

**Texas Assessment of
Knowledge and Skills
(TAKS)**

Grades 9, 10, and 11 Exit Level Mathematics Chart

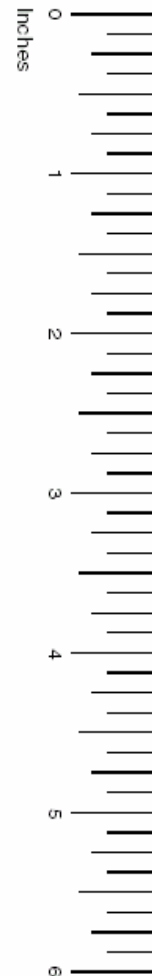


LENGTH	
Metric	Customary
1 kilometer = 1000 meters	1 mile = 1760 yards
1 meter = 100 centimeters	1 mile = 5280 feet
1 centimeter = 10 millimeters	1 yard = 3 feet
	1 foot = 12 inches

CAPACITY AND VOLUME	
Metric	Customary
1 liter = 1000 milliliters	1 gallon = 4 quarts
	1 gallon = 128 ounces
	1 quart = 2 pints
	1 pint = 2 cups
	1 cup = 8 ounces

MASS AND WEIGHT	
Metric	Customary
1 kilogram = 1000 grams	1 ton = 2000 pounds
1 gram = 1000 milligrams	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



Grades 9, 10, and 11 Exit Level 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 9 Mathematics

TAKS Objectives and TEKS Student Expectations

TAKS 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.

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

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

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

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

Objective 1—For Your Information

At ninth grade, students should be able to

- ◆ Work with linear and quadratic functions;
- ◆ Describe a functional relationship by selecting an equation or inequality that describes one variable in terms of another variable given in the problem;
- ◆ Match a representation of a functional relationship with an interpretation of the results for a given situation;
- ◆ Translate functional relationships among numerous forms; and
- ◆ Recognize linear equations in different forms, such as slope-intercept, standard, etc.

Objective 1 Sample Items

- 1 Jim has a \$30 gift certificate for a movie theater. Each time that he sees a movie, m , \$5 is deducted from his gift-certificate balance, b . Which equation best describes b in terms of m ?

A* $b = 30 - 5m$
B $b = 30 + 5m$
C $b = 30m + 5$
D $b = 30m - 5$

- 2 A manager calculated the total amount of pay, $f(x)$, an employee received for one week according to the function

$$f(x) = 12.00x + 6.00(x - 40)$$

where $x > 40$ employee hours. The best interpretation for this function is that an employee earned —

- A the same \$12.00 hourly wage for any number of hours worked
B* an additional \$6.00 per hour for hours worked over the weekly 40 hours
C \$18.00 per hour for all hours worked up to the weekly 40 hours
D a \$6.00 hourly wage for any hours worked over the weekly 40 hours

Students should be able to work with functions that are written in function notation.

TAKS 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.

(A) The student identifies [and sketches] the general forms of linear ($y = x$) and quadratic ($y = x^2$) parent functions.

(B) For a variety of situations, the student identifies the mathematical domains and ranges and determines reasonable domain and range values for given situations.

(C) The student interprets situations in terms of given graphs [or creates situations that fit given graphs].

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

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.

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

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.

(A) The student finds specific function values, simplifies polynomial expressions, transforms and solves equations, and factors as necessary in problem situations.

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

Objective 2—For Your Information

At ninth grade, students should be able to:

- ◆ Work with linear and quadratic functions;
- ◆ Identify a valid decision or judgment based on a given set of data;
- ◆ Write an expression or equation describing a pattern; and
- ◆ Recognize linear equations in numerous forms, such as slope-intercept, standard, etc.

Objective 2 Sample Items

1 Which of the following functions is linear?

A $f(x) = 2^x$

B* $f(x) = 2x - 3$

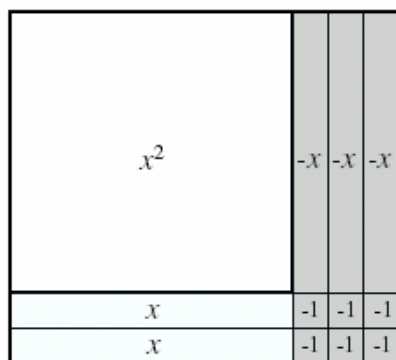
C $f(x) = 2x^2 - 3x - 4$

D $f(x) = \frac{2}{x} - 3$

2 Joey used algebra tiles to model the trinomial

$$x^2 - x - 6$$

as shown below.



What are the factors of this trinomial?

A $(x + 3)(x + 2)$

B $(x + 1)(x - 6)$

C $(x - 6)(x - 3)$

D* $(x - 3)(x + 2)$

3 The dimensions of a rectangle are $2x - 5$ and $3x - 4$. Which expression best represents the area of the rectangle in simplest terms?

A $-17x^2 - 20$

B* $6x^2 - 23x + 20$

C $6x^2 + 20$

D $6x^2 - 7x - 20$

TAKS 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.

(A) The student determines whether or not given situations can be represented by linear functions.

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

(B) The student interprets the meaning of slope and intercepts in situations using data, symbolic representations, or graphs.

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

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

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

(F) The student interprets and predicts the effects of changing slope and y -intercept in applied situations.

(G) The student relates direct variation to linear functions and solves problems involving proportional change.

Objective 3—For Your Information

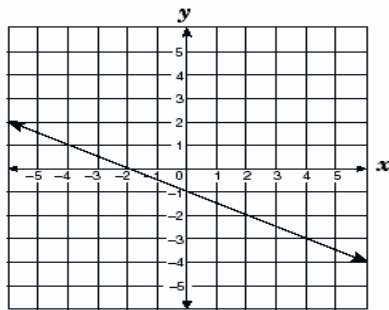
At ninth grade, students should be able to:

- ◆ Translate linear relationships among various forms;

- ◆ Recognize linear equations in numerous forms, such as slope-intercept, standard, etc.;
- ◆ Work with both x- and y-intercepts; and
- ◆ Solve problems involving linear functions and proportional change, with or without the key words “varies directly” in the item.

Objective 3 Sample Items

- 1 The graph of a line is shown below.



Find the equation of a second line by multiplying the slope by -1 and adding 3 to the y-intercept.

- A $y = -2x + 3$
- B $y = -2x - 3$
- C $y = -\frac{1}{2}x - 2$
- D* $y = \frac{1}{2}x + 2$

- 2 A group of actors needs to have \$915 in ticket sales to meet expenses for each performance of a play. The combined number of \$3 student tickets, x , and \$5 adult tickets, y , needed can be represented by the equation

$$3x + 5y = 915$$

If no student tickets are sold, how many adult tickets must be sold to meet expenses?

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

	1	0	5	.			
0	0	0	0		0	0	0
1	●	1	1		1	1	1
2	2	2	2		2	2	2
3	3	3	●		3	3	3
4	4	4	4		4	4	4
5	5	5	5		5	5	5
6	6	6	6		6	6	6
7	7	7	7		7	7	7
8	8	●	8		8	8	8
9	9	9	9		9	9	9

The correct answer is 183. It is acceptable, although not necessary, to bubble in the zeros in front of the one and/or after the decimal. These zeros will not affect the value of the correct answer.

- 3 The cost, c , of producing n regular hamburgers at a fast-food restaurant is found using the equation $c = 0.62n + 1$. The cost of producing n deluxe hamburgers is found using the equation $c = 0.9n + 1$. How does the graph of deluxe hamburger costs compare to the graph of regular hamburger costs?
- A* The slope is greater, and the y-intercept remains the same.
 - B The slope is smaller, and the y-intercept remains the same.
 - C The slope is smaller, and the y-intercept is greater.
 - D The slope is greater, and the y-intercept is smaller.

TAKS 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.

(B) The student investigates methods for solving linear equations and inequalities using [concrete] models, graphs, and the properties of equality, selects a method, and solves the equations and inequalities.

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

Objective 4—For Your Information

At ninth grade, students should be able to:

- ◆ Recognize linear equations in numerous forms, such as slope-intercept, standard, etc.;
- ◆ Select an equation or inequality that can be used to find the solution;
- ◆ Find a solution expressed as a number or a range of numbers; and
- ◆ Look at solutions in terms of a given context and determine whether the solution is reasonable.

Objective 4 Sample Items

- 1 What is the numerical solution to the statement “15 less than twice a number is equal to 5”?

A $n = 5$
B* $n = 10$
C $n = 20$
D $n = 25$

- 2 Shayna has a total of 50 music CDs in two categories. The number of her rock CDs is 8 more than twice the number of her country CDs. Which system of equations can be used to find how many rock CDs, r , and country CDs, c , Shayna has?

A $r = 2c$
 $r - 50 = c$
B $r - c = 50$
 $c = 2r + 8$
C* $r + c = 50$
 $r = 2c + 8$
D $r + c = 50$
 $c = 2r - 8$

TAKS 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 $y = x^2 + c$.

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 problem-solving situations.

