqrt{-1}$
i^6	-1

Based on the table, which of the following best represents i raised to the 16th power?

- A $\sqrt{-1}$
- B -1
- C $-i$
- D 1

Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.

(8.15) **Underlying processes and mathematical tools.** The student communicates about Grade 8 mathematics through informal and mathematical language, representations, and models. The student is expected to

(A) communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models.

53 Shannon has spent \$850 on gasoline and repairs for her car in the last 6 months. Of this total, she spent \$300 on repairs. The gasoline she purchased cost \$1.29 per gallon. Which of the following can be used to determine how many gallons of gas, g , Shannon has bought within the last 6 months?

- A $1.29g - 300 = 850$
- B $1.29g + 300 = 850$
- C $1.29 - 300g = 850$
- D $1.29 + 300g = 850$

Grade: 10
Subject: Mathematics
Administration: April 2004

Item Number	Correct Answer	Objective Measured	Student Expectations
01	D	02	A.B4 (B)
02	G	10	8.14 (A)
03	B	09	8.12 (C)
04	J	02	A.B3 (B)
05	B	10	8.14 (C)
06	G	03	A.C2 (E)
07	A	10	8.14 (B)
08	H	03	A.C2 (C)
09	A	07	8.7 (B)
10	F	06	8.6 (B)
11	B	10	8.16 (A)
12	H	02	A.B2 (D)
13	A	08	8.8 (C)
14	F	04	A.C3 (A)
15	A	08	8.9 (A)
16	J	06	8.6 (A)
17	B	05	A.D1 (B)
18	G	04	A.C3 (A)
19	D	10	8.15 (A)
20	G	01	A.B1 (D)
21	72	08	8.10 (A)
22	J	10	8.16 (B)
23	C	01	A.B1 (A)
24	G	04	A.C4 (B)
25	C	02	A.B4 (B)
26	H	03	A.C2 (A)
27	A	08	8.8 (B)
28	G	06	8.6 (B)
29	A	09	8.3 (B)
30	H	08	8.8 (B)
31	C	10	8.14 (B)
32	J	02	A.B3 (A)
33	C	05	A.D3 (A)
34	G	09	8.12 (A)
35	B	01	A.B1 (B)
36	H	07	8.7 (C)
37	C	06	8.7 (D)
38	G	08	8.8 (A)
39	B	09	8.13 (B)
40	H	05	A.D2 (B)
41	A	07	8.7 (B)
42	J	08	8.9 (B)
43	C	09	8.11 (B)
44	G	03	A.C2 (D)
45	C	05	A.D1 (C)
46	F	04	A.C3 (C)
47	D	10	8.16 (A)
48	F	06	8.7 (D)
49	A	01	A.B1 (C)
50	H	07	8.7 (B)
51	B	01	A.B1 (E)
52	J	03	A.C1 (C)
53	B	10	8.15 (A)
54	J	04	A.C4 (A)
55	B	05	A.D1 (D)
56	H	07	8.7 (A)