MASSACHUSETTS COMPREHENSIVE ASSESSMENT SYSTEM

PRACTICE TEST

Mathematics

Grade 10

Student Name

School Name

District Name

MASSACHUSETTS
Department of Elementary and Secondary Education

Grade 10 Mathematics

PRACTICE TEST

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 Practice Test Booklet.

For some questions, you will mark your answers by filling in the circles in your Practice Test 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.
4. Under each answer box, fill in the circle that matches the number or symbol you wrote above. Make a solid mark that completely fills the circle.
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6. Fractions cannot be entered into an answer grid and will not be scored. Enter fractions as decimals.
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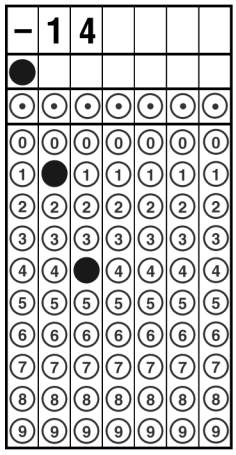
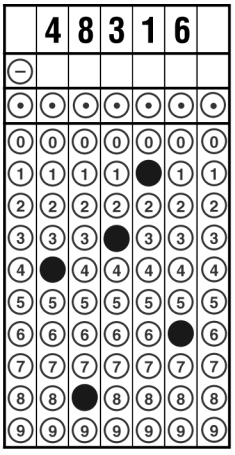
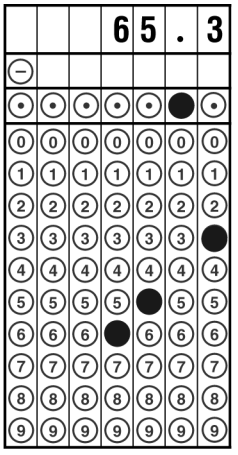
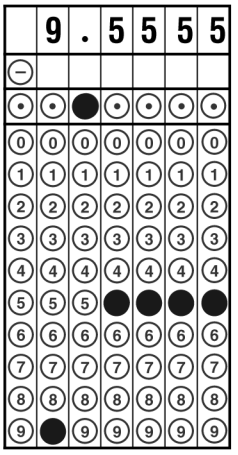
8. See below for examples of how to correctly complete an answer grid.

Examples

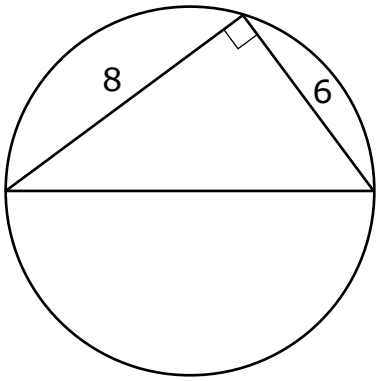








1 This diagram shows a circle with an inscribed right triangle and some of its measurements, in units.



Based on the diagram, what is the circumference, in units, of the circle?

Ⓐ 5π

Ⓑ 10π

Ⓒ 14π

Ⓓ 25π

2 Consider this expression.

$$\sqrt[3]{t}$$

Which of the following are equivalent to the expression for all positive values of t?

Select the **three** equivalent expressions.

Ⓐ $t^{\frac{1}{3}}$

Ⓑ $t^{\frac{2}{3}}$

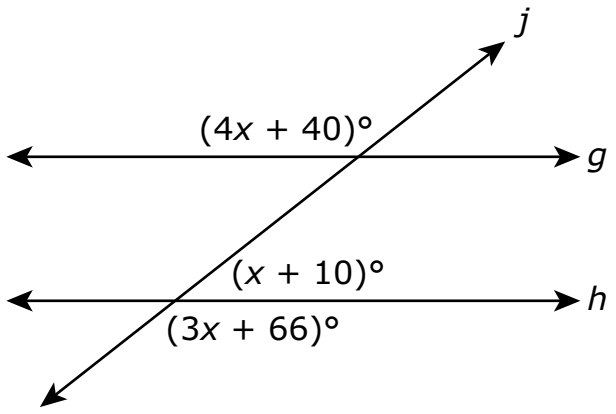
Ⓒ $t^{\frac{3}{2}}$

Ⓓ $\frac{t^{\frac{1}{3}}}{t^{\frac{2}{3}}}$

Ⓔ $\frac{t^{\frac{2}{3}}}{t^{\frac{1}{3}}}$

Ⓕ $\frac{t^{\frac{4}{3}}}{t}$

3 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?

