

Massachusetts MCAS 2022

Grade 10 Math

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CONVERSIONS

1 cup = 8 fluid ounces

1 pint = 2 cups

1 quart = 2 pints

1 gallon = 4 quarts

1 gallon \approx 3.785 liters

1 liter \approx 0.264 gallon

1 liter = 1000 cubic centimeters

1 inch = 2.54 centimeters

1 meter \approx 39.37 inches

1 mile = 5280 feet

1 mile = 1760 yards

1 mile \approx 1.609 kilometers

1 kilometer \approx 0.62 mile

1 pound = 16 ounces

1 pound \approx 0.454 kilogram

1 kilogram \approx 2.2 pounds

1 ton = 2000 pounds

AREA (A) FORMULAS

square $A = s^2$

rectangle $A = lw$

parallelogram $A = bh$

triangle $A = \frac{1}{2}bh$

trapezoid $A = \frac{1}{2}h(b_1 + b_2)$

circle $A = \pi r^2$

TOTAL SURFACE AREA (SA) FORMULAS

cube $SA = 6s^2$

right square pyramid $SA = s^2 + 2s\ell$
(ℓ = slant height)

right rectangular prism . . $SA = 2(lw) + 2(hw) + 2(lh)$

VOLUME (V) FORMULAS

cube $V = s^3$
(s = length of an edge)

prism $V = Bh$

cylinder $V = \pi r^2 h$

cone $V = \frac{1}{3}\pi r^2 h$

pyramid $V = \frac{1}{3}Bh$

sphere $V = \frac{4}{3}\pi r^3$

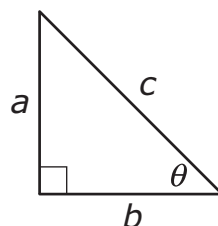
CIRCLE FORMULAS

pi $\pi \approx 3.14$

circumference $C = 2\pi r$ OR $C = \pi d$

area $A = \pi r^2$

RIGHT TRIANGLES



Pythagorean Theorem

$$a^2 + b^2 = c^2$$

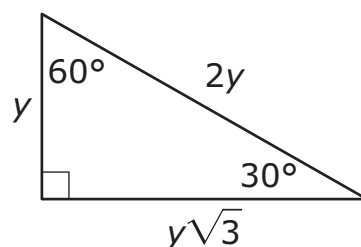
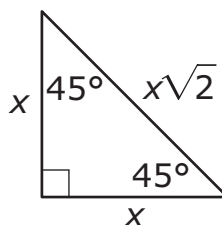
Trigonometric Ratios

$$\sin \theta = \frac{a}{c}$$

$$\cos \theta = \frac{b}{c}$$

$$\tan \theta = \frac{a}{b}$$

SPECIAL RIGHT TRIANGLES





*Release of Spring 2022
MCAS Test Items*

from the

*Grade 10 Mathematics
Paper-Based Test*

June 2022
**Massachusetts Department of
Elementary and Secondary Education**

Grade 10 Mathematics

SESSION 1

This session contains 21 questions.

You may use your reference sheet during this session.
*You may **not** use a calculator during this session.*



Directions

Read each question carefully and then answer it as well as you can. You must record all answers in this Test & Answer Booklet.

For some questions, you will mark your answers by filling in the circles in your Test & Answer Booklet. Make sure you darken the circles completely. Do not make any marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely.

For other questions, you will need to fill in an answer grid. Directions for completing questions with answer grids are provided on the next page.

If a question asks you to show or explain your work, you must do so to receive full credit. Write your response in the space provided. Only responses written within the provided space will be scored.

Directions for Completing Questions with Answer Grids

1. Work the question and find an answer.
2. Enter your answer in the answer boxes at the top of the answer grid.
3. Print only one number or symbol in each box. Do not leave a blank box in the middle of an answer.
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8. See below for examples of how to correctly complete an answer grid.

EXAMPLES

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- 1 What is the solution of this equation?

$$3(x + 5) = 5x - 7$$

- Ⓐ $x = -1$
- Ⓑ $x = 4$
- Ⓒ $x = 6$
- Ⓓ $x = 11$

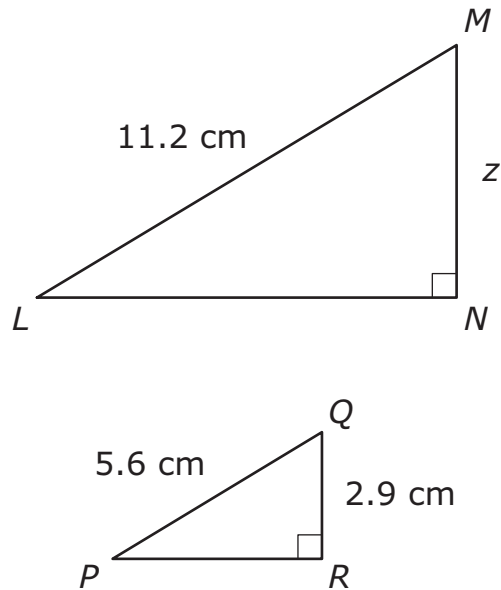
- 2 Two car rental companies each charge a fixed fee for renting a car, plus an additional amount for each mile the car is driven.

- Company A charges a fixed fee of \$25 plus \$0.10 per mile.
- Company B charges a fixed fee of \$15 plus \$0.20 per mile.

Which pair of equations can be used to determine y , the total amount, in dollars, a customer will be charged for renting a car from Company A or Company B and driving it x miles?

- Ⓐ Company A: $y = 0.25x + 10$
Company B: $y = 0.15x + 20$
- Ⓑ Company A: $y = 0.10x + 25$
Company B: $y = 0.20x + 15$
- Ⓒ Company A: $y = 10x + 0.25$
Company B: $y = 20x + 0.15$
- Ⓓ Company A: $y = 25x + 0.10$
Company B: $y = 15x + 0.20$

- 3 Triangle LMN is similar to triangle PQR . The triangles and some of their dimensions are shown in this diagram.



Based on the dimensions in the diagram, what is the value of z ?

- Ⓐ 2.7 cm
- Ⓑ 4.8 cm
- Ⓒ 5.8 cm
- Ⓓ 8.3 cm

- 4 Consider this expression.

$$8x^2 + 16x + 24$$

Which of the following is equivalent to the expression?

- Ⓐ $8(x^2 + 16x + 24)$
- Ⓑ $8(x^2 + 2x) + 3$
- Ⓒ $8(x^2 + 2x + 3)$
- Ⓓ $8(x^2 + 5x)$

- 5 The first five terms of an arithmetic sequence are shown.