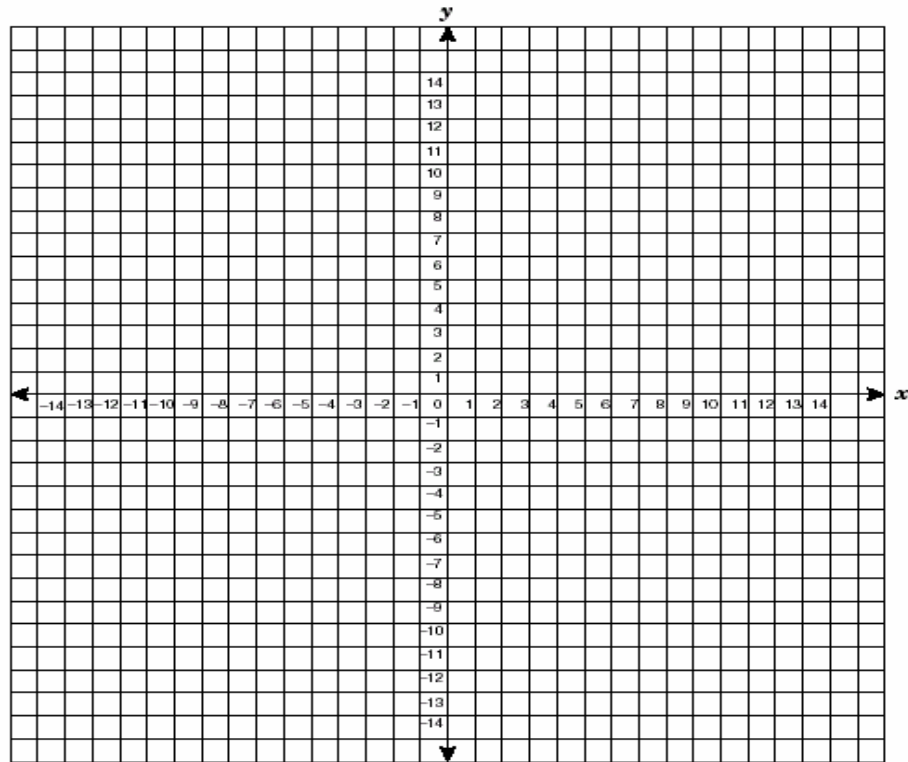
Objective 5—For Your Information

At ninth grade. Students should be able to:

- ◆ Recognize how the graph of the parabola is modified when the quadratic equation changes.

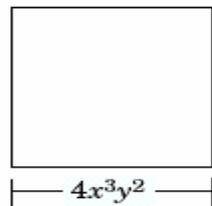
Objective 5 Sample Items

- 1 The function $y = x^2 + 4$ is transformed to the function $y = x^2 - 6$.



Each point on the curve of the first function is —

- A shifted down 2 units
 - B shifted left 2 units
 - C* shifted down 10 units
 - D shifted left 10 units
- 2 Which expression best represents the area of this square with sides of $4x^3y^2$?



- A $4x^6y^4$
- B $16x^3y^2$
- C* $16x^6y^4$
- D $8x^3y^2$

TAKS 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; and

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

(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.

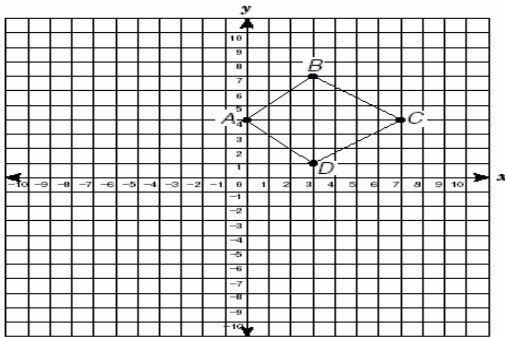
Objective 6—For Your Information

At ninth grade, students should be able to:

- ◆ Identify and use formal geometric terms; and
- ◆ Use geometric concepts, properties, theorems, and definitions to solve problems.

Objective 6 Sample Items

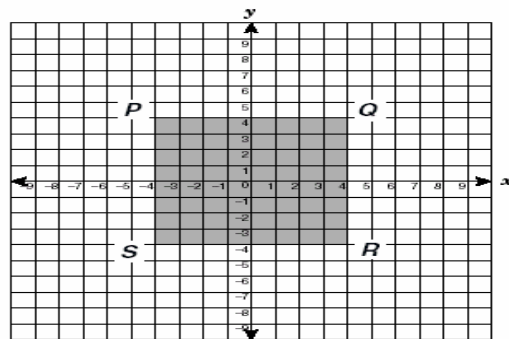
1 The quadrilateral $ABCD$ is shown below.



If this quadrilateral is reflected across the y -axis, what will be the coordinates of the vertices for the image $A'B'C'D'$?

- A* $\{A'(0, 4), B'(-3, 7), C'(-7, 4), D'(-3, 1)\}$
- B $\{A'(0, -4), B'(-3, -7), C'(-7, -4), D'(-3, -1)\}$
- C $\{A'(0, 4), B'(7, 3), C'(4, 7), D'(1, 3)\}$
- D $\{A'(0, -4), B'(3, -7), C'(7, -4), D'(3, -1)\}$

2 Which side of the square is a segment that includes coordinate points $(4, -4)$ and $(-1, -4)$?



- A \overline{QR}
- B \overline{PS}
- C \overline{PQ}
- D* \overline{RS}

TAKS 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;

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

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

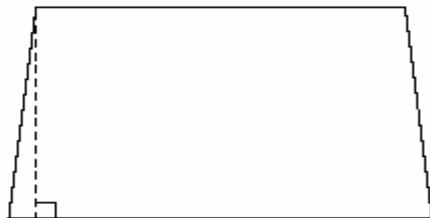
Objective 7—For Your Information

At ninth grade, students should be able to:

- ◆ Identify and use formal geometric terms;
- ◆ Use geometric concepts, properties, theorems, and definitions to solve problems; and
- ◆ Match a two-dimensional representation of a solid with three-dimensional representation of the same solid or vice versa using the top, front, side or corner views of the solid.

Objective 7 Sample Items

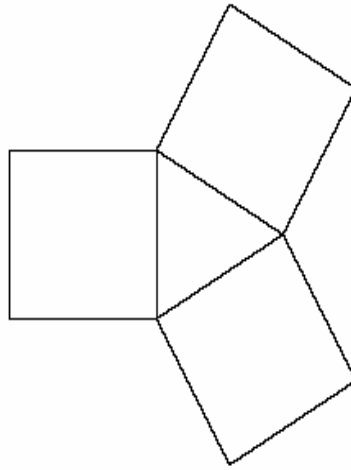
- 1 Sunnyhill Garden Center sells lawn grass seeds for \$2.25 a pound. It takes 1 pound of grass seed for every 150 square feet. A lawn is shaped like a trapezoid with bases of 27 and 31 feet, and the perpendicular distance between the bases is 18 feet.



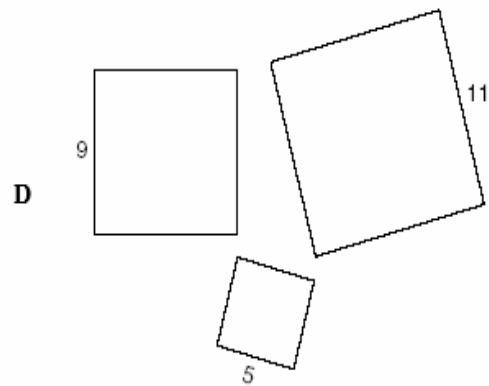
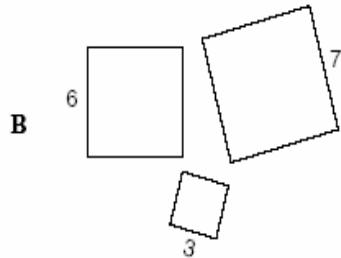
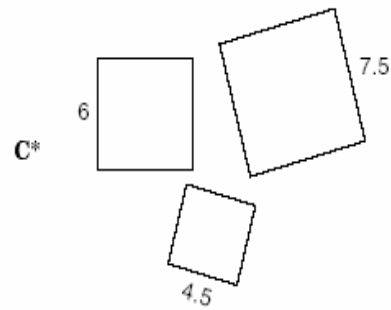
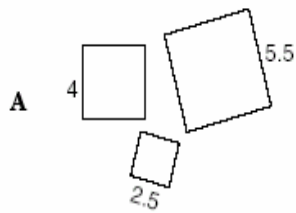
How much will it cost to seed this lawn?

- A** \$15.66
- B*** \$7.83
- C** \$3.59
- D** \$1.55

- 2 The sides of squares can be used to form triangles. The areas of the squares that form right triangles have a special relationship.



Use the lengths of the sides of the squares to determine which set of squares could form a right triangle.



TAKS 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 (two-dimensional models);
 - (B) connect models to formulas for volume of prisms, cylinders, pyramids, and cones; and
 - (C) estimate answers and use formulas to solve application problems involving surface area and volume.
- (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; and
 - (B) use proportional relationships in similar shapes to find missing measurements.
- (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; and
 - (B) describe the resulting effect on volume when dimensions of a solid are changed proportionally.

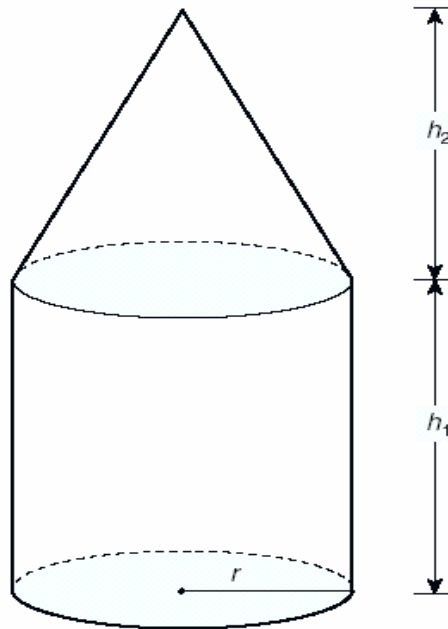
Objective 8—For Your Information

At ninth grade, students should be able to:

- ◆ Identify and use formal geometric terms;
- ◆ Describe, in the form of a verbal expression or a mathematical solution, the effect on perimeter, area, and volume when any measurement of a three-dimensional solid is changed (for example, if the sides of a rectangle are doubled in length, the perimeter is doubled, and the area is four times the original area; if the edges of a cube are doubled, the volume is eight times the original volume); and
- ◆ Use geometric concepts, properties, theorems, and definitions to solve problems.

Objective 8 Sample Items

- 1 Which formula can be used to find the volume of the composite solid figure represented in the drawing?