Ⓐ $(x + 10) + (3x + 66) = 180$

Ⓑ $(4x + 40) + (x + 10) = 180$

Ⓒ $(3x + 66) = (4x + 40)$

Ⓓ $(x + 10) = (4x + 40)$

4 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 $g(x)$?

Ⓐ $g(x) = -x^2 - 3$

Ⓑ $g(x) = -x^2 - 11$

Ⓒ $g(x) = 3x^2 - 3$

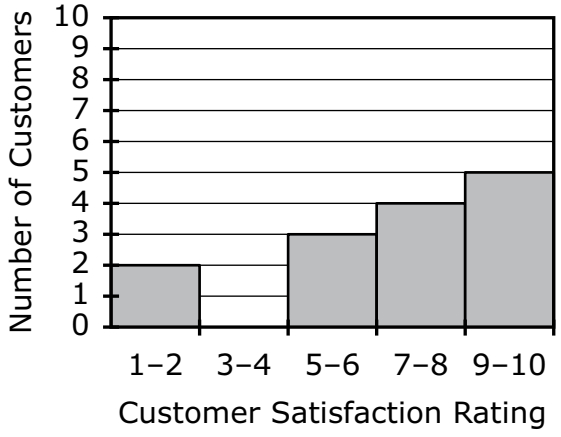
Ⓓ $g(x) = 3x^2 - 11$

5 A survey was given to fifteen customers at a store. The customers rated their satisfaction with the store on a scale from 1 to 10. The ratings from the survey are shown in this list.

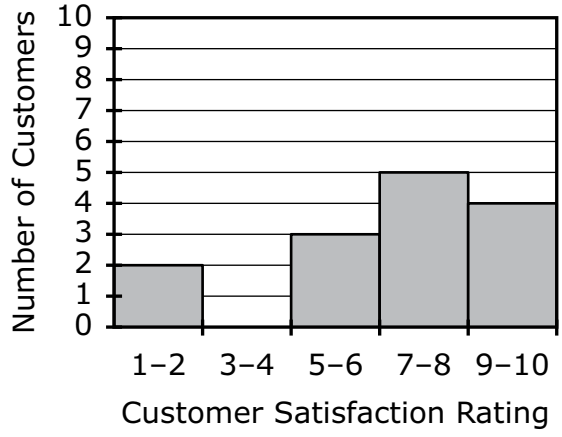
8, 9, 2, 7, 10, 1, 7, 6, 9, 8, 5, 5, 9, 7, 10

Which histogram shows the correct distribution of customer satisfaction ratings?

Ⓐ



Ⓑ



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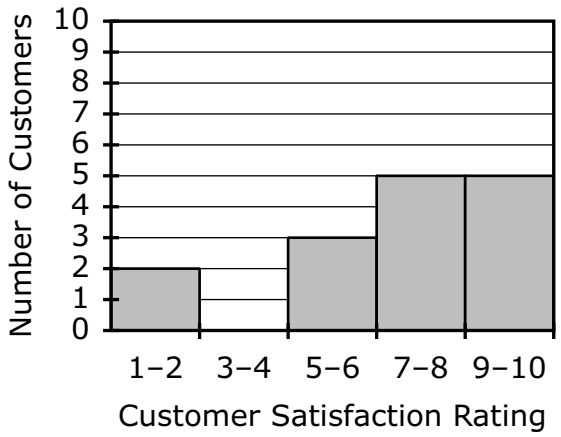
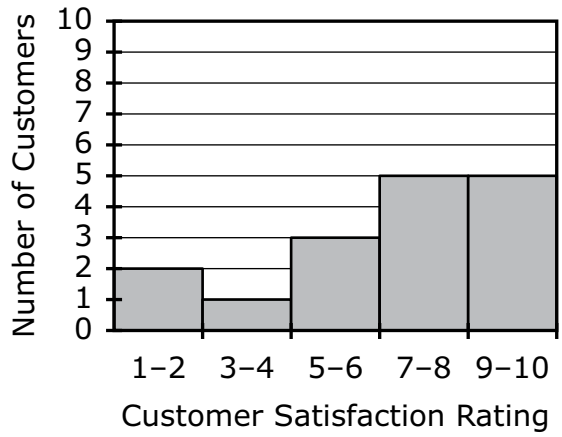
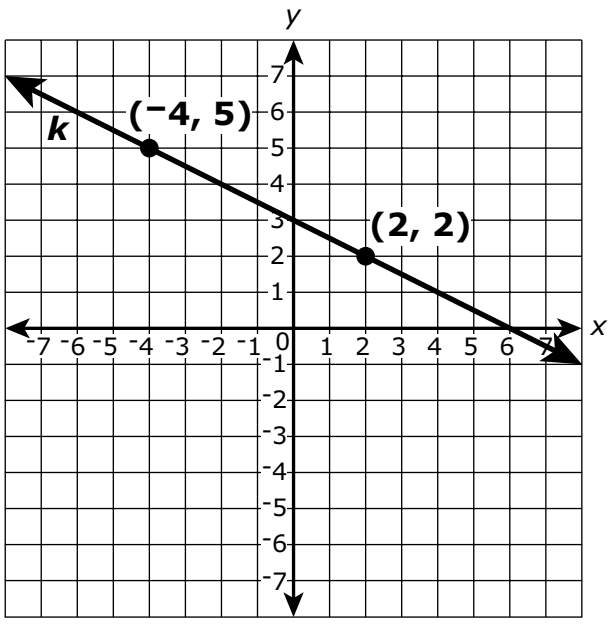