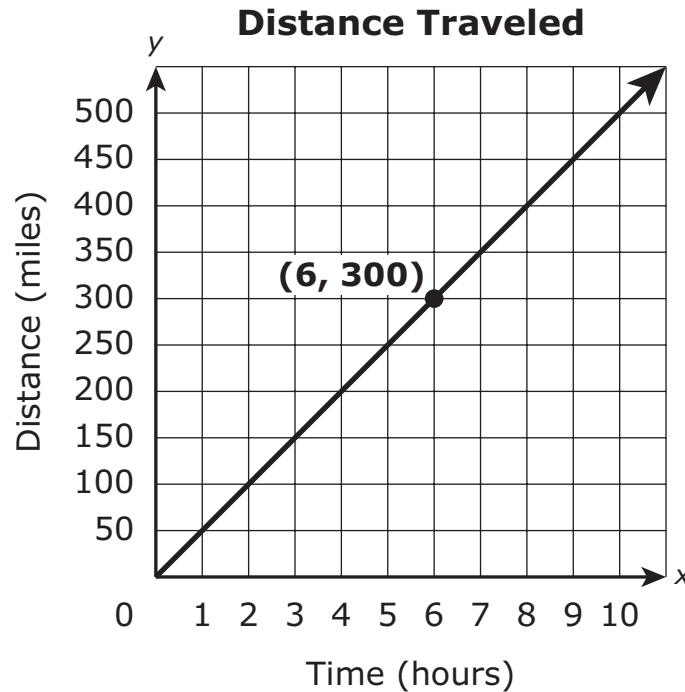
$$2, 6, 10, 14, 18, \dots$$

Which of the following expressions represents the n th term of the sequence?

- Ⓐ $3n$
- Ⓑ $4n$
- Ⓒ $3n - 1$
- Ⓓ $4n - 2$

This question has four parts. Be sure to label each part of your response.

- 6 This graph models the linear relationship between the distance a car traveled and time.

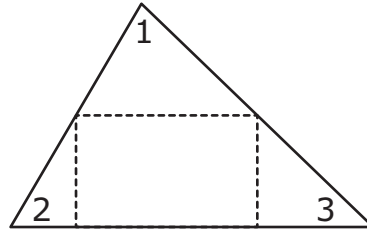


- A. What does the point (6, 300) represent in this situation?
- B. Based on the graph, what was the average speed of the car? Show or explain how you got your answer.
- C. A second car traveled a distance of 209 miles in 5 hours and 6 minutes. **Estimate** the average speed of the second car. Show or explain how you got your answer.
- D. A third car traveled at an average speed of 61 miles per hour for 8 hours and 28 minutes. **Estimate** the total distance the third car traveled. Show or explain how you got your answer.

6

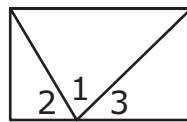
- 7 A student performed a demonstration to illustrate a property of triangles.

First, the student created a paper triangle with angles 1, 2, and 3, as shown in this diagram.



Paper Triangle

Then the student folded the triangle along the dotted lines, shown in the diagram above, to create the rectangle below.



Rectangle

What property of triangles is **best** illustrated by the student's demonstration?

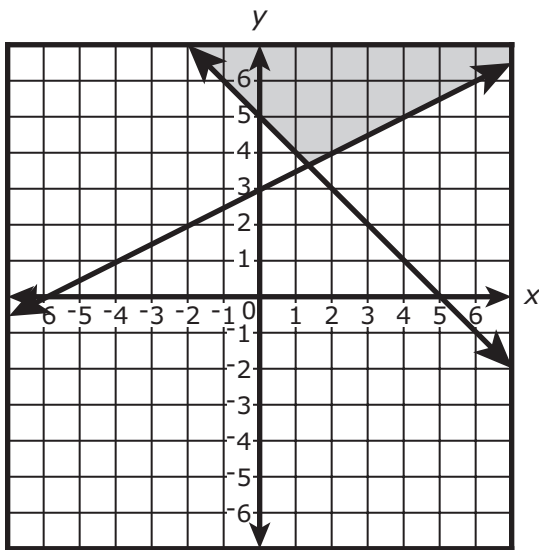
- Ⓐ The sum of the interior angle measures of a triangle is equal to 180° .
- Ⓑ The sum of the exterior angle measures of a triangle is equal to 180° .
- Ⓒ The sum of the exterior angle measures of a triangle is equal to 360° .
- Ⓓ The sum of any two side lengths of a triangle is greater than the length of its third side.

- 8 Which of the following graphs represents the solution set of this system of inequalities?

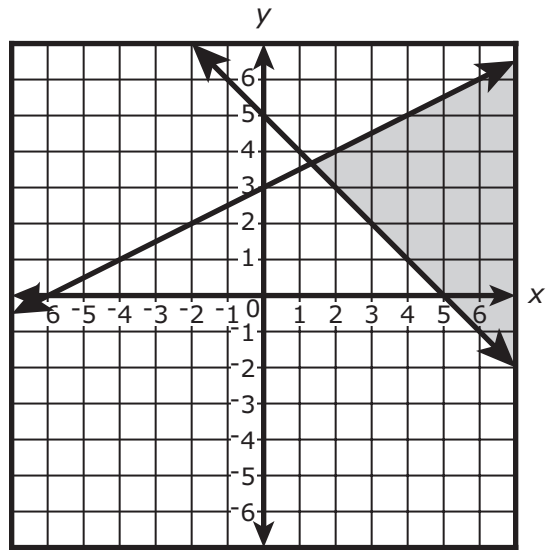
$$y \geq \frac{1}{2}x + 3$$

$$y \geq -x + 5$$

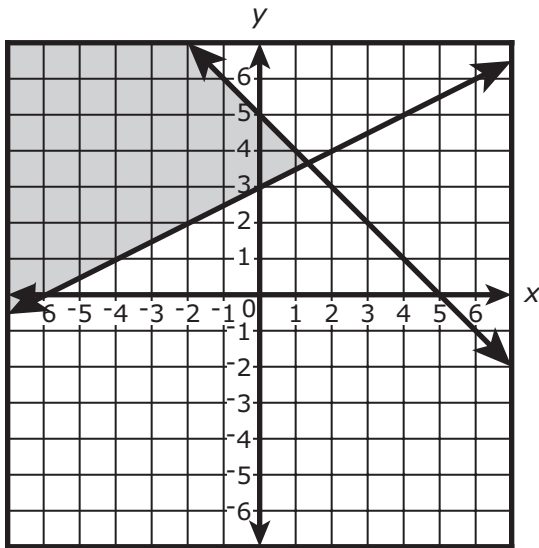
(A)