- A $V = \frac{1}{3}\pi r^2(h_1 + h_2)$
- B $V = \frac{1}{3}\pi r^2 h_1 + \pi r^2 h_2$
- C $V = \pi r^2(h_1 + h_2)$
- D* $V = \pi r^2 h_1 + \frac{1}{3}\pi r^2 h_2$
- 2 A farmer uses a storage container shaped like a right cylinder to store his corn. The container has a radius of 5 feet and a height of 20 feet. The farmer plans to paint only the side of the cylinder with red paint. If 1 gallon covers 325 square feet, how many gallons of paint will he need to buy to complete the job?
- A* 2 gal
- B 3 gal
- C 5 gal
- D 7 gal
- 3 A cylindrical fruit-juice can has a volume of 64 fluid ounces. A second cylindrical can has dimensions that are $\frac{3}{4}$ the size of the larger can. Which is closest to the volume of the smaller can?
- A 20 fl oz
- B* 27 fl oz
- C 36 fl oz
- D 48 fl oz

Students should recognize that the scale factor is $\frac{3}{4}$. Therefore, the change in volume is $(\frac{3}{4})^3$ or $\frac{27}{64}$.

TAKS Objective 9

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

(8.1) **Number, operation, and quantitative reasoning.** The student understands that different forms of numbers are appropriate for different situations. The student is expected to

(B) select and use appropriate forms of rational numbers to solve real-life problems including those involving proportional relationships.

(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.

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

(A) find the probabilities of compound events (dependent and independent); and

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

(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; and

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

(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.

Objective 9—For Your Information

At ninth grade, students should be able to:

- ◆ Choose a proportion that can be used to solve a problem situation or solve a problem situation by using a proportion;
- ◆ Understand and distinguish between theoretical probability and experimental results;
- ◆ Understand and distinguish between mean, median, mode, and range to determine which is most appropriate for a particular purpose;
- ◆ Match a given set of data in the form of a verbal description, chart, tally, graph, etc., with its circle graph, bar graph or histogram or vice versa; and
- ◆ Interpret a set of data and match it to a statement describing a prediction or conclusion.

Objective 9 Sample Items

- 1 A math student programmed a calculator to randomly display a digit from 0 to 9. The results of the first 50 displays are shown in the table below.

Random-Number Experiment

Digit	Frequency
0	###
1	
2	###
3	
4	###
5	###
6	###
7	
8	
9	###
Total	50

What is the difference between the theoretical probability and the experimental probability for getting an 8 if each digit has an equal chance of being displayed?

- A 30%
- B 10%
- C 6%
- D* 4%

- 2 The chart shows the amount of farmland in six western states during a recent year.

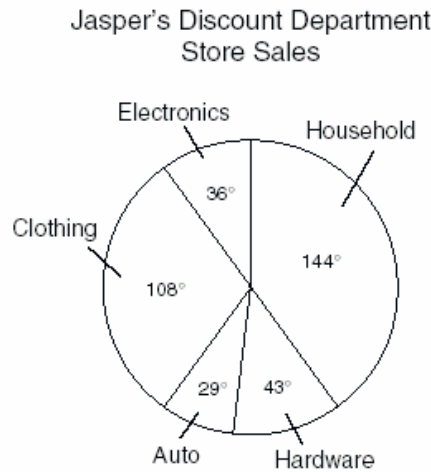
Acres of Farmland

State	Number of Acres (millions)
Arizona	35.0
Colorado	34.0
Montana	59.6
New Mexico	46.8
Texas	130.9
Wyoming	32.9

Which of the following statements is supported by the information in the chart?

- A Texas has more farmland than the other five states combined.
- B Montana has more than twice as much farmland as Wyoming has.
- C The range of the number of acres of farmland in these six states is 95.9 million acres.
- D* The median number of acres of farmland of the states shown is 40.9 million acres.

- 3 The manager of Jasper's Discount Department Store constructed a circle graph to represent his monthly sales. The angle measures are shown on the graph.



Which table identifies the percent of sales, rounded to the nearest tenth of a percent, represented by each sector?

Jasper's Discount Department Store Sales

Category of Sales	Percent of Sales
Household	144%
Hardware	43%
Auto	29%
Clothing	108%
Electronics	36%

A

Jasper's Discount Department Store Sales

Category of Sales	Percent of Sales
Household	40%
Hardware	11.9%
Auto	10%
Clothing	30%
Electronics	8.1%

C

Jasper's Discount Department Store Sales

Category of Sales	Percent of Sales
Household	30%
Hardware	11.9%
Auto	8.1%
Clothing	40%
Electronics	10%

B

Jasper's Discount Department Store Sales

Category of Sales	Percent of Sales
Household	40%
Hardware	11.9%
Auto	8.1%
Clothing	30%
Electronics	10%

D*

TAKS 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;

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

(B) 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.

(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.

(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; and

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

Objective 10—For Your Information

At ninth grade, students should be able to:

- ◆ Identify the question that is being asked or answered;
- ◆ Identify the information that is needed to solve a problem;
- ◆ Select or describe the next step or a missing step that would be most appropriate in a problem-solving situation;
- ◆ Choose the correct supporting information for a given conclusion;
- ◆ Select the description of a mathematical situation when provided a written or pictorial prompt;
- ◆ Match informal language to mathematical language and/or symbols; and
- ◆ Draw a conclusion by investigating patterns and/or sets of examples and non-examples, which can be defined as a counterexample.

Objective 10 Sample Items

- 1 A block of ice is melting at an average of $\frac{1}{2}$ of its weight each hour. After 5 hours the block weighed 1 pound. How much did the block weigh originally?

- A 5 lb
- B 10 lb
- C 16 lb
- D* 32 lb

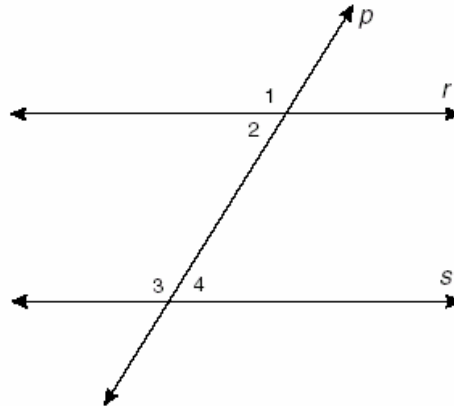
- 2 The following solution for this inequality is incorrect.

$$\begin{aligned}2x - 3 &< 5x + 6 \\ -3x &< 9 \\ x &< -3\end{aligned}$$

Which statement describes the basic error in the solution?

- A Failure to combine like terms
- B* Failure to reverse the inequality symbol
- C Incorrect addition
- D Incorrect division

- 3 Lines r and s are parallel. Both lines are cut by transversal p .



Which statement is not a valid conclusion?

- A $m\angle 1 + m\angle 2 = 180^\circ$
- B $m\angle 2 + m\angle 3 = 180^\circ$
- C* $m\angle 1 + m\angle 3 = 180^\circ$
- D $m\angle 1 + m\angle 4 = 180^\circ$

Grade 10 Mathematics

TAKS Objectives and TEKS Student Expectations

TAKS 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.

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

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

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

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

Objective 1—For Your Information

At tenth grade, students should be able to:

- ◆ Work with linear and quadratic functions;
- ◆ Describe a functional relationship by selecting an equation or inequality that describes one variable in terms of another variable given in the problem;
- ◆ Match a representation of a functional relationship with an interpretation of the results for a given situation;
- ◆ Translate functional relationships among numerous forms; and
- ◆ Recognize linear equations in different forms, such as slope-intercept, standard, etc.

Objective 1 Sample Items

- 1 Which set of coordinates describes a function?
- A $\{(2, -3), (-2, -6), (2, 3), (-2, 6)\}$
B* $\{(5, 2), (3, 4), (1, 2), (-1, 4)\}$
C $\{(-6, -1), (-4, -3), (-2, -5), (-6, -7)\}$
D $\{(3, 4), (3, -4), (5, 8), (7, 2)\}$
- 2 Jacob has \$15 to spend on roses for his girlfriend. Each rose costs \$2. Which statement is true about the number of roses Jacob could buy?
- A Jacob could buy 13 roses.
B Jacob could buy more than 7 roses.
C Jacob could buy 8 roses.
D* Jacob could buy less than 7 roses.

Although students get $7\frac{1}{2}$ when they divide 15 by 2, they need to realize that Jacob could buy only 7 whole roses.

TAKS 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.

(A) The student identifies [and sketches] the general forms of linear ($y = x$) and quadratic ($y = x^2$) parent functions.

(B) For a variety of situations, the student identifies the mathematical domains and ranges and determines reasonable domain and range values for given situations.

(C) The student interprets situations in terms of given graphs [or creates situations that fit given graphs].

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

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.

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

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.

(A) The student finds specific function values, simplifies polynomial expressions, transforms and solves equations, and factors as necessary in problem situations.

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

Objective 2—For Your Information

At tenth grade, students should be able to:

- ◆ Work with linear and quadratic functions;
- ◆ Identify a valid decision or judgment based on a given set of data;
- ◆ Write an expression or equation describing a pattern; and
- ◆ Recognize linear equations in numerous forms, such as slope-intercept, standard, etc.

Objective 2 Sample Items

1 The length of a rectangle measures l . The width of the rectangle measures 10 units less than the length. The area of the rectangle is $l(l - 10)$. What is a reasonable domain for the length of this rectangle?

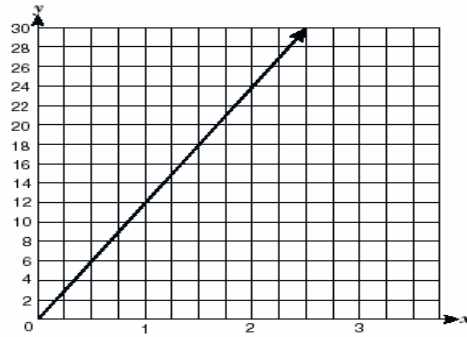
- A $l > 0$
- B* $l > 10$
- C $l < 10$
- D $l = 10$

In this problem, students should realize that the length must be greater than 10 because the width cannot be zero or a negative number.