Ⓓ



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

6 Line *k* is shown on this coordinate plane.



A. What is the slope of line *k*? Show or explain how you got your answer.

B. Line *p* is parallel to line *k*. The *y*-intercept of line *p* is the point (0, –4). Create an equation that represents line *p*.

C. Line *r* passes through the points (–2, 1) and (1, 0). Is line *r* parallel to line *k*? Explain your reasoning.

D. Line *s* is **perpendicular** to line *k*. Line *s* passes through the point (5, –2). Create an equation that represents line *s*.

6

7 Which of the following is equivalent to this expression?

$$14 - 2(x - 4)$$

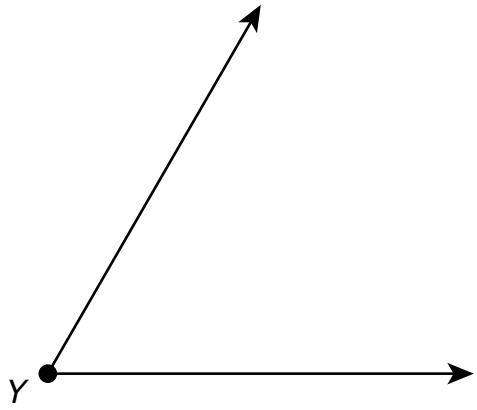
Ⓐ $10 - 2x$

Ⓑ $12 - 2x$

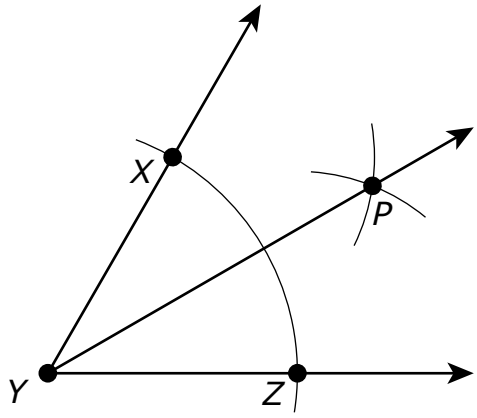
Ⓒ $20 - 2x$

Ⓓ $22 - 2x$

8 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 $\angle XYZ$.

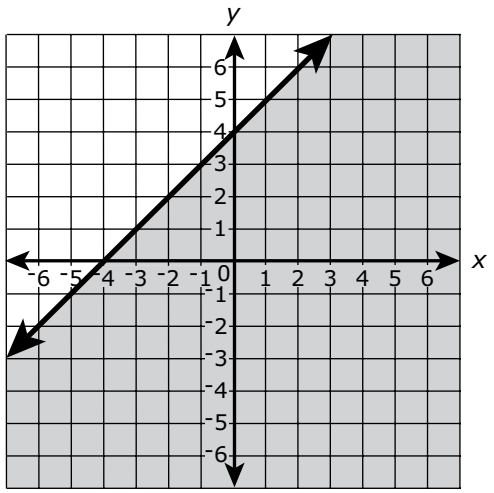
Ⓓ Point *P* is equidistant from points *X* and *Z*.

9 Consider this inequality.

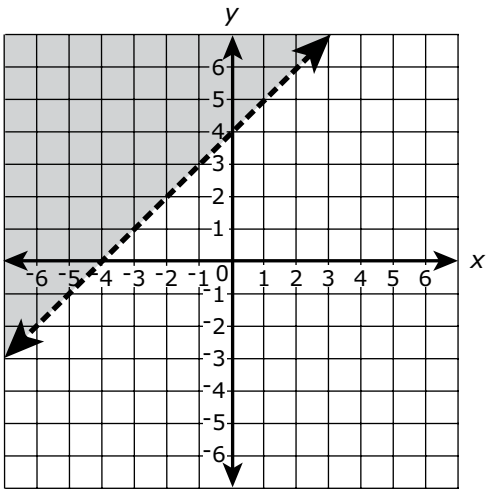
$$y \geq x - 4$$

Which of the following graphs represents the solution set of the inequality?