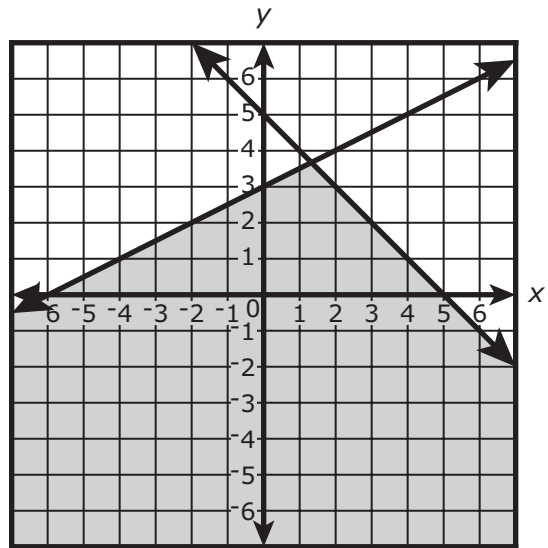
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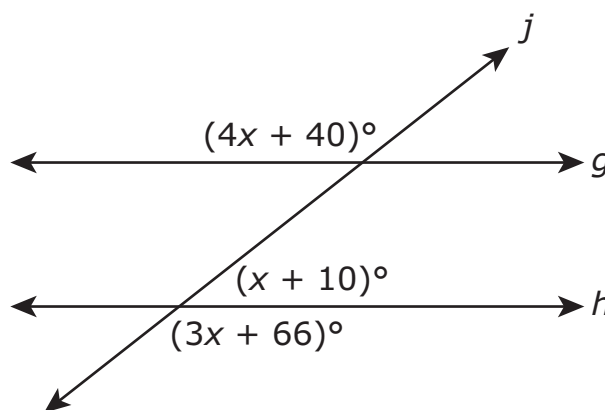
(C)



(D)



- 9 Parallel lines g and h are intersected by line j . Lines g , h , j , and expressions representing angle measurements are shown in this diagram.



Based on the diagram, which of the following equations is **not** always true?

- Ⓐ $(x + 10) + (3x + 66) = 180$
 - Ⓑ $(4x + 40) + (x + 10) = 180$
 - Ⓒ $(3x + 66) = (4x + 40)$
 - Ⓓ $(x + 10) = (4x + 40)$
- 10 Which of the following is equivalent to this expression?

$$7 - 2(4x - 3y)$$

- Ⓐ $7 - 8x + 6y$
- Ⓑ $7 - 8x + 3y$
- Ⓒ $7 - 8x - 3y$
- Ⓓ $7 - 8x - 6y$

This question has two parts.

- 11** The volume, V , of a cylinder with radius r and height h can be found using this equation.

$$V = \pi r^2 h$$

Part A

Which of the following equations has been correctly rearranged to solve for h ?

Ⓐ $h = V + \pi r^2$

Ⓑ $h = V - \pi r^2$

Ⓒ $h = \frac{\pi r^2}{V}$

Ⓓ $h = \frac{V}{\pi r^2}$

Part B

Which of the following equations has been correctly rearranged to solve for r ?

Ⓐ $r = \sqrt{\frac{\pi h}{V}}$

Ⓑ $r = \sqrt{\frac{V}{\pi h}}$

Ⓒ $r = \frac{\pi h}{2V}$

Ⓓ $r = \frac{V}{2\pi h}$

- 12 Consider this expression.

$$(x^3y^5)^4(x^3y^2)^{-2}$$

Which of the following is equivalent to the expression?

- Ⓐ xy^5
- Ⓑ $x^{12}y$
- Ⓒ x^6y^{16}
- Ⓓ $x^{18}y^{24}$

This question has four parts. Be sure to label each part of your response.

- 13 A student received a gift card to use at a coffee shop. The student used the gift card to spend the same amount of money at the coffee shop every day until the remaining value of the card was \$0. This function represents $f(n)$, the value, in dollars, of the gift card after n days.

$$f(n) = -2.5n + 75$$

- A. Based on the function, what was the original value, in dollars, of the gift card? Show or explain how you got your answer.
- B. Based on the function, how much money, in dollars, did the student spend each day at the coffee shop? Show or explain how you got your answer.
- C. What was the remaining value, in dollars, of the gift card after 20 days? Show or explain how you got your answer.
- D. How many days in total did it take until the remaining value of the gift card was \$0? Show or explain how you got your answer.

13

This question has two parts.

- 14 This function models retail sales data in the United States from 2000 to 2017.

$$R(t) = 263.3 + 11.6t$$

In the model,

- t represents the number of years **since** 2000, and
- R represents the amount, in billions of dollars, of retail sales for the year.

Part A

Based on the model, what was the amount, in billions of dollars, of retail sales in the United States for the year 2000?

Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.

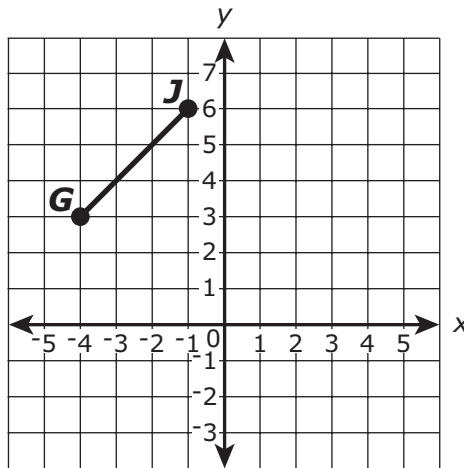
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Part B

Based on the model, which of the following statements about retail sales in the United States from 2000 to 2017 is true?

- Ⓐ Retail sales increased by an average of \$11.6 billion each year.
- Ⓑ Retail sales increased by an average of \$22.7 billion each year.
- Ⓒ Retail sales increased by an average of \$263.3 billion each year.
- Ⓓ Retail sales increased by an average of \$274.9 billion each year.

- 15 Segment GJ is shown on this coordinate plane.



Which of the following **best** describes a transformation of the segment that will result in an image that is **parallel** to segment GJ ?

- Ⓐ a reflection over the x -axis
- Ⓑ a reflection over the y -axis
- Ⓒ a 90° clockwise rotation about the origin
- Ⓓ a 180° clockwise rotation about the origin

- 16** Consider this function.

$$f(x) = 3x^2 - 7$$

The graph of $f(x)$ is translated 4 units down to create the graph of $g(x)$.

Which of the following functions represents $g(x)$?

- Ⓐ $g(x) = -x^2 - 3$
- Ⓑ $g(x) = -x^2 - 11$
- Ⓒ $g(x) = 3x^2 - 3$
- Ⓓ $g(x) = 3x^2 - 11$

- 17** The area of a square is represented by this expression.

$$g^2 + 8g + 16$$

Which of the following expressions represents the length of one side of the square?