2 Mr. Darison packs liters of cooking oil into a crate. The crate has a mass of 1.36 kilograms. The mass of each liter is about 0.91 kilogram. If the function $y = 0.91x + 1.36$ describes the total mass, the variable x represents the —

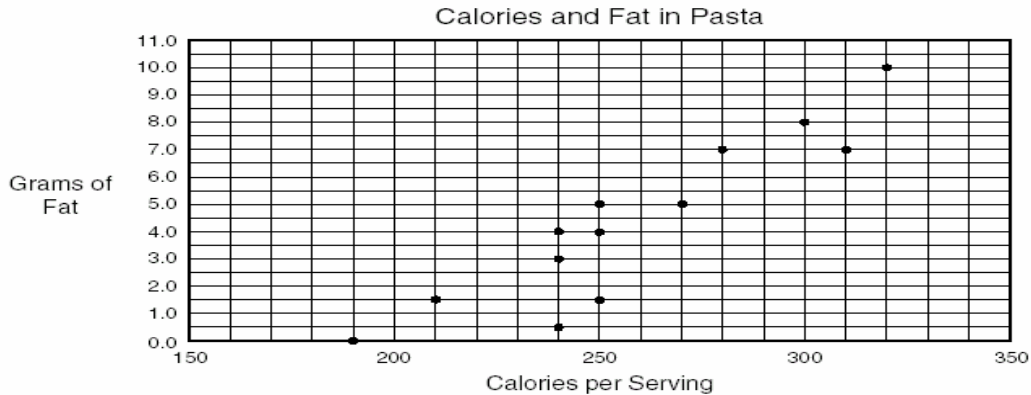
- A total mass of a crate filled with liters of cooking oil
- B total number of crates filled with liters of cooking oil
- C mass of each liter of cooking oil inside a crate
- D* number of liters of cooking oil packed into a crate

- 3 Which situation best represents the graph shown below?



- A** Jamie is cycling in a triathlon. After the first 3 miles, she begins cycling an average of 12 miles per hour. The function $y = 12x + 3$ describes y , the distance in miles Jamie has cycled at x , the number of seconds since she started the cycling leg of the triathlon.
- B** Tomorrow Felix starts his new job with a computer company. His hourly wage is \$15.00. The function $y = 15x$ describes y , the wage Felix will earn for working x hours.
- C*** Sara tosses a stone into a pond and watches the circular ripples spread outward. The function $y = 12x$ describes y , the radius in inches of the first circular ripple x seconds after the stone hit the surface of the pond.
- D** Dave has \$30.00 in his savings account. Each month he deposits \$15.00 into his savings account. The function $y = 15x + 30$ describes y , the total savings Dave has after x months.

- 4 A new pasta dish is being produced by a company that already has 13 pasta dishes in its product line. The graph shows the number of calories and the fat content in a serving of each of the existing products.



The new dish contains 240 calories and 6.4 grams of fat per serving. How does a serving of this dish compare to the other 13 dishes?

- A** Above the median for calories and above the median for fat
- B** Above the median for calories and below the median for fat
- C** Below the median for calories and below the median for fat
- D*** Below the median for calories and above the median for fat

TAKS 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.

(A) The student determines whether or not given situations can be represented by linear functions.

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

(B) The student interprets the meaning of slope and intercepts in situations using data, symbolic representations, or graphs.

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

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

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

(F) The student interprets and predicts the effects of changing slope and y -intercept in applied situations.

(G) The student relates direct variation to linear functions and solves problems involving proportional change.

Objective 3—For Your Information

At tenth grade, students should be able to:

- ◆ Translate linear relationships among various forms;
- ◆ Recognize linear equations in numerous forms, such as slope-intercept, standard, etc;
- ◆ Work with both x - and y -intercepts; and
- ◆ Solve problems involving linear functions and proportional change, with or without the key words “varies directly” in the item.

Objective 3 Sample Items

- 1 Which problem situation cannot be described by a linear function?
- A The distance traveled at an average speed of 66 miles per hour for t hours
 - B* The area of a square given the length of a side
 - C The gross weekly salary earned at an hourly rate of \$7.50 for r hours
 - D The amount of sales tax on a purchase if the rate is 7%

- 2 The height (h) and base (b) measurements for three similar triangles are shown in the table.

Triangle	Base (centimeters)	Height (centimeters)
$\triangle FGH$	3.8	17.1
$\triangle JKL$	5.4	24.3
$\triangle PQR$	1.6	7.2

Which function represents the relationship between the height and base of each of these triangles?

- A $h = \frac{1}{4}b$
- B $h = \frac{5}{2}b$
- C $h = 5b - 1.9$
- D* $h = 4.5b$

- 3 Each table below lists ordered pairs of numbers. Which table identifies points contained in a line with a slope of -3 ?

A

x	-4	-2	-1	0	2	5
y	14	10	8	6	2	-4

B

x	21	15	6	3	-6	-15
y	-5	-3	0	1	4	7

C

x	-4	-2	-1	0	2	5
y	-6	0	3	6	12	21

D*

x	-5	-3	0	1	4	7
y	21	15	6	3	-6	-15

Students should recognize function tables presented horizontally or vertically.

TAKS 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.

(B) The student investigates methods for solving linear equations and inequalities using [concrete] models, graphs, and the properties of equality, selects a method, and solves the equations and inequalities.

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

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

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

Objective 4—For Your Information

At tenth grade, students should be able to

- ◆ Recognize linear equations in numerous forms, such as slope-intercept, standard, etc.;
- ◆ Select an equation or inequality that can be used to find the solution;
- ◆ Find a solution expressed as a number or a range of numbers; and
- ◆ Look at solutions in terms of a given context and determine whether the solution is reasonable.

Objective 4 Sample Items

- 1 Melissa's final grade in her history class is determined by a combined average of her final exam, her chapter-test average, and a research paper. The table shows her results before the final exam.

Description	Grade	Percent of Final Grade
Final exam	x	
Chapter-test average	84	20%
Research paper	92	40%
Final grade	90	100%

Melissa's goal is to earn a final grade of 90 or higher. Which inequality can be used to find x , the minimum grade she must make on her final exam to achieve her goal?

- A*** $0.2(84) + 0.4(92) + 0.4x \geq 90$
B $0.2(84) + 0.4(92) + 0.6x \geq 90$
C $0.2(84) + 0.8(92 + x) \leq 90$
D $0.2(84) + 0.4(92x) \leq 90$

- 2 A rectangle's length, l , is 3 times the width, w . If the perimeter of the rectangle is 96 units, what are the rectangle's dimensions?

- A 12 units and 32 units
 B 4 units and 12 units
 C 8 units and 24 units
 D* 36 units and 12 units

- 3 At a local bank Wanda received \$10 bills and \$20 bills in exchange for a \$100 bill. She received a total of 8 bills. How many \$10 bills did she receive?

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

			6	.			
0	0	0	0		0	0	0
1	1	1	1		1	1	1
2	2	2	2		2	2	2
3	3	3	3		3	3	3
4	4	4	4		4	4	4
5	5	5	5		5	5	5
6	6	6	<input checked="" type="radio"/>		6	6	6
7	7	7	7		7	7	7
8	8	8	8		8	8	8
9	9	9	9		9	9	9

The correct answer is 6. It is acceptable, although not necessary, to bubble in the zeros in front of the six and/or after the decimal. These zeros will not affect the value of the correct answer.

TAKS 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 $y = ax^2$.

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

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

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.

(A) The student solves quadratic equations using [concrete] models, tables, graphs, and algebraic methods.

(B) The student relates the solutions of quadratic equations to the roots of their 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 problem-solving situations.

Objective 5—For Your Information

At tenth grade, students should be able to:

- ◆ Recognize how the graph of the parabola is modified when the quadratic equation changes; and
- ◆ Determine reasonable solutions to quadratic equations on the given context of the problem.

Objective 5 Sample Items

- 1 How does Parabola B, $y = 2x^2$, compare to Parabola A, $y = x^2$?
- A The vertex of Parabola B is 2 units above the x -axis.
 - B The vertex of Parabola B is 2 units to the right of the origin.
 - C Parabola B is wider than Parabola A.
 - D* Parabola B is narrower than Parabola A.

- 2 The surface area, S , of a sphere can be found using the formula

$$S = 4\pi r^2$$

If the surface area of a ball is approximately 76 in.², what is the approximate radius, r , of this ball?

- A 9.84 in.
- B 8.72 in.
- C 4.36 in.
- D* 2.46 in.

- 3 Which expression represents the product of $(-4x^3y^2z)^3(4x^6y^4z^3)$?

- A $-16x^{11}y^9z^7$
- B $-16x^{14}y^{10}z^6$
- C $-256x^{11}y^9z^7$
- D* $-256x^{14}y^{10}z^6$

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

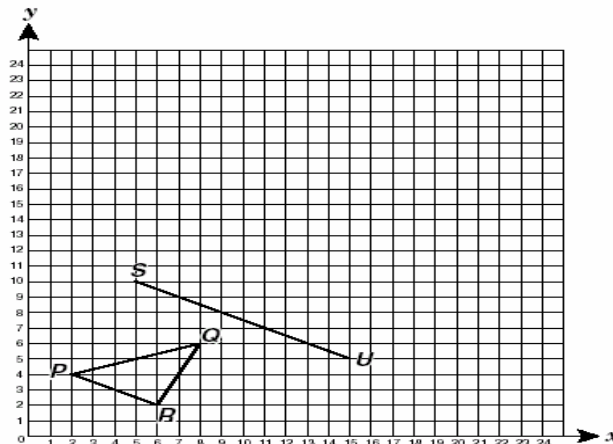
Objective 6—For Your Information

At tenth grade, students should be able to:

- ◆ Identify and use formal geometric terms; and
- ◆ Use geometric concepts, properties, theorems, and definitions to solve problems

Objective 6 Sample Items

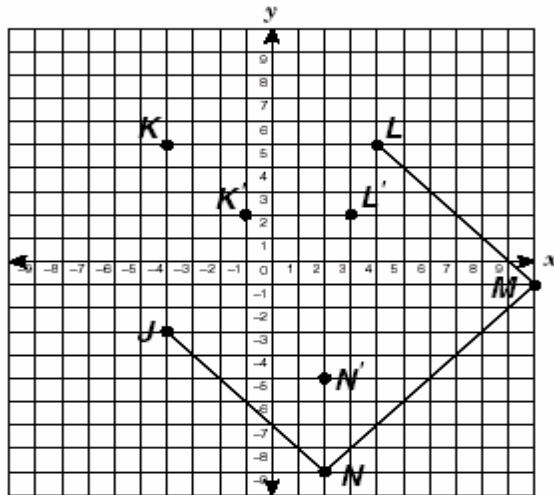
- 1 The graph shows $\triangle PQR$ with vertices $P(2, 4)$, $Q(8, 6)$, and $R(6, 2)$ and \overline{SU} with endpoints $S(5, 10)$ and $U(15, 5)$.