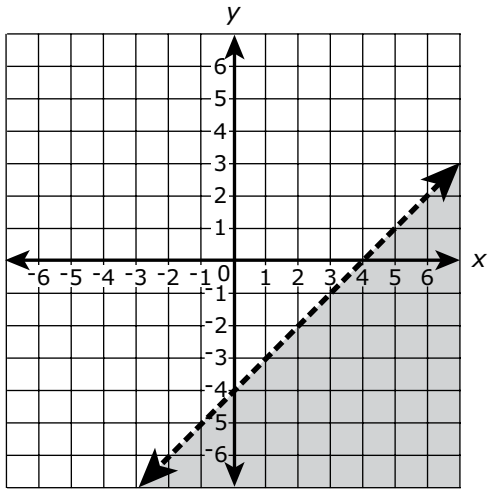
Ⓐ



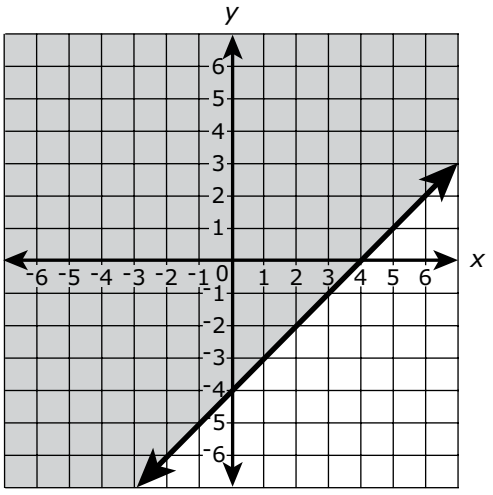
Ⓑ



Ⓒ



Ⓓ

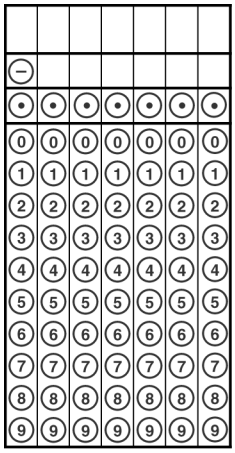


10 A factory worker loaded some boxes onto a cart. Each box has the same weight. This expression represents the total weight, in pounds, of the cart **and** n boxes.

$$10n + 25$$

Based on the expression, what is the weight, in pounds, of the cart?

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



This question has two parts.

11 **Part A**

Which of the following statements is true?

Ⓐ The sum of two rational numbers is rational.

Ⓑ The product of two rational numbers is irrational.

Ⓒ The sum of a rational number and an irrational number is rational.

Ⓓ The product of a non-zero rational number and an irrational number is rational.

Part B

Which of the following statements is true?

Ⓐ The sum of $\frac{\pi}{2}$ and $\frac{\pi}{2}$ is rational, and the product of $\frac{1}{2}$ and π is rational.

Ⓑ The sum of $\frac{\pi}{2}$ and $\frac{\pi}{2}$ is rational, and the product of $\frac{1}{2}$ and π is irrational.

Ⓒ The sum of $\frac{\pi}{2}$ and $\frac{\pi}{2}$ is irrational, and the product of $\frac{1}{2}$ and π is rational.

Ⓓ The sum of $\frac{\pi}{2}$ and $\frac{\pi}{2}$ is irrational, and the product of $\frac{1}{2}$ and π is irrational.

12 Which of the following equations is true?

Ⓐ $\sin(30°) = \cos(30°)$

Ⓑ $\cos(30°) = \sin(60°)$

Ⓒ $\sin(60°) = \cos(90°)$

Ⓓ $\cos(60°) = \sin(60°)$

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 Shayla and Carlos each have a bag that contains 5 green marbles, 5 red marbles, and 10 yellow marbles. The marbles are all the same size and shape.

Part A

Shayla will select two marbles from her bag at random. She will not return the first marble to the bag before selecting the second marble.

Which expression represents the probability that Shayla will select two red marbles?

Ⓐ $\frac{5}{20} \cdot \frac{4}{19}$

Ⓑ $\frac{5}{20} \cdot \frac{4}{20}$

Ⓒ $\frac{5}{20} \cdot \frac{5}{19}$

Ⓓ $\frac{5}{20} \cdot \frac{5}{20}$

Part B

Carlos will select two marbles from his bag at random. He will not return the first marble to the bag before selecting the second marble.