- Ⓐ $g + 16$
- Ⓑ $g + 8$
- Ⓒ $g + 4$
- Ⓓ $g + 2$

This question has two parts.

18 Part A

Consider this expression.

$$(\sqrt{n^3})^4$$

Which of the following is equivalent to the expression for all positive values of n ?

- Ⓐ n^3
- Ⓑ n^6
- Ⓒ n^7
- Ⓓ n^{12}

Part B

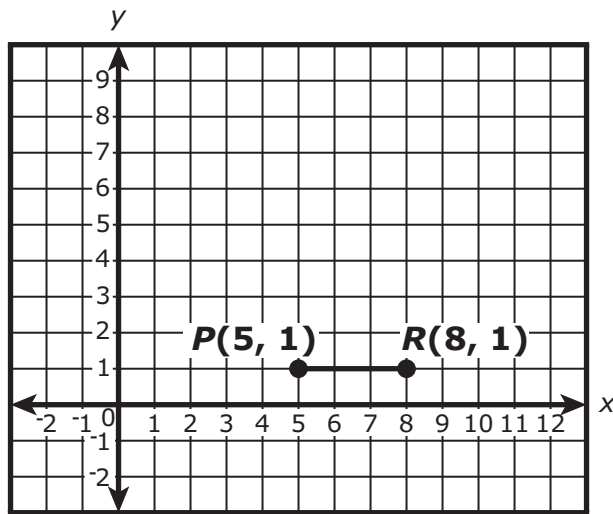
Consider this expression.

$$(x)(\sqrt[5]{x^4})$$

Which of the following is equivalent to the expression for all positive values of x ?

- Ⓐ $x^{\frac{2}{10}}$
- Ⓑ $x^{\frac{4}{9}}$
- Ⓒ $x^{\frac{9}{5}}$
- Ⓓ $x^{\frac{5}{2}}$

- 19 Line segment PR is shown on this coordinate plane.



Point R is rotated 180° clockwise about point P .

Which of the following are the coordinates of its image, R' ?

- Ⓐ $(2, 1)$
- Ⓑ $(5, -2)$
- Ⓒ $(8, -2)$
- Ⓓ $(11, 1)$

- 20 What is the y -value in the solution of this system of equations?

$$3x + y = 3$$

$$-2x + y = -12$$

- Ⓐ $y = -6$
 Ⓑ $y = -3$
 Ⓒ $y = 3$
 Ⓓ $y = 6$

- 21 In right triangle QRS , the length of side \overline{QR} is equal to one-half the length of hypotenuse \overline{QS} .

What is the measure, in degrees, of $\angle S$?

Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.

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Grade 10 Mathematics

SESSION 2

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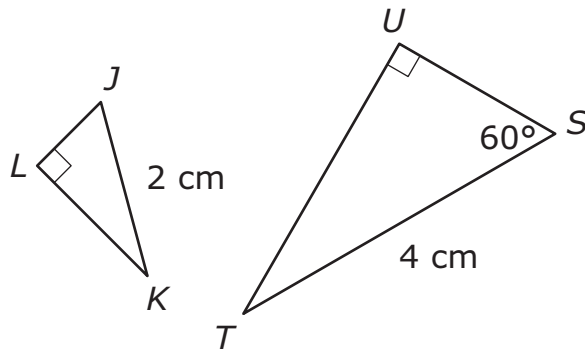
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9	●	9	9	9	9	9

- 22 In this diagram, $\triangle JKL \sim \triangle STU$.



Based on the measurements in the diagram, what is the measure of $\angle K$?

- Ⓐ 15°
- Ⓑ 30°
- Ⓒ 45°
- Ⓓ 60°

- 23 Which list shows the rates, which relate distance and time, in order from least to greatest?
- Ⓐ 100,000 yards per hour
1 mile per minute
100 feet per second
 - Ⓑ 100 feet per second
1 mile per minute
100,000 yards per hour
 - Ⓒ 1 mile per minute
100 feet per second
100,000 yards per hour
 - Ⓓ 100 feet per second
100,000 yards per hour
1 mile per minute
- 24 A bag contains 21 red marbles and 4 blue marbles, all of the same size and shape. Two marbles will be randomly selected from the bag. The first marble will **not** be returned to the bag before the second marble is selected.
- Given that the first marble selected is blue, what is the probability that the second marble selected will also be blue?
- Ⓐ $\frac{3}{24}$
 - Ⓑ $\frac{3}{25}$
 - Ⓒ $\frac{4}{24}$
 - Ⓓ $\frac{4}{25}$

- 25 A ball is dropped from the top of a ladder and bounces on the ground several times. A student measures the maximum height of each bounce.

This function models $h(n)$, the maximum height, in inches above the ground, of the ball during its n th bounce.

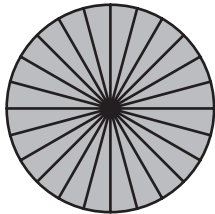
$$h(n) = 96(0.55)^n$$

What does the value 96 represent in the function?

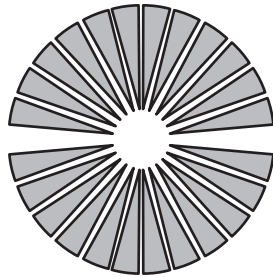
- Ⓐ the number of times the ball bounces
- Ⓑ the initial height of the ball before it is dropped
- Ⓒ the decrease in the height of the ball per bounce
- Ⓓ the factor by which the height of each bounce is multiplied

- 26 A circle with a diameter of 10 centimeters is divided into 24 equal sectors. The sectors are separated and rearranged to create the figures shown in the steps of this diagram.

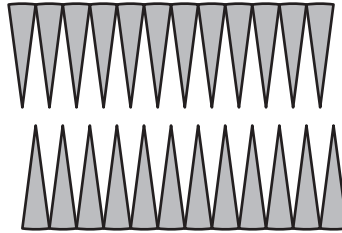
10 cm



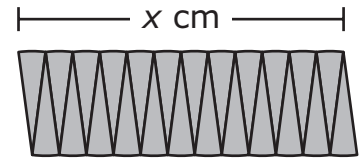
Step 1



Step 2



Step 3



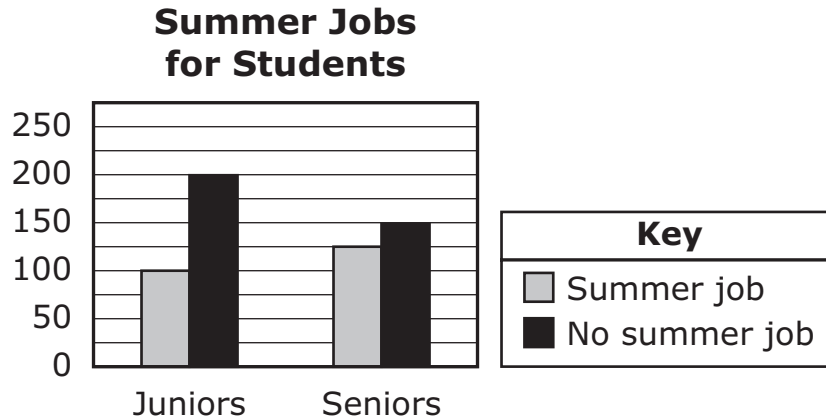
Step 4

The length of the figure in Step 4 of the diagram is x centimeters. Which of the following is **closest** to the value of x ?