At what coordinates would vertex T be placed to create $\triangle STU$, a triangle similar to $\triangle PQR$?

- A (12, 9)
- B (16, 12)
- C* (20, 15)
- D (24, 18)

- 2 Figure $J'K'L'M'N'$ is a dilation of figure $JKLMN$.



Find the coordinate points of J' and M' .

- A $J'(-1, -1)$ and $M'(6, -2)$
 B* $J'(-1, -2)$ and $M'(6, -1)$
 C $J'(-2, -2)$ and $M'(7, -2)$
 D $J'(-2, -1)$ and $M'(7, -1)$

TAKS 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;
 (B) use geometric concepts and properties to solve problems in fields such as art and architecture; and
 (C) use pictures or models to demonstrate the Pythagorean Theorem.

Objective 7—For Your Information

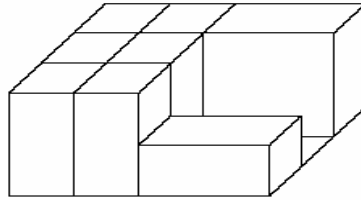
At tenth grade, students should be able to:

- ◆ Identify and use formal geometric terms;
- ◆ Use geometric concepts, properties, theorems, and definitions to solve problems; and

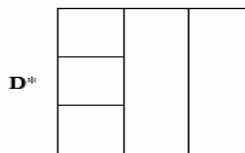
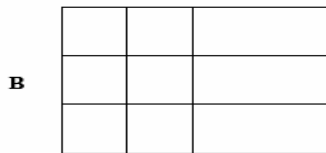
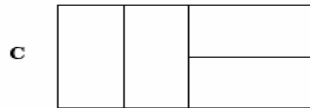
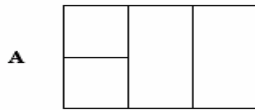
- ◆ Match a two-dimensional representation of a solid with three-dimensional representation of the same solid or vice versa using the top, front, side, and corner views of the solid.

Objective 7 Sample Items

1 Look at the drawing of the solid below.



Which of the following is not a top, front, or side view of this solid?



- 2 An architect wanted the field of a stadium she was designing to be large enough for both soccer and football games. A soccer field is 225 feet wide by 360 feet long. It is 65 feet wider than a football field, but both fields are the same length. What is the difference in feet between their perimeters?

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

	1	3	0	.			
0	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

TAKS 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 (two-dimensional models);
 - (B) connect models to formulas for volume of prisms, cylinders, pyramids, and cones; and
 - (C) estimate answers and use formulas to solve application problems involving surface area and volume.
- (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; and
 - (B) use proportional relationships in similar shapes to find missing measurements.
- (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; and
 - (B) describe the resulting effect on volume when dimensions of a solid are changed proportionally.

Objective 8—For Your Information

At tenth grade, students should be able to:

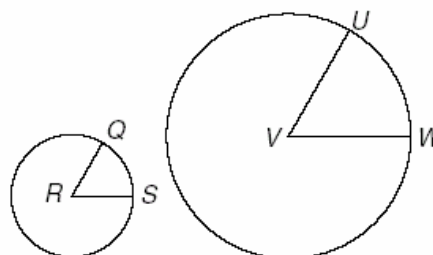
- ◆ Identify and use formal geometric terms;
- ◆ Describe, in the form of a verbal expression or mathematical solution, the effect on perimeter, area, and volume when any measurement of a three-dimensional solid is changed (for example, if the sides of a rectangle are doubled in length, then the perimeter is doubled, and the area is four times the original area; if the edges of a cube are doubled in length, the volume is eight times the original volume); and

- ◆ Use geometric concepts, properties, theorems, formulas, and definitions to solve problems.

Objective 8 Sample Items

- 1 The diagonal of a rectangular rug is almost 6 yards. Which pair of dimensions is closest to the length and the width of the rug?
- A 2 yd and 3 yd
 - B 2 yd and 4 yd
 - C* 3 yd and 5 yd
 - D 4 yd and 9 yd

- 2 Circle R has a radius of 4.3 units. Circle V has a radius of 8.6 units. Angles QRS and UVW are congruent. If the length of arc QS is 4.5 units, what is the length of arc UW , measured to the nearest tenth of a unit?



- A 2.3 units
- B 4.1 units
- C 8.2 units
- D* 9.0 units

TAKS 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.

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

(A) find the probabilities of compound events (dependent and independent); and

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

(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; and

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

(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.

Objective 9—For Your Information

At tenth grade, students should be able to:

- ◆ Choose a proportion that can be used to solve a problem situation or solve a problem situation by using a proportion;
- ◆ Understand and distinguish between theoretical probability and experimental results;
- ◆ Understand and distinguish between mean, median, mode, and range to determine which is most appropriate for a particular purpose;
- ◆ Match a given set of data in the form of a verbal description, chart, tally, graph, etc., with its circle graph, bar graph, or histogram or vice versa; and
- ◆ Interpret a set of data and match it to a statement describing a prediction or conclusion.

Objective 9 Sample Items

- 1 A garden center received a shipment of 60 trees. The original order was for 80 trees. What percent of the order did not arrive?

A* 25%
B 60%
C 75%
D 80%

- 2 Seven cards numbered 2, 4, 5, 6, 7, 9, and 10 are placed facedown on a desk. If Tyra chooses 3 cards at random, what is the probability that she will choose 3 even-numbered cards?

A $\frac{1}{35}$
B* $\frac{4}{35}$
C $\frac{4}{7}$
D $\frac{16}{49}$

- 3 The hours Cynthia worked last week are shown in the chart below.

Cynthia's Work Schedule

Monday	8 hours
Tuesday	6 hours
Wednesday	7 hours
Thursday	4 hours
Friday	6 hours

Which measure of these data would change if Cynthia worked 2 hours less on Wednesday?

A* Mean
B Median
C Mode
D Range

TAKS 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;

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

(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.

(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.

(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; and

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

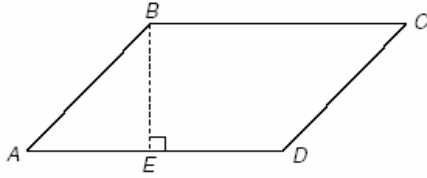
Objective 10—For Your Information

At tenth grade, students should be able to

- ◆ identify the question that is being asked or answered;
- ◆ identify the information that is needed to solve a problem;
- ◆ select or describe the next step or a missing step that would be most appropriate in a problem-solving situation;
- ◆ choose the correct supporting information for a given conclusion;
- ◆ select the description of a mathematical situation when provided a written or pictorial prompt;
- ◆ match informal language to mathematical language and/or symbols; and
- ◆ draw a conclusion by investigating patterns and/or sets of examples and non-examples, which can be defined as counterexamples.

Objective 10 Sample Items

- 1 In parallelogram $ABCD$, the length of \overline{AD} is 90 units, and the length of \overline{AB} is 50 units.



Which additional data provides sufficient information to find the height of parallelogram $ABCD$?

- A* The area of parallelogram $ABCD$
- B The perimeter of parallelogram $ABCD$
- C The length of \overline{BC}
- D The measure of $\angle BED$

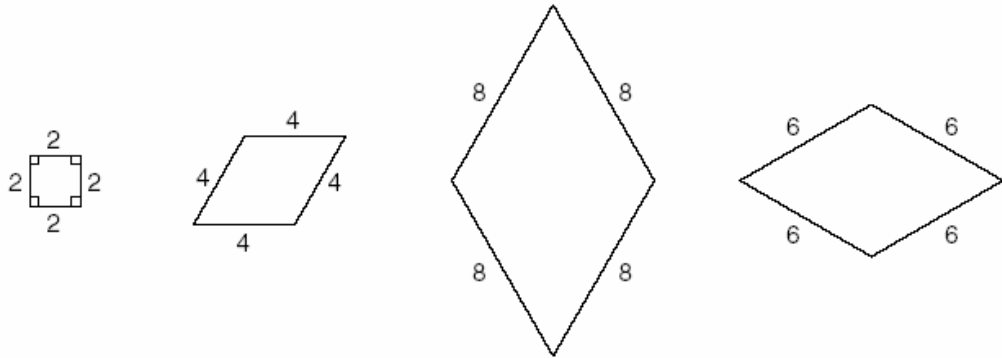
Although many combinations of additional data might provide sufficient information to find the height, students should be able to select from the given answer choices of additional data.

- 2 The Miller family bought a used car for \$8599. They made a down payment of \$3000 and used a loan to pay the rest. They agreed to pay \$299 a month for 24 months to repay the loan with interest. Which method can be used to find the amount of interest paid on the loan?

- A Subtract \$3000 from \$8599 and then add the product of \$299 and 24 to the difference
- B* Subtract \$3000 from \$8599 and then subtract that difference from the product of \$299 and 24
- C Add \$8599 and \$3000 and then subtract the product of \$299 and 24 from the total
- D Subtract \$3000 from the product of \$299 and 24 and then subtract \$8599 from the difference

Students should recognize that there are multiple strategies to solve problems. Students should be able to select the most appropriate strategy given for a particular situation.

3 Which statement about the figures below is true?



- A These four figures are similar to one another.
- B* Each of the four figures is a rhombus.
- C Each of these figures has four congruent angles.
- D These four figures are rectangles.

Grade 11 Exit Level Mathematics

TAKS Objectives and TEKS Student Expectations

TAKS 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.

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

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

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

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

Objective 1—For Your Information

For the eleventh-grade exit level, students should be able to:

- ◆ Work with linear and quadratic functions;
- ◆ Describe a functional relationship by selecting an equation or inequality that describes one variable in terms of another variable given in the problem;
- ◆ Match a representation of a functional relationship with an interpretation of the results for a given situation;
- ◆ Translate functional relationships among numerous forms; and
- ◆ Recognize linear equations in different forms, such as slope-intercept, standard, etc.