The first marble Carlos selects will **not** be yellow. What is the probability that the second marble he selects will be yellow?

Ⓐ $\frac{9}{20}$

Ⓑ $\frac{9}{19}$

Ⓒ $\frac{10}{20}$

Ⓓ $\frac{10}{19}$

15 The area, in square units, of a rectangle is represented by this expression.

$$6x^2 + 15x$$

Which of the following also represents the area, in square units, of the rectangle?

Ⓐ $3x(2x + 5)$

Ⓑ $3x(2x + 15)$

Ⓒ $6x(x + 9)$

Ⓓ $6x(x) + 15$

16 Marvin solved this equation.

$$4(x + 5) = 88$$

Marvin created a table showing each step he used to solve the equation. The table also showed the correct explanation for each step.

Which of the following tables shows the correct explanations for each step in Marvin's solution?

Ⓐ

$4(x + 5) = 88$	Given
$4x + 20 = 88$	He multiplied both sides by 4.
$4x = 68$	He added 20 to both sides.
$x = 17$	He multiplied both sides by 4.

Ⓑ

$4(x + 5) = 88$	Given
$4x + 20 = 88$	He used the distributive property.
$4x = 68$	He subtracted 20 from both sides.
$x = 17$	He divided both sides by 4.

Ⓒ

$4(x + 5) = 88$	Given
$4x + 20 = 88$	He used the distributive property.
$4x = 68$	He divided both sides by 20.
$x = 17$	He subtracted 4 from both sides.

Ⓓ

$4(x + 5) = 88$	Given
$4x + 20 = 88$	He added 4 to both sides.
$4x = 68$	He multiplied both sides by 20.
$x = 17$	He divided both sides by 4.

17 A circle graphed on a coordinate plane has its center at (2, –4) and a radius of 4 units.

Which of the following is an equation of the circle?

Ⓐ $(x + 2)^2 + (y - 4)^2 = 2^2$

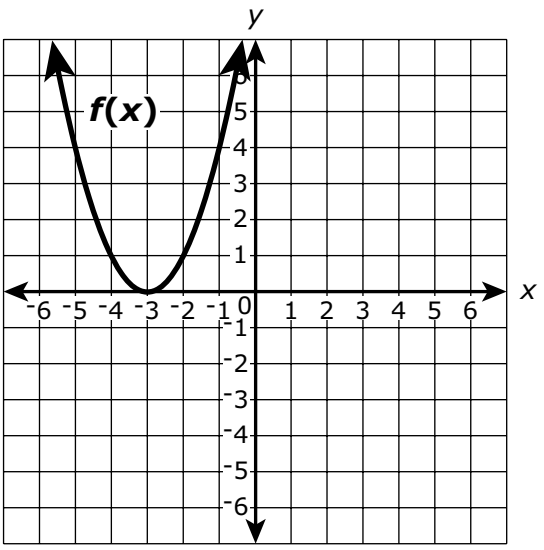
Ⓑ $(x - 2)^2 + (y + 4)^2 = 4^2$

Ⓒ $(x + 2)^2 + (y - 4)^2 = 8^2$

Ⓓ $(x - 2)^2 + (y + 4)^2 = 16^2$

This question has two parts.

18 This graph shows quadratic function $f(x)$.



This table represents points on the graph of a different quadratic function, $g(x)$.

x	−4	−2	0	2	4	6
$g(x)$	−7	−4	−3	−4	−7	−12

Part A

Which of the following statements about functions $f(x)$ and $g(x)$ is true?

Ⓐ The minimum value of $f(x)$ is equal to the maximum value of $g(x)$.

Ⓑ The minimum value of $f(x)$ is less than the maximum value of $g(x)$.

Ⓒ The minimum value of $f(x)$ is greater than the maximum value of $g(x)$.

Ⓓ The minimum value of $f(x)$ cannot be compared to the maximum value of $g(x)$.

Part B

Which of the following statements about $f(x)$ and $g(x)$ is **not** true?

Ⓐ The graphs of the functions open in opposite directions.

Ⓑ The functions have different y-intercepts.

Ⓒ The functions have the same domain.

Ⓓ The functions have the same range.

19 A librarian purchased books and e-readers for the school library.

- The school received 11 shipments of books.
- The average price of the books was $189.20 per shipment.
- The school received 18 e-readers.
- The price of each e-reader was $54.90.

Which of the following is **closest** to the total amount the librarian spent on the shipments of books and the e-readers?

