

Grade 10 TAKS Mathematics—Objective 1

Understanding **functional relationships** is critical for algebra and geometry. Students need to understand that functions represent pairs of numbers in which the value of one number is dependent on the value of the other. This basic idea has major significance in areas such as science, social studies, and economics. From their understanding of functions, students should be able to communicate information using models, tables, graphs, diagrams, verbal descriptions, and algebraic equations or inequalities. Making inferences and drawing conclusions from functional relationships are also important skills for students because these skills will allow students to understand how functions relate to real-life situations and how real-life situations relate to functions. Mastering the knowledge and skills in Objective 1 at tenth grade will help students master the knowledge and skills in other TAKS objectives in tenth grade.

Objective 1 groups together the basic ideas of **functional relationships** included within the TEKS. The concepts of **patterns, relationships, and algebraic thinking** found in the lower grades form the foundation for Objective 1.

TAKS Objectives and TEKS Student Expectations

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 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.

Grade 10 TAKS Mathematics—Objective 2

Understanding the **properties and attributes of functions** is critical for algebra and geometry. Recognizing the similarities and differences between linear and quadratic functions is useful when evaluating and analyzing statistical data. The ability to work with and solve algebraic equations is useful for creating effective personal and business budgets that include shopping, fuel efficiency, car payments, etc. Mastering the knowledge and skills in Objective 2 at tenth grade will help students master the knowledge and skills in other TAKS objectives in tenth grade.

Objective 2 groups together the **properties and attributes of functions** found within the TEKS. The concepts of **patterns, relationships, and algebraic thinking** found in the lower grades form the foundation for Objective 2.

TAKS Objectives and TEKS Student Expectations

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?

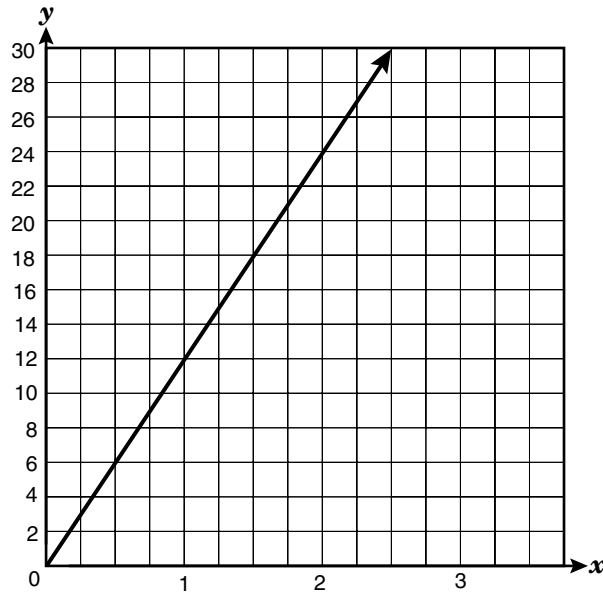
- A $l > 0$
- B* $l > 10$
- C $l < 10$
- D $l = 10$