- Ⓐ 12
- Ⓑ 16
- Ⓒ 24
- Ⓓ 32

This question has four parts. Be sure to label each part of your response.

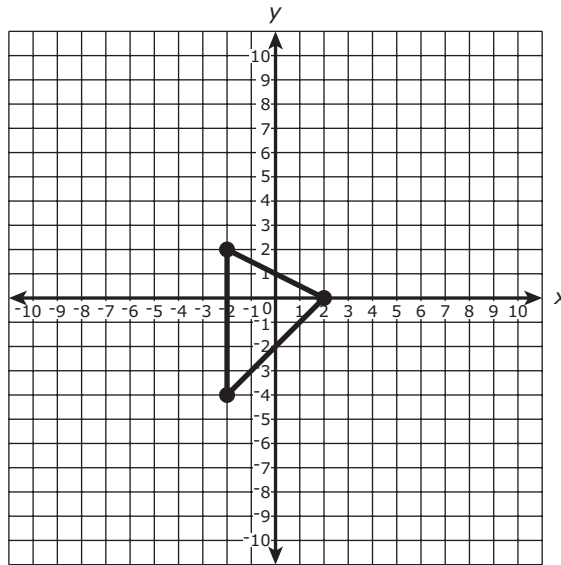
- 27 All juniors and seniors at a high school were surveyed about whether they had ever had a summer job. This graph shows the data from the survey.



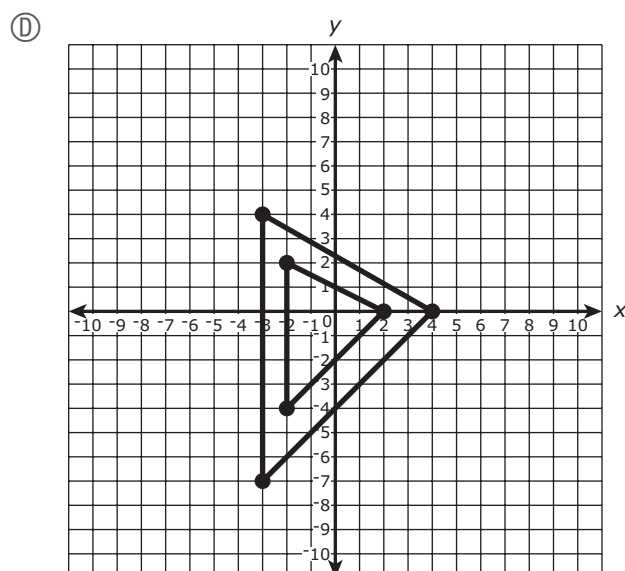
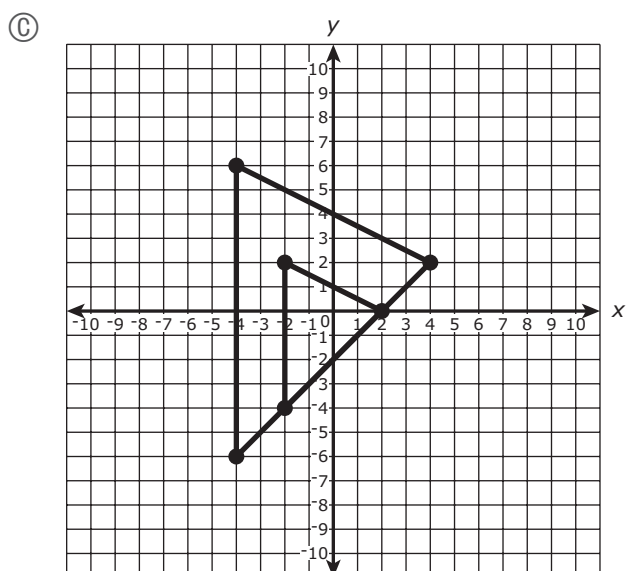
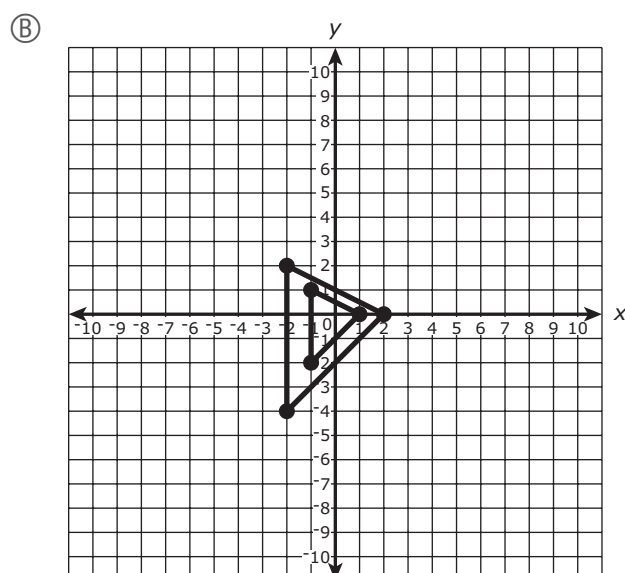
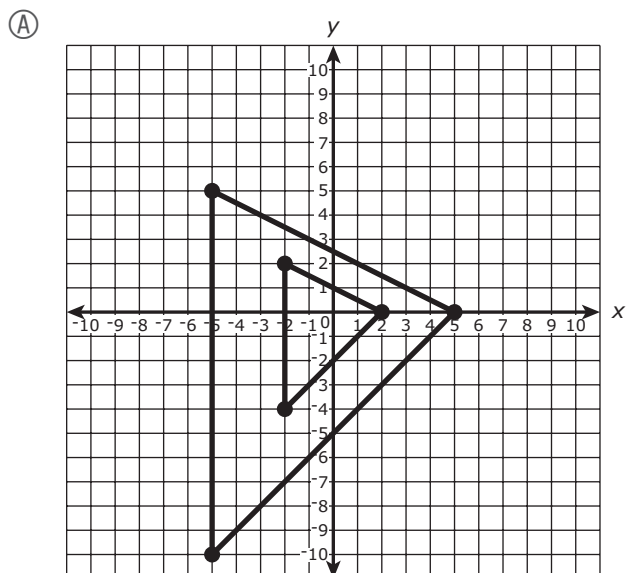
- A. Based on the graph, what is the total number of students who were surveyed?
- B. Based on the graph, what is the probability that a randomly selected student had a summer job **and** is a junior? Show or explain how you got your answer.
- C. Based on the graph, what is the probability that a randomly selected student had a summer job given that the student is a junior? Show or explain how you got your answer.
- D. Based on the graph, are juniors or seniors more likely to have had a summer job? Explain your answer using conditional probabilities.