Objective 1 Sample Items

1 For Saturday's debate tournament, Sarah ordered 3 cookies for each student participant and a tray of 30 cookies for the sponsors' hospitality room. This relationship can be expressed by the function $f(s) = 3s + 30$, where s is the number of student participants. Which is the dependent quantity in this functional relationship?

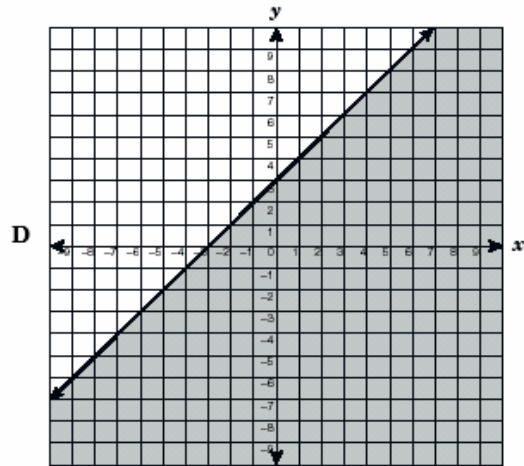
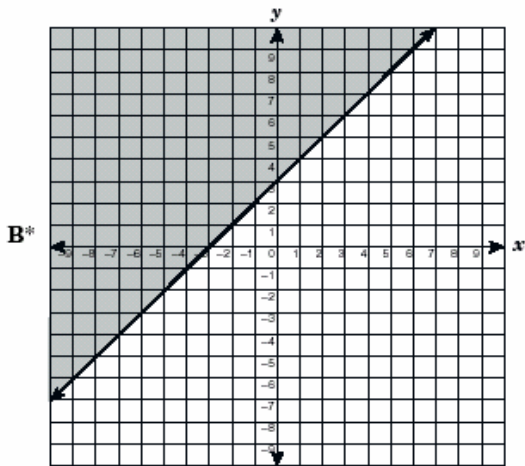
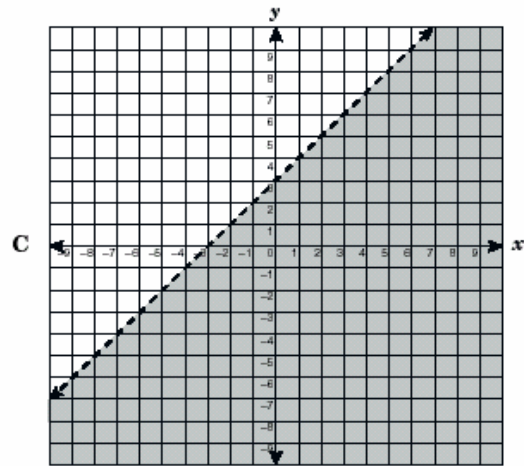
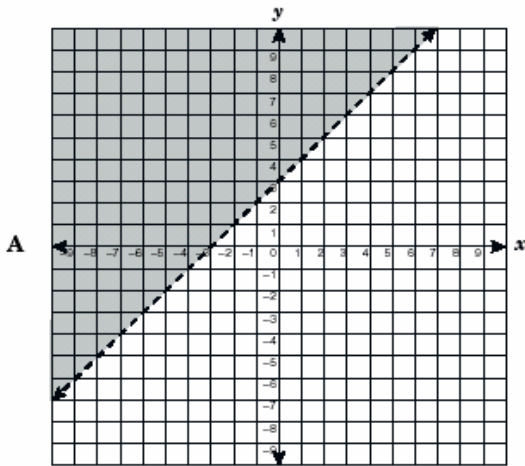
- A* The number of cookies ordered
- B The number of trays ordered
- C The number of student participants
- D The number of sponsors

Students should be able to identify or describe the dependent and independent quantities.

2 Mr. Henry decided to invest money earned from selling some land. He invested \$5000 of the money at an annual rate of 4% and the rest of the money, x , at an annual rate of 6.25%. Which equation describes y , the total amount of interest earned from both investments during the first year?

- A* $y = 0.04(5000) + 0.0625x$
- B $y = 4(5000) + 6.25x$
- C $y = (5000 + x)(0.04 + 0.0625)$
- D $y = (5000 + x)(4 + 6.25)$

3 Which graph best represents the inequality $-x + y \geq 3$?



TAKS 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.

(A) The student identifies [and sketches] the general forms of linear ($y = x$) and quadratic ($y = x^2$) parent functions.

(B) For a variety of situations, the student identifies the mathematical domains and ranges and determines reasonable domain and range values for given situations.

(C) The student interprets situations in terms of given graphs [or creates situations that fit given graphs].

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

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.

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

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.

(A) The student finds specific function values, simplifies polynomial expressions, transforms and solves equations, and factors as necessary in problem situations.

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

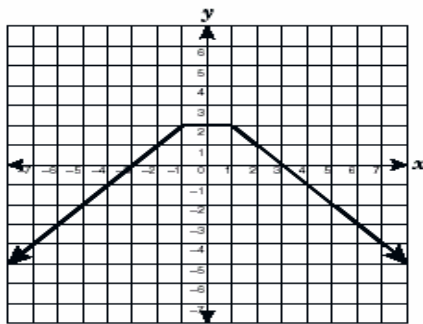
Objective 2—For Your Information

For the eleventh-grade exit level, students should be able to:

- ◆ Work with linear and quadratic functions;
- ◆ Identify a valid decision or judgment based on a given set of data;
- ◆ Write an expression or equation describing a pattern; and
- ◆ Recognize linear equations in numerous forms, such as slope-intercept, standard, etc.

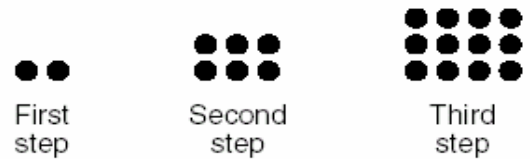
Objective 2 Sample Items

- 1 Which best describes the range represented in the graph?



- A $-3 \leq y \leq 3$
- B $-3 \leq x \leq 3$
- C $x \leq 2$
- D* $y \leq 2$

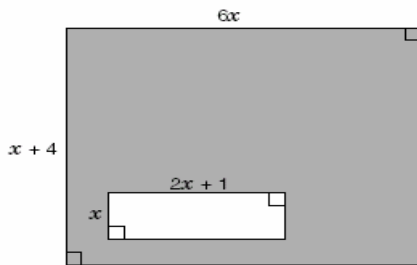
- 2 The pattern of dots shown below continues infinitely, with more dots being added at each step.



Which expression can be used to determine the number of dots in the n th step?

- A $2n$
- B $n(n + 2)$
- C* $n(n + 1)$
- D $2(n + 1)$

- 3 What is the area of the shaded region of the rectangle, reduced to simplest terms?



- A $8x^2 + 25x$
- B $6x^2 + 24x$
- C* $4x^2 + 23x$
- D $2x^2 + x$

TAKS 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.

(A) The student determines whether or not given situations can be represented by linear functions.

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

(B) The student interprets the meaning of slope and intercepts in situations using data, symbolic representations, or graphs.

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

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

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

(F) The student interprets and predicts the effects of changing slope and y -intercept in applied situations.

(F) The student relates direct variation to linear functions and solves problems involving proportional change

Objective 3—For Your Information

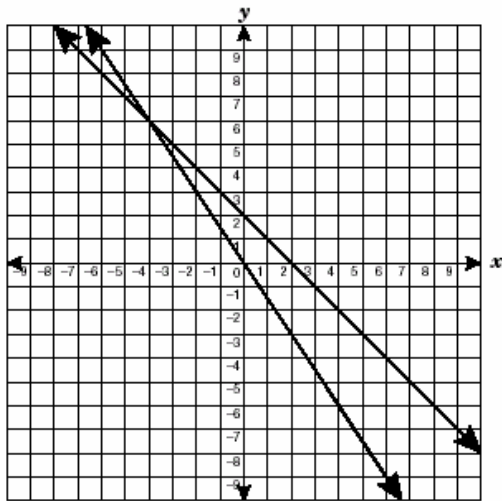
For the eleventh-grade exit level, students should be able to:

- ◆ Translate linear relationships among various forms;

- ◆ Recognize linear equations in numerous forms, such as slope-intercept, standard, etc.;
- ◆ Work with both x- and y-intercepts; and
- ◆ Solve problems involving linear functions and proportional change, with or without the key words “varies directly” in the item.

Objective 3 Sample Items

- 1 Two lines are shown on the grid. The two lines pass through $(-4, 6)$. One line passes through the origin, and the other passes through the point $(5, -3)$.



Which pair of equations below identifies these lines?

- A $y = -x + 2$ and $y = \frac{1}{2}x - \frac{3}{2}$
- B $y = \frac{1}{2}x$ and $y = x - 2$
- C $y = -\frac{1}{2}x$ and $y = -\frac{2}{3}x$
- D* $y = -x + 2$ and $y = -\frac{3}{2}x$

- 2 The amount of garbage produced in the United States varies directly with the number of people who produce it. It is estimated that on average 200 people produce 50 tons of garbage annually. Approximately how many tons of garbage are produced each year by 100,000 people?

- A 800 tons
- B* 25,000 tons
- C 125,000 tons
- D 400,000 tons

- 3 The cost of a long-distance telephone call is a function of the length of the call. The cost of 4 calls is shown in the table.

Minutes	Cost
5	\$0.60
15	\$1.80
25	\$3.00
60	\$7.20

If the data are graphed with minutes on the horizontal axis and cost on the vertical axis, what does the slope represent?

- A* A rate of \$0.12 per minute
- B The total cost per call
- C An average time of $8\frac{1}{3}$ minutes per call
- D A total time of 10 minutes between calls

TAKS 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.

(B) The student investigates methods for solving linear equations and inequalities using [concrete] models, graphs, and the properties of equality, selects a method, and solves the equations and inequalities.