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 —

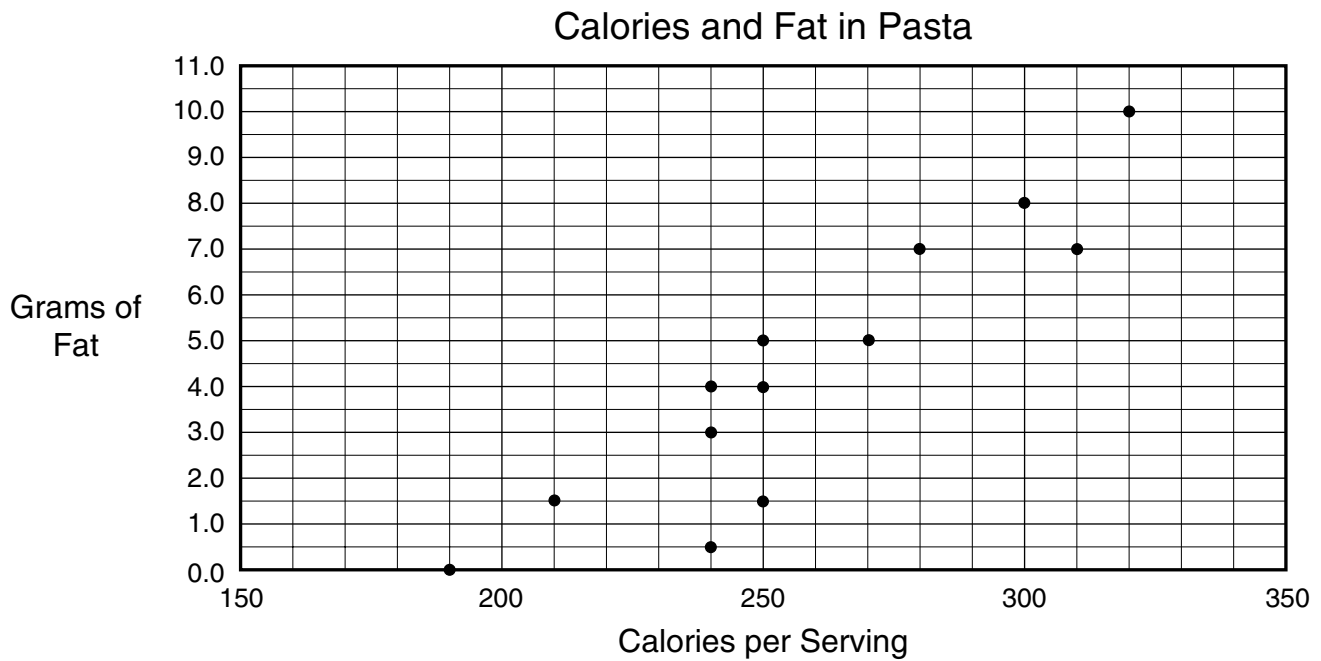
- A total mass of a crate filled with liters of cooking oil
- B total number of crates filled with liters of cooking oil
- C mass of each liter of cooking oil inside a crate
- D* number of liters of cooking oil packed into a crate

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

Grade 10 TAKS Mathematics—Objective 3

Understanding **linear functions** is critical for algebra and geometry. Students should understand that linear functions are pairs of numbers that can be represented by the graph of a line. Linear functions are an integral part of science, geography, and economics. The concept of rate of change between data points is used in everyday situations such as calculating taxicab or telephone-billing rates. Mastering the knowledge and skills in Objective 3 at tenth grade will help students master the knowledge and skills in other TAKS objectives in tenth grade.

Objective 3 groups together concepts of **linear functions** found within the TEKS. The concepts of **patterns, relationships, and algebraic thinking** found in the lower grades form the foundation for Objective 3.

TAKS Objectives and TEKS Student Expectations

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.

Grade 10 TAKS Mathematics—Objective 4

Understanding how to **formulate and use linear equations and inequalities** is critical for algebra and geometry. The ability to organize contextual problems into equations and inequalities or systems of equations and inequalities allows students to find and evaluate reasonable solutions in daily situations. For example, as students become more knowledgeable consumers, they may want to use a system of equations to determine which car-insurance company offers a better rate. Mastering the knowledge and skills in Objective 4 at tenth grade will help students master the knowledge and skills in other TAKS objectives in tenth grade.

Objective 4 groups together the ideas of how to **formulate and use linear equations and inequalities** found within the TEKS. The concepts of **patterns, relationships, and algebraic thinking** found in the lower grades form the foundation for Objective 4.

TAKS Objectives and TEKS Student Expectations

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 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	●		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.

Grade 10 TAKS Mathematics—Objective 5

Understanding **quadratic and other nonlinear functions** is critical for algebra and geometry. Students should understand that quadratic functions can be represented by the graph of a parabola. Graphs of quadratic functions can be used to represent data such as population growths in biology, projectile movements in physics, and compound interest in economics. In these and other examples, students should understand how changes in the functional situation affect the graph of the parabola. Understanding the correct use of exponents is essential in scientific fields such as medicine, astronomy, and microbiology. Mastering the knowledge and skills in Objective 5 in tenth grade will help students master the knowledge and skills in other TAKS objectives in tenth grade.

Objective 5 groups together the concepts of **quadratic and other nonlinear functions** found within the TEKS. The concepts of **patterns, relationships, and algebraic thinking** found in the lower grades form the foundation for Objective 5.

TAKS Objectives and TEKS Student Expectations

Objective 5

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

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

- (B) The student investigates, describes, and predicts the effects of changes in a on the graph of $y = ax^2$.
- (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 based 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 $(-4x^3y^2z)^3(4x^5y^4z^3)$?