27

- 28** A triangle is shown on this coordinate plane. The triangle will be dilated by a scale factor of 2.5 with respect to the origin.



Which of the following graphs correctly shows the triangle and its image after the dilation?



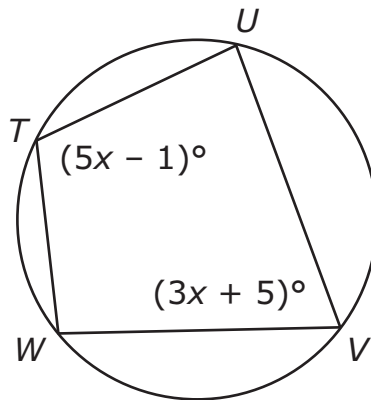
29 A restaurant serves iced tea in small glasses and large glasses.

- 1 small glass and 2 large glasses contain a total of 48 fluid ounces of iced tea.
- 2 small glasses and 3 large glasses contain a total of 76 fluid ounces of iced tea.

What is the total number of fluid ounces contained in 1 **large** glass of iced tea?

- Ⓐ 8
- Ⓑ 14
- Ⓒ 20
- Ⓓ 28

- 30 This diagram shows a circle and an inscribed quadrilateral, with angle measures represented by expressions.



Based on the diagram, what is $m\angle V$?

- Ⓐ 68°
- Ⓑ 71°
- Ⓒ 109°
- Ⓓ 136°

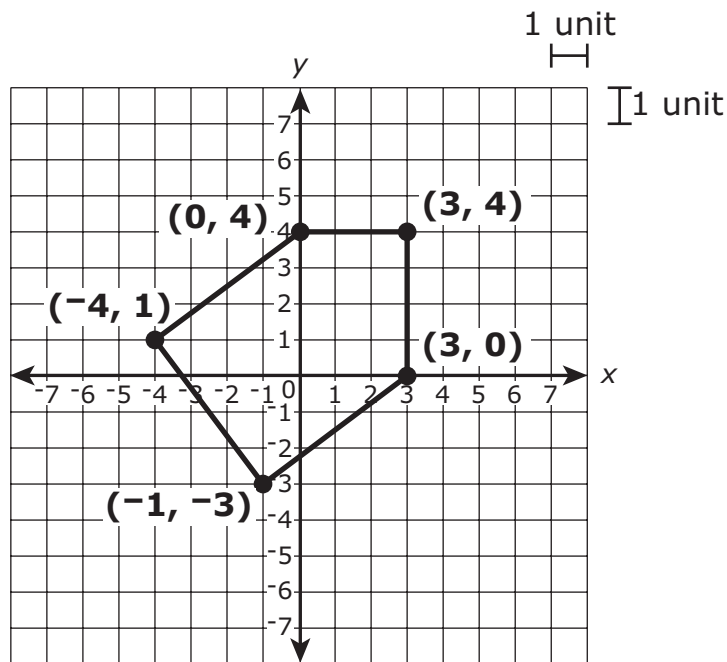
- 31 It takes a barber between 20 and 30 minutes to give a customer a haircut.
- The barber will give haircuts for a total of 8 hours today.
 - He has already spent 96 minutes cutting hair today.

What is a reasonable estimate of the number of **additional** haircuts the barber can give today?

- Ⓐ 16
- Ⓑ 24
- Ⓒ 32
- Ⓓ 40

This question has two parts.

- 32** A pentagon is graphed on this coordinate plane.



Part A

What is the perimeter, in units, of the pentagon?

- Ⓐ 17.8 units
- Ⓑ 22 units
- Ⓒ 23.2 units
- Ⓓ 27 units

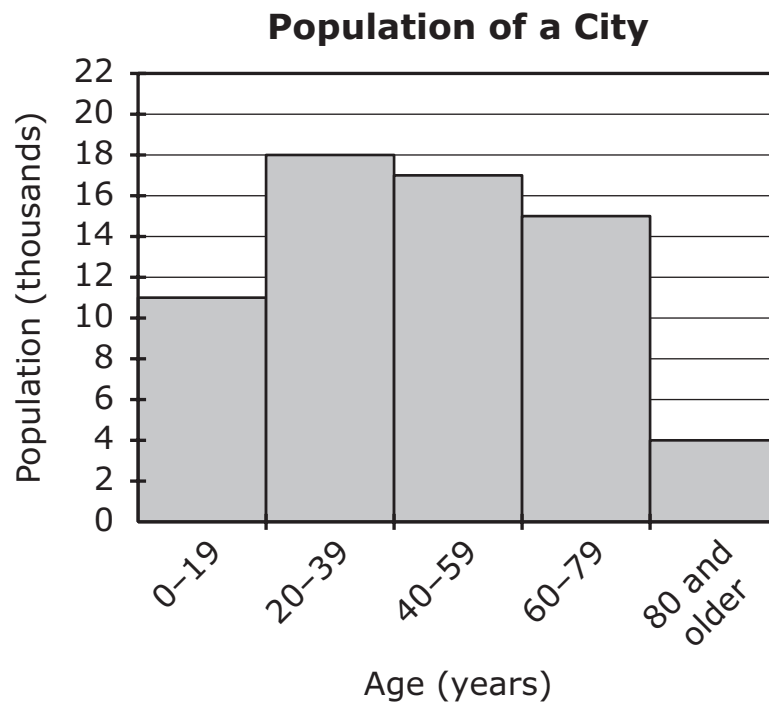
Part B

What is the area, in square units, of the pentagon?

Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.

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

- 33 This histogram shows the populations, in thousands, of different age groups in a city.



Based on the histogram, what fraction of the total population of the city is between the ages of 20 and 59?

- Ⓐ $\frac{17}{65}$
- Ⓑ $\frac{18}{65}$
- Ⓒ $\frac{30}{65}$
- Ⓓ $\frac{35}{65}$

This question has four parts. Be sure to label each part of your response.

34

A vase in the shape of a right circular cylinder has a diameter of 22 centimeters.