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

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

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

Objective 4—For Your Information

For the eleventh-grade exit level, students should be able to:

- ◆ Recognize linear equations in numerous forms, such as slope-intercept, standard, etc.;
- ◆ Select an equation or inequality that can be used to find the solution;
- ◆ Find a solution expressed as a number or a range of numbers; and
- ◆ Look at solutions in terms of a given context and determine whether the solution is reasonable.

Objective 4 Sample Items

- 1 Mrs. Olsen rented a car on Monday at the rate of \$29 per day plus \$0.15 per mile driven. Her bill for Monday was \$44 for rental and mileage charges. Mrs. Olsen rented a car on Wednesday at the same rate and drove exactly 3 times as many miles as she drove on Monday. What was the amount of her bill Wednesday for rental and mileage charges?

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

		7	4	.			
0	0	0	0		0	0	0
1	1	1	1		1	1	1
2	2	2	2		2	2	2
3	3	3	3		3	3	3
4	4	4	●		4	4	4
5	5	5	5		5	5	5
6	6	6	6		6	6	6
7	7	●	7		7	7	7
8	8	8	8		8	8	8
9	9	9	9		9	9	9

This item asks for a *dollar* amount. On griddable items, students do not grid the dollar sign (\$). It is acceptable, although not necessary, to bubble in the zeros in front of the seven and/or after the decimal. These zeros will not affect the value of the correct answer.

- 2 The equations of two lines are

$$4x - 5y = -15 \text{ and } y = \frac{4}{5}x - 6$$

Which of the following describes their point of intersection?

- A (5, -2)
- B (-5, 1)
- C (10, -5)
- D* No intersection

- 3 Some students read a magazine article that said a person's height is a function of the length of the person's foot. The students used the equation $h = 8f - 7$ to represent the function, with h for height and f for foot length. The students recorded their heights and foot lengths in a table.

Student	Foot Length (inches)	Height (inches)
Mark	10	$67\frac{1}{2}$
Tyson	$10\frac{1}{2}$	68
Joanne	9	$65\frac{1}{4}$
Melinda	$7\frac{3}{4}$	62

Which is a valid statement about the accuracy of this equation for this set of data?

- A* It gives a reasonably accurate measure only for Joanne.
- B It does not give a reasonably accurate measure for any of the 4 students.
- C It gives an exact measure for at least 1 of these students.
- D It gives a reasonably accurate measure for everyone except Mark.

TAKS 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 $y = ax^2$.

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

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

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.

(A) The student solves quadratic equations using [concrete] models, tables, graphs, and algebraic methods.

(B) The student relates the solutions of quadratic equations to the roots of their 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 problem-solving situations.

Objective 5—For Your Information

For the eleventh-grade exit level, students should be able to:

- ◆ Recognize how the graph of the parabola is modified when the quadratic equation changes; and
- ◆ Determine reasonable solutions to quadratic equations based on the given context of the problem.

Objective 5 Sample Items

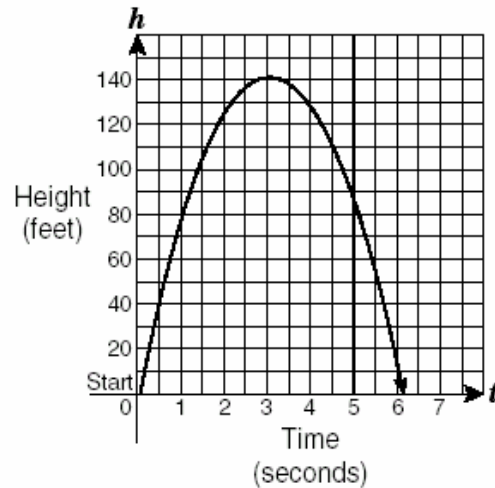
- 1 What is the effect on the graph of the equation $y = 2x^2$ when the equation is changed to $y = -2x^2$?

- A The x values for any given y are farther from the y -axis.
- B* The graph of $y = -2x^2$ is a reflection of $y = 2x^2$ across the x -axis.
- C The graph is rotated 90° about the origin.
- D The x values for any given y are closer to the y -axis.

-
- 2 A rocket was shot upward with an initial velocity of 144 feet per second. The height of the rocket is a function of t , the time in seconds since the rocket left the ground. The height can be expressed by the equation $h(t) = 144t - 16t^2$. How many seconds will it take for the rocket to return to the ground?

- A 4.5 sec
- B 6.5 sec
- C 8.0 sec
- D* 9.0 sec

- 3 A ball that was hit had an initial upward velocity of 96 feet per second. The function that describes the position of the ball at any time after it was hit is $h = 96t - 16t^2$, where t is the time in seconds and h is the height in feet. The graph of this function is shown below.



Which is the best conclusion about the ball's action?

- A The ball traveled more than 300 feet in less than 6 seconds.
- B* The ball reached its maximum height in about 3 seconds.
- C The ball returned to the ground in less than 5 seconds.
- D The ball traveled more slowly as it approached the ground.

TAKS Objective 6

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

G(b)(4) **Geometric structure.** The student uses a variety of representations to describe geometric relationships and solve problems.

(A) The student selects an appropriate representation ([concrete,] pictorial, graphical, verbal, or symbolic) in order to solve problems.

G(c)(1) **Geometric patterns.** The student identifies, analyzes, and describes patterns that emerge from two- and three-dimensional geometric figures.

(A) The student uses numeric and geometric patterns to make generalizations about geometric properties, including properties of polygons, ratios in similar figures and solids, and angle relationships in polygons and circles.

(B) The student uses the properties of transformations and their compositions to make connections between mathematics and the real world in applications such as tessellations or fractals.

(C) The student identifies and applies patterns from right triangles to solve problems, including special right triangles (45-45-90 and 30-60-90) and triangles whose sides are Pythagorean triples.

G(e)(3) **Congruence and the geometry of size.** The student applies the concept of congruence to justify properties of figures and solve problems.

(A) The student uses congruence transformations to make conjectures and justify properties of geometric figures.

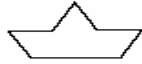
Objective 6—For Your Information

For the eleventh-grade exit level, students should be able to:

- ◆ Identify and use formal geometric terms; and
- ◆ Use geometric concepts, properties, theorems, and definitions to solve problems.

Objective 6 Sample Items

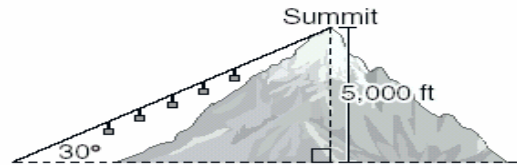
- 1 Charlotte designed a floor pattern for her new game room. She used only translations of the following tile to produce the pattern.



Which pattern did Charlotte produce?

- A
- B*
- C
- D

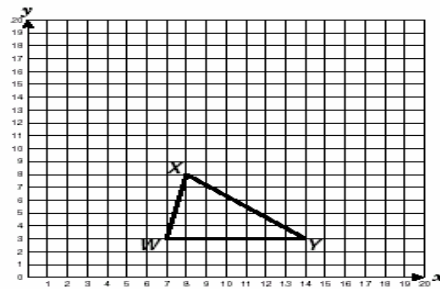
- 2 The cable cars of a ski lift rise 5,000 vertical feet from the base at a constant 30° angle of inclination.



What is the approximate straight-line distance that a cable car travels from the base to the summit of the mountain?

- A 2,500 ft
 B 2,900 ft
 C 8,500 ft
 D* 10,000 ft

- 3 $\triangle WXY$ is graphed on the coordinate grid below.



Which set of coordinates represents the vertices of a triangle congruent to $\triangle WXY$?

- A (2, 6), (2, 12), (7, 11)
 B* (2, 6), (2, 13), (7, 12)
 C (3, 8), (3, 13), (8, 12)
 D (3, 8), (3, 14), (8, 11)

TAKS Objective 7

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

G(d)(1)**Dimensionality and the geometry of location.** The student analyzes the relationship between three-dimensional objects and related two-dimensional representations and uses these representations to solve problems.

(B) The student uses nets to represent [and construct] three-dimensional objects.

(C) The student uses top, front, side, and corner views of three-dimensional objects to create accurate and complete representations and solve problems.

G(d)(2)**Dimensionality and the geometry of location.** The student understands that coordinate systems provide convenient and efficient ways of representing geometric figures and uses them accordingly.

(A) The student uses one- and two-dimensional coordinate systems to represent points, lines, line segments, and figures.

(B) The student uses slopes and equations of lines to investigate geometric relationships, including parallel lines, perpendicular lines, and [special segments of] triangles and other polygons.

(C) The student [develops and] uses formulas including distance and midpoint.

G(e)(2) **Congruence and the geometry of size.** The student analyzes properties and describes relationships in geometric figures.

(C) The student analyzes the characteristics of three-dimensional figures and their component parts.

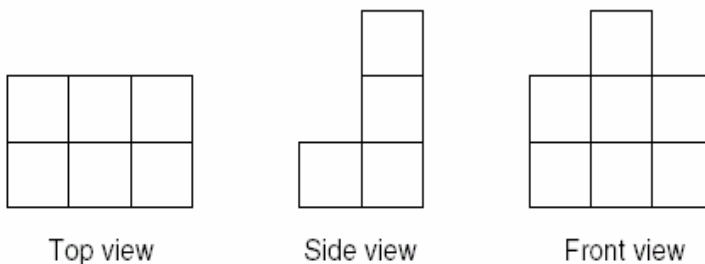
Objective 7—For Your Information

For the eleventh-grade exit level, students should be able to:

- ◆ Identify and use formal geometric terms;
- ◆ Use geometric concepts, properties, theorems, and definitions to solve problems; and
- ◆ Match a two-dimensional representation of a solid with a three-dimensional representation of the same solid or vice versa.

Objective 7 Sample Items

- 1 The top, side, and front views of an object built with cubes are shown below.



How many cubes are needed to construct this object?