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

Grade 10 TAKS Mathematics—Objective 6

Understanding **geometric relationships and spatial reasoning** is important because the structure of the world is based on geometric properties. The concepts covered in this objective are an integral part of many fields, such as physics, navigation, geography, and construction. These concepts build spatial-reasoning skills that help develop an understanding of distance and location. The knowledge and skills contained in Objective 6 will allow students to understand how the basic concepts of geometry are related to the real world. Mastering the knowledge and skills in Objective 6 at tenth grade will help students master the knowledge and skills in other TAKS objectives in tenth grade.

Objective 6 groups together the fundamental concepts of **geometric relationships and spatial reasoning** found within the TEKS. The concepts of **geometry and spatial reasoning** found in the lower grades form the foundation for Objective 6.

TAKS Objectives and TEKS Student Expectations

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.

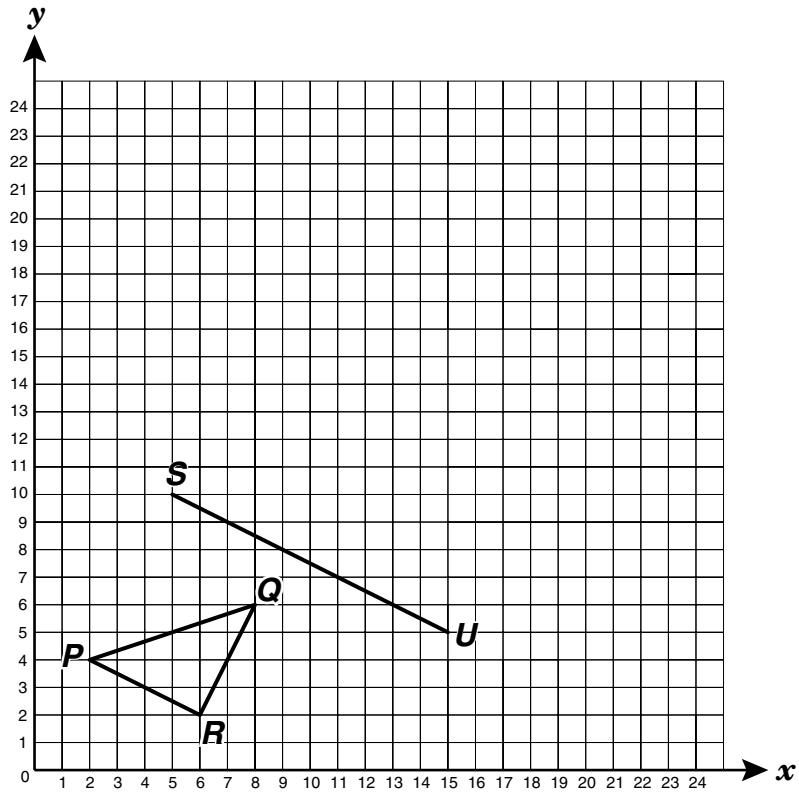
Objective 6—For Your Information

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

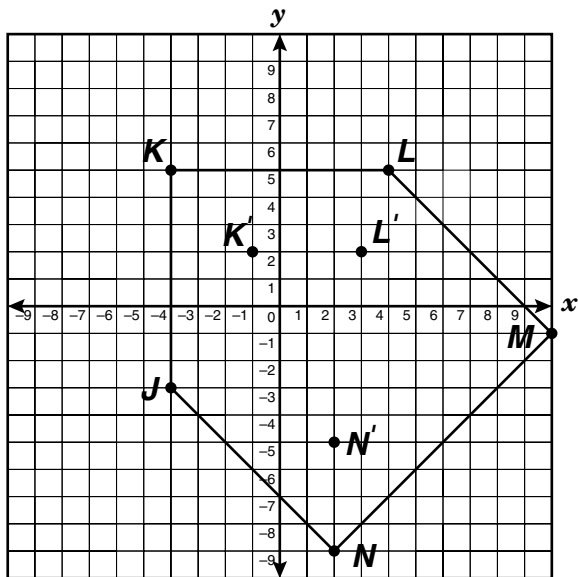
- 1 The graph shows $\triangle PQR$ with vertices $P(2, 4)$, $Q(8, 6)$, and $R(6, 2)$ and \overline{SU} with endpoints $S(5, 10)$ and $U(15, 5)$.