A. What is the area, in square centimeters, of the base of the vase? Show or explain how you got your answer.

B. The vase is partially filled with water to a depth of 10 centimeters.

What is the volume, in cubic centimeters, of the water in the vase? Show or explain how you got your answer.

C. A solid sphere with a diameter of 12 centimeters is placed into the vase.

What is the volume, in cubic centimeters, of the sphere? Show or explain how you got your answer.

D. The sphere sinks to the bottom of the vase. As a result, the water level rises, but the water does not overflow.

What is the total number of centimeters the water level in the vase rises when the sphere sinks to the bottom? Show or explain how you got your answer.

34

This question has two parts.

- 35** A student has an after-school job. This function models the amount of money, in dollars, the student earns for working h hours in a week.

$$M(h) = 12.5h$$

The student can work a maximum of 20 hours in a week.

Part A

Which of the following is the domain of the function?

- Ⓐ $0 \leq h \leq 12.5$
- Ⓑ $0 \leq h \leq 20$
- Ⓒ $12.5 \leq h \leq 20$
- Ⓓ $12.5 \leq h \leq 32.5$

Part B

Which of the following is the range of the function?

- Ⓐ $0 \leq M(h) \leq 650$
- Ⓑ $0 \leq M(h) \leq 250$
- Ⓒ $125 \leq M(h) \leq 250$
- Ⓓ $250 \leq M(h) \leq 650$

36 Triangle EFG is similar to triangle JKL .

- The measure of $\angle E$ is 32° .
- The measure of $\angle K$ is 49° .

What is the measure of $\angle F$?

- Ⓐ 32°
- Ⓑ 49°
- Ⓒ 81°
- Ⓓ 99°

- 37 A marketing company surveyed random customers from two age groups about their favorite type of juice. The results of the survey are shown in this table.

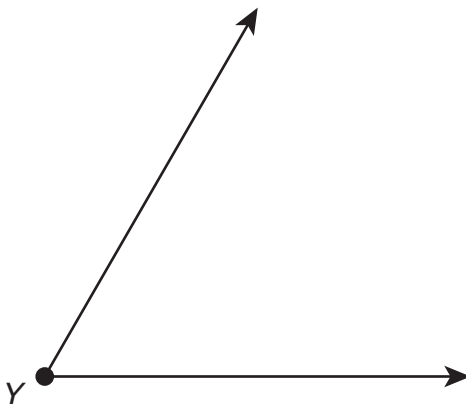
		Favorite Juice			
		Type of Juice			
		Apple	Orange	Grape	Total
Age of Customer	Less Than 30	80	120	50	250
	30 or Greater	140	70	40	250
	Total	220	190	90	500

Based on the table, what percentage of the customers surveyed chose apple juice as their favorite type of juice?

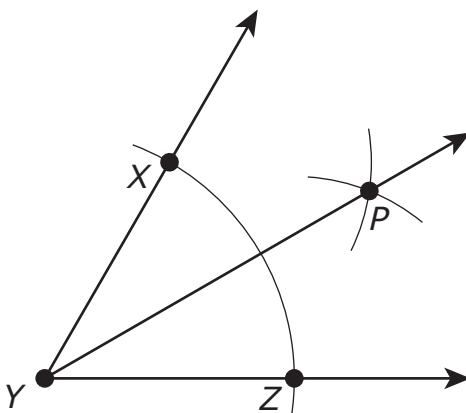
Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.

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<div>⊙</div>	<div>⊙</div>	<div>⊙</div>	<div>⊙</div>	<div>⊙</div>	<div>⊙</div>	<div>⊙</div>	<div>⊙</div>
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<div>9</div>	<div>9</div>	<div>9</div>	<div>9</div>	<div>9</div>	<div>9</div>	<div>9</div>	<div>9</div>

- 38 Consider $\angle Y$.



A compass and a straightedge were used to perform a construction given $\angle Y$. This diagram shows the completed construction.



These steps were followed to complete the construction.

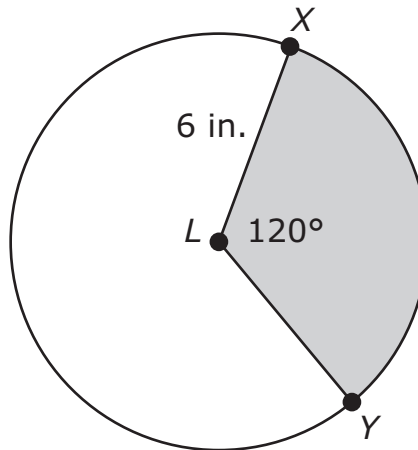
- An arc was drawn, with the compass, from point Y through the sides of the angle to create point X and point Z .
- Two arcs were drawn, each with the same compass setting, one from point X and one from point Z . The arcs intersect to create point P .
- A ray was drawn, with the straightedge, from point Y through point P .

Based on the construction, which of the following is **not** true?

- Ⓐ $m\angle PYX = m\angle PYZ$
- Ⓑ $m\angle XYZ = \frac{1}{2}(m\angle PYZ)$
- Ⓒ ray YP is an angle bisector of $\angle XYZ$
- Ⓓ point P is equidistant from points X and Z

This question has two parts.

- 39 This diagram shows circle L , central angle XY , and some of their measurements.



Part A

Which of the following is **closest** to the area, in square inches, of the shaded sector of circle L ?

- Ⓐ 9.4
- Ⓑ 18.8
- Ⓒ 28.3
- Ⓓ 37.7

Part B

What is the length, to the nearest **tenth** of an inch, of \widehat{XY} ?

Enter your answer in the answer boxes at the top of the answer grid **and** completely fill the matching circles.

$\frac{\square}{\square}$							
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0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

- 40 Which of the following can **not** be modeled by a linear function?
- Ⓐ The total cost of purchasing apples that cost 60 cents each.
 - Ⓑ As 5-pound bricks are added to a cart, the total weight increases.
 - Ⓒ The number of people registered on a website doubles every month.
 - Ⓓ The total distance traveled by a turtle walking at a constant speed increases over time.

- 41 The coordinates of each vertex of quadrilateral $LMNP$ are listed.

- $L(x, y)$
- $M(2x, -y)$
- $N(-2x, -y)$
- $P(-x, y)$

In quadrilateral $LMNP$, $x = y$, and $x \neq 0$. What type of quadrilateral is $LMNP$?

- Ⓐ square
- Ⓑ rhombus
- Ⓒ trapezoid
- Ⓓ rectangle

- 42 All the students in Mr. Greene's class are either 17 years old or 18 years old.

- There are a total of 20 students in Mr. Greene's class.
- The sum of the ages of the 20 students is 345 years.

What is the total number of **17-year-old** students in Mr. Greene's class?