- A** 7
B* 10
C 13
D 17
-
- 2 Two perpendicular lines with the equations $y = \frac{3}{7}x + 5$ and $y = mx - 3$ contain consecutive sides of a rectangle. What is the value of m in the second linear equation?
- A** $\frac{7}{3}$
B $\frac{3}{7}$
C $-\frac{3}{7}$
D* $-\frac{7}{3}$
- 3 A diameter of a circle has endpoints $P(-5, -4)$ and $Q(-1, 2)$. Find the approximate length of the radius.
- A** 2.2 units
B* 3.6 units
C 4.5 units
D 7.2 units

TAKS Objective 8

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

G(e)(1) **Congruence and the geometry of size.** The student extends measurement concepts to find area, perimeter, and volume in problem situations.

(A) The student finds areas of polygons and composite figures.

(B) The student finds areas of sectors and arc lengths of circles using proportional reasoning.

(C) The student develops, extends, and uses the Pythagorean Theorem.

(D) The student finds surface areas and volumes of prisms, pyramids, spheres, cones, and cylinders in problem situations.

G(f)(1) **Similarity and the geometry of shape.** The student applies the concepts of similarity to justify properties of figures and solve problems.

(A) The student uses similarity properties and transformations to [explore and] justify conjectures about geometric figures.

(B) The student uses ratios to solve problems involving similar figures.

(C) In a variety of ways, the student [develops,] applies, and justifies triangle similarity relationships, such as right triangle ratios, [trigonometric ratios,] and Pythagorean triples.

(D) The student describes the effect on perimeter, area, and volume when length, width, or height of a three-dimensional solid is changed and applies this idea in solving problems.

Objective 8—For Your Information

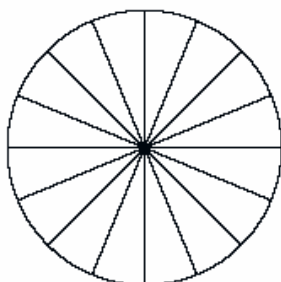
For the eleventh-grade exit level, students should be able to:

- ◆ Identify and use formal geometric terms;

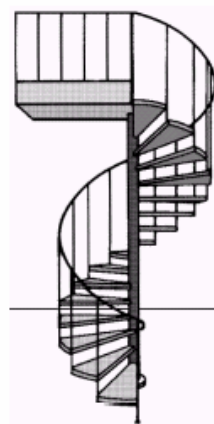
- ◆ Describe, in the form of a verbal expression or mathematical solution, the effect on perimeter, area, and volume when any measurement of a three-dimensional solid is changed (for example, if the sides of a rectangle are doubled in length, then the perimeter is doubled, and the area is four times the original area; if the edges of a cube are doubled in length, the volume is eight times the original volume); and
- ◆ Use geometric concepts, properties, theorems, formulas, and definitions to solve problems.

Objective 8 Sample Items

- 1 When viewed from above, a metal spiral staircase appears to be a circle, and each step appears to be a sector.



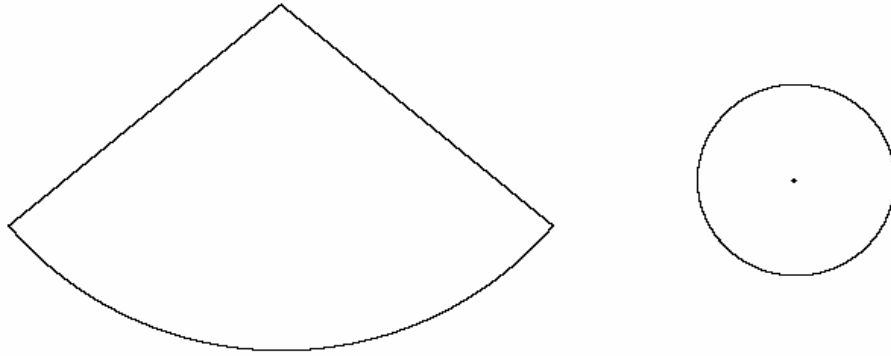
Top view



Side view

The staircase has a diameter of 5 feet 6 inches. A total of 16 steps can be used to form the circle. If the area of the center pole is ignored, what is the approximate area of the top surface of each step?

- A 177 in.²
 - B 207 in.²
 - C* 214 in.²
 - D 272 in.²
2. A two-dimensional representation of a right circular cone is shown below.

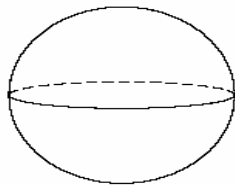


Use the ruler on the Mathematics Chart to measure the dimensions of the cone to the nearest tenth of a centimeter. Find the total surface area of the cone to the nearest square centimeter.

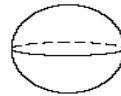
- A. 27 cm^2
- B. 35 cm^2
- C.* 45 cm^2
- D. 80 cm^2

This item specifically instructs students to measure the dimensions of the cone to the nearest tenth of a centimeter. Students need to use the correct ruler on the Mathematics Chart based on the unit of measure in the problem.

- 3 The radius of the larger sphere shown below was multiplied by a factor of $\frac{1}{2}$ to produce the smaller sphere.



Radius = r



Radius = $\frac{1}{2}r$

How does the surface area of the smaller sphere compare to the surface area of the larger sphere?

- A The surface area of the smaller sphere is $\frac{1}{2}$ as large.
- B The surface area of the smaller sphere is $\frac{1}{\pi}$ as large.
- C* The surface area of the smaller sphere is $\frac{1}{4}$ as large.
- D The surface area of the smaller sphere is $\frac{1}{8}$ as large.

Students should recognize that the scale factor is $\frac{1}{2}$. Therefore, the change in area is $(\frac{1}{2})^2$, or $\frac{1}{4}$.

TAKS 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.
- (8.11) **Probability and statistics.** The student applies concepts of theoretical and experimental probability to make predictions. The student is expected to
- (A) find the probabilities of compound events (dependent and independent); and
 - (B) use theoretical probabilities and experimental results to make predictions and decisions.
- (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; and
 - (C) construct circle graphs, bar graphs, and histograms, with and without technology.
- (8.13) **Probability and statistics.** The student evaluates predictions and conclusions based on statistical data. The student is expected to
- (C) recognize misuses of graphical or numerical information and evaluate predictions and conclusions based on data analysis.

Objective 9—For Your Information

For the eleventh-grade exit level, students should be able to:

- ◆ Choose a proportion that can be used to solve a problem situation or solve a problem situation by using a proportion;
- ◆ Understand and distinguish between theoretical probability and experimental results;
- ◆ Understand and distinguish between mean, median, mode, and range to determine which is most appropriate for a particular purpose;
- ◆ Match a given set of data in the form of a verbal description, chart, tally, graph, etc., with its circle graph, bar graph, or histogram or vice versa; and
- ◆ Interpret a set of data and match it to a statement describing a prediction or conclusion.

Objective 9 Sample Items

1 Richard bought a jacket priced at \$29.70. The total cost of the jacket, including sales tax, was \$32.15. What was the sales tax rate to the nearest hundredth of a percent?

- A 2.45%
- B 7.62%
- C* 8.25%
- D 12.12%

2 The table below shows high-temperature readings for a January day in various Texas cities.

City	High Temperature
Austin	46°F
Dallas	34°F
El Paso	45°F
Galveston	53°F
Houston	50°F
San Antonio	49°F

Which measure of the data would be least affected if the 53°F reading in Galveston had been 50°F?

- A Mean
- B* Median
- C Mode
- D Range

TAKS 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;

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

(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.

(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.

(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; and

(D) validate his/her conclusions using mathematical properties and relationship

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.

Objective 10—For Your Information

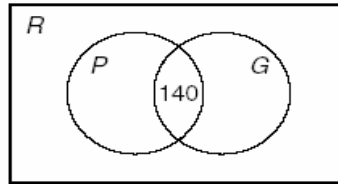
For the eleventh-grade exit level, students should be able to:

- ◆ Identify the equation that is being asked or answered;

- ◆ Identify the information that is needed to solve a problem;
- ◆ Select or describe the next step or a missing step that would be most appropriate in a problem-solving situation;
- ◆ Choose the correct supporting information for a given conclusion;
- ◆ Select the description of a mathematical situation when provided a written or pictorial prompt;
- ◆ Match informal language to mathematical language and/or symbols; and
- ◆ Draw a conclusion by investigating patterns and/or sets of examples and non-examples, which can be defined as counterexamples.

Objective 10 Sample Items

- 1 Rectangle R represents 250 students in eleventh grade at a school. Circle P represents the 200 students who went to a school pep rally. Circle G represents the 180 students who went to the big game. A total of 140 students went to both the pep rally and the big game.



Which table correctly shows the number of students who went only to the pep rally, went only to the big game, or went to neither?

A*

Event	Number of Students
Pep rally only	60
Big game only	40
Neither	10

C

Event	Number of Students
Pep rally only	50
Big game only	70
Neither	50

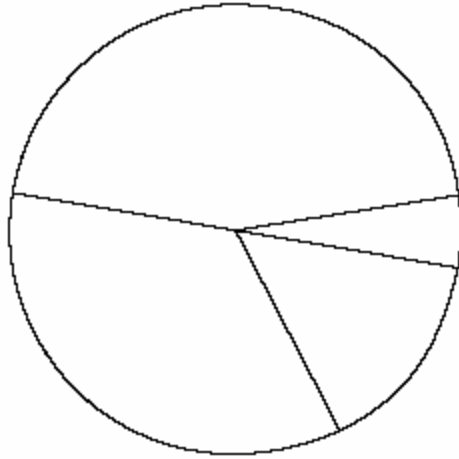
B

Event	Number of Students
Pep rally only	40
Big game only	60
Neither	10

D

Event	Number of Students
Pep rally only	70
Big game only	50
Neither	50

- 2 The circle graph most accurately represents which of the situations below?



- A** In the election for class president, Sarah received 40% of the votes, Eddie received 25%, Carol received 15%, and Matthew received 20%.
- B** During a special sale at Calvert Auto Mart, Edward sold 30% of the cars sold, Janet sold 5%, Edith sold 40%, and Mitch sold 25%.
- C** Mr. and Mrs. Johnson spent 30% of their income on housing, 25% on utilities, 35% on food, and 10% on miscellaneous expenses.
- D*** In a recent survey about favorite pets, 45% of those surveyed chose dogs, 35% chose cats, 5% chose horses, and 15% chose other animals.