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 $M'(7, -1)$

Grade 10 TAKS Mathematics—Objective 7

Understanding **two- and three-dimensional representations of geometric relationships and shapes** is important because the structure of the world is based on geometric properties. The concepts covered in this objective are an integral part of many fields, such as molecular chemistry, aviation, pattern design, etc. These concepts build spatial-reasoning skills that help develop an understanding of distance, location, area, and space. The knowledge and skills contained in Objective 7 will allow students to understand how the basic concepts of geometry are related to the real world. Mastering the knowledge and skills in Objective 7 at tenth grade will help students master the knowledge and skills in other TAKS objectives in tenth grade.

Objective 7 groups together the fundamental concepts of **two- and three-dimensional shapes** found within the TEKS. The concepts of **geometry and spatial reasoning** found in the lower grades form the foundation for Objective 7.

TAKS Objectives and TEKS Student Expectations

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.

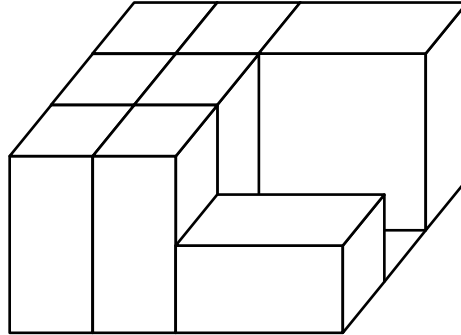
Objective 7—For Your Information

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

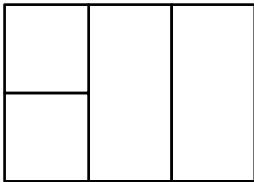
Objective 7 Sample Items

1 Look at the drawing of the solid below.

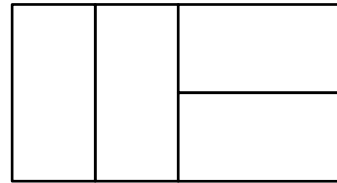


Which of the following is not a top, front, or side view of this solid?

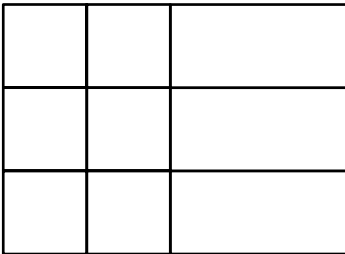
A



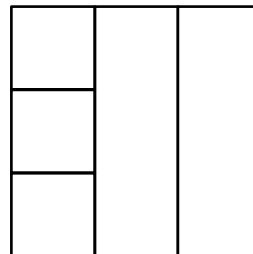
C



B



D*



- 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 type="radio"/>	<input checked="" 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 type="radio"/>	<input checked="" 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"/>

The correct answer is 130. 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.

Grade 10 TAKS Mathematics—Objective 8

Understanding the **concepts and uses of measurement and similarity** has many real-world applications and provides a basis for developing skills in geometry. These skills are important in real-world applications and in other academic disciplines. The concept of surface area is essential in everyday tasks, such as laying carpet, upholstering furniture, painting houses, etc. Businesses involved with packing and shipping find the effect of changes in area, perimeter, and volume critical in their work. Understanding the basic concepts included in Objective 8 will prepare students to apply measurement skills in various situations. Mastering the knowledge and skills found in Objective 8 at tenth grade will help students master the knowledge and skills found in other TAKS objectives in tenth grade.

Objective 8 groups together the **concepts and uses of measurement and similarity** found within the TEKS. The **concepts and uses of measurement** found in the lower grades form the foundation for Objective 8.

TAKS Objectives and TEKS Student Expectations

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

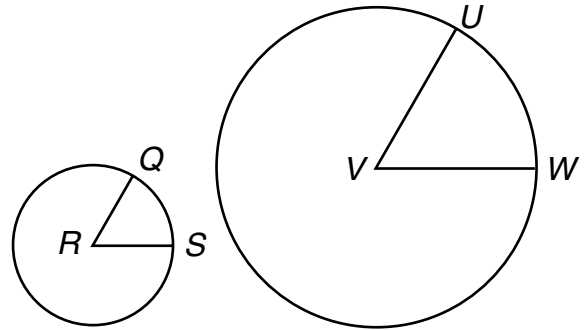
At tenth grade, students should be able to

- 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

Grade 10 TAKS Mathematics—Objective 9

Understanding **percents, proportional relationships, probability, and statistics** will help students become informed consumers of data and information. Percent calculations are important in retail, real estate, banking, taxation, etc. As students become more skilled in describing and predicting the results of a probability experiment, they should begin to recognize and account for all the possibilities of a given situation. Students should be able to compare different graphical representations of the same data and solve problems by analyzing the data presented. Students must be able to recognize appropriate and accurate representations of data in everyday situations and in information related to science and social studies (for example, in polls and election results). The knowledge and skills contained in Objective 9 are essential for processing everyday information. Mastering the knowledge and skills in Objective 9 at tenth grade will help students master the knowledge and skills in other TAKS objectives in tenth grade.