- Ⓐ 5
- Ⓑ 8
- Ⓒ 12
- Ⓓ 15

Grade 10 Mathematics
Spring 2022 Released Operational Items

PBT Item No.	Page No.	Reporting Category	Standard	Item Type*	Item Description	Correct Answer**
1	4	<i>Algebra and Functions</i>	A-REI.B.3	SR	Determine the solution of a linear equation in one variable.	D
2	4	<i>Algebra and Functions</i>	A-CED.A.2	SR	Identify linear equations in two variables that represent a real-world situation.	B
3	5	<i>Geometry</i>	G-SRT.B.5	SR	Given two similar triangles, use a proportional relationship to determine an unknown side length.	C
4	6	<i>Algebra and Functions</i>	A-SSE.A.2	SR	Factor a trinomial expression to identify an equivalent expression.	C
5	6	<i>Algebra and Functions</i>	F-BF.A.2	SR	Determine an expression that represents an arithmetic sequence, given its first five terms.	D
6	7–8	<i>Number and Quantity</i>	N-Q.A.2	CR	Interpret the units in a graph that represents a real-world situation and estimate solutions of associated problems.	
7	9	<i>Geometry</i>	G-CO.C.10	SR	Identify the triangle theorem that is illustrated by a folded paper demonstration.	A
8	10	<i>Algebra and Functions</i>	A-REI.D.12	SR	Identify the graph of the solution set of a system of linear inequalities in two variables.	A
9	11	<i>Geometry</i>	G-CO.C.9	SR	Identify an equation that may not be true based on a diagram featuring parallel lines and a transversal.	D
10	11	<i>Algebra and Functions</i>	A-APR.A.1	SR	Expand a polynomial expression to create an equivalent expression.	A
11	12	<i>Algebra and Functions</i>	A-CED.A.4	SR	Rearrange an equation to solve for different aspects of the formula it represents.	D;B
12	13	<i>Number and Quantity</i>	N-RN.A.2	SR	Given an exponential expression, use properties of exponents to identify an equivalent expression.	C
13	13–14	<i>Algebra and Functions</i>	F-IF.A.2	CR	Evaluate a linear function over specific values of its domain and interpret given values of the function in terms of a real-world context.	
14	15–16	<i>Statistics and Probability</i>	S-ID.C.7	SA	Interpret the slope and the y-intercept of a linear model based on real-world data.	263.3;A
15	17	<i>Geometry</i>	G-CO.A.4	SR	Describe a transformation of a line segment that will result in a parallel image.	D
16	18	<i>Algebra and Functions</i>	F-BF.B.3	SR	Identify an equation that represents the graph of a function after it has been translated.	D
17	18	<i>Algebra and Functions</i>	A-SSE.B.3	SR	Factor a quadratic expression to solve a real-world problem.	C
18	19	<i>Number and Quantity</i>	N-RN.A.1	SR	Identify equivalent radical expressions using rational exponents.	B;C
19	20	<i>Geometry</i>	G-CO.A.2	SR	Determine the coordinates of an end point of a line segment, graphed on a coordinate plane, after a rotation.	A
20	21	<i>Algebra and Functions</i>	A-REI.C.6	SR	Determine the y-value of the solution of a system of linear equations.	A
21	21	<i>Geometry</i>	G-SRT.C.6	SA	Determine an angle measure in a right triangle based on the relationship of two of the triangle's side lengths.	30
22	24	<i>Geometry</i>	G-SRT.B.5	SR	Determine an unknown angle measure based on a diagram of two similar triangles.	B
23	25	<i>Number and Quantity</i>	N-Q.A.1	SR	Compare rates that relate distance and time, given in different units.	A

PBT Item No.	Page No.	Reporting Category	Standard	Item Type*	Item Description	Correct Answer**
24	25	<i>Statistics and Probability</i>	S-CP.A.3	SR	Compute a conditional probability based on dependent events in a real-world situation.	A
25	26	<i>Algebra and Functions</i>	F-LE.B.5	SR	Interpret the parameters of an exponential function based on a real-world context.	B
26	27	<i>Geometry</i>	G-GMD.A.1	SR	Use dissections to find the partial circumference of a circle.	B
27	28–29	<i>Statistics and Probability</i>	S-CP.B.6	CR	Calculate compound and conditional probabilities from data displayed in a graph and interpret the graph in terms of the probabilities.	
28	30–31	<i>Geometry</i>	G-SRT.A.1	SR	Identify the graph of a triangle on a coordinate plane after a dilation.	A
29	32	<i>Algebra and Functions</i>	A-CED.A.2	SR	Create two-variable linear equations and use them to solve a real-world problem.	C
30	33	<i>Geometry</i>	G-C.A.3	SR	Determine the measure of an angle of a quadrilateral inscribed in a circle.	B
31	34	<i>Number and Quantity</i>	N-Q.A.3	SR	Use estimation and rounding strategies to solve a real-world problem.	A
32	35–36	<i>Geometry</i>	G-GPE.B.7	SA	Calculate the perimeter and the area of a pentagon graphed on a coordinate plane.	B;31
33	37	<i>Statistics and Probability</i>	S-ID.A.1	SR	Interpret a histogram based on a set of real-world data.	D
34	38–39	<i>Geometry</i>	G-GMD.A.3	CR	Use volume formulas for cylinders and spheres to solve real-world problems.	
35	40	<i>Algebra and Functions</i>	F-IF.B.5	SR	Determine the domain and range of a linear function based on a real-world context.	B;B
36	41	<i>Geometry</i>	G-SRT.A.3	SR	Determine the measure of an angle in one of a pair of similar triangles.	B
37	42	<i>Statistics and Probability</i>	S-ID.B.5	SA	Calculate a marginal relative frequency from data in a two-way table.	44
38	43–44	<i>Geometry</i>	G-CO.D.12	SR	Interpret the results of the construction of an angle bisector.	B
39	45–46	<i>Geometry</i>	G-C.B.5	SA	Determine the area of a sector of a circle and its arc length given the radius of the circle and a central angle measure.	D;12.5
40	46	<i>Algebra and Functions</i>	F-LE.A.1	SR	Identify a situation which can not be modeled by a linear function.	C
41	47	<i>Geometry</i>	G-GPE.B.4	SR	Determine the nature of a quadrilateral given its coordinates represented by expressions.	C
42	47	<i>Algebra and Functions</i>	A-CED.A.1	SR	Create a one-variable equation, based on a real-world context, and use the equation to solve a problem.	D

* Mathematics item types are: selected-response (SR), short-answer (SA), and constructed-response (CR).

** Answers are provided here for selected-response and short-answer items only. Sample responses and scoring guidelines for constructed-response items will be posted to the Department's website later this year.