Objective 9 groups together the concepts of **percents, proportional relationships, probability, and statistics** found within the TEKS. The **probability and statistics** found in the lower grades form the foundation for Objective 9.

TAKS Objectives and TEKS Student Expectations

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

Grade 10 TAKS Mathematics—Objective 10

Knowledge and understanding of **underlying processes and mathematical tools** are critical for students to be able to apply mathematics in their everyday lives. Problems that occur in the real world often require the use of multiple concepts and skills. Students should be able to recognize mathematics as it occurs in real-life situations, generalize from mathematical patterns and sets of examples, select an appropriate approach to solving a problem, solve the problem, and then determine whether the answer is reasonable. Expressing these problem situations in mathematical language and symbols is essential to finding solutions to real-life problems. These concepts allow students to communicate clearly and use logical reasoning to make sense of their world. Students can then connect the concepts they have learned in mathematics to other disciplines and to higher mathematics. Through an understanding of the basic ideas found in Objective 10, students will be able to analyze and solve real-world problems. Mastering the knowledge and skills in Objective 10 at tenth grade will help students master the knowledge and skills in other TAKS objectives in tenth grade.

Objective 10 groups together the **underlying processes and mathematical tools** within the TEKS that are used in finding mathematical solutions to real-world problems. The **underlying processes and mathematical tools** found in the lower grades form the foundation for Objective 10.

TAKS Objectives and TEKS Student Expectations

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.

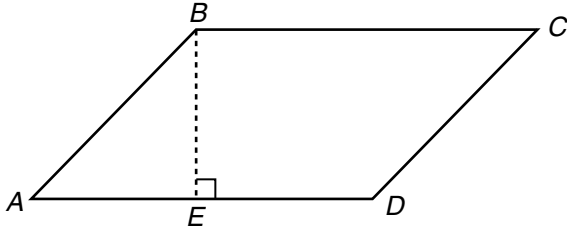
Objective 10—For Your Information

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 nonexamples, 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 $\angle BED$

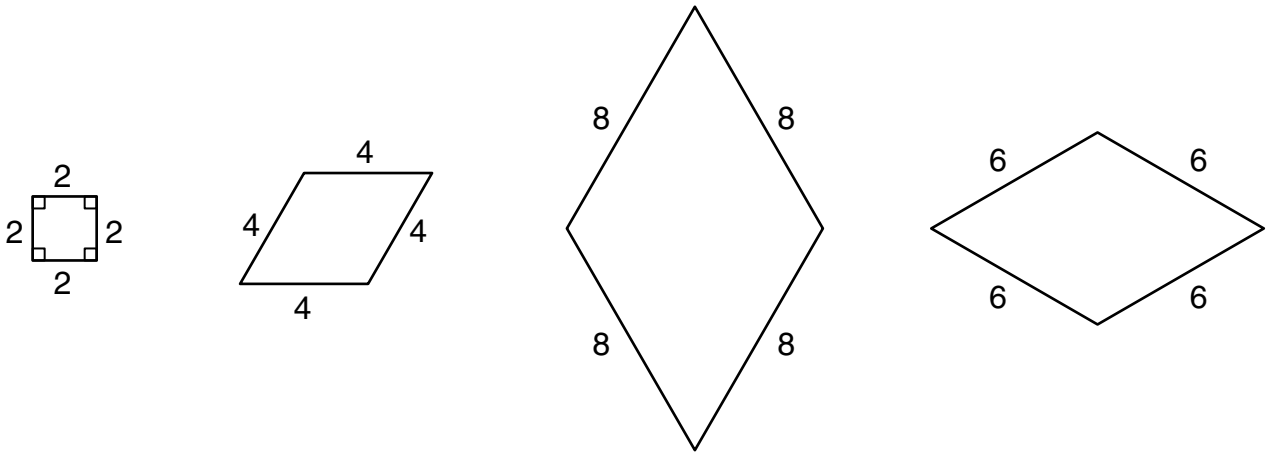
Although many combinations of additional data might provide sufficient information to find the height, students should be able to select from the given answer choices of additional data.

- 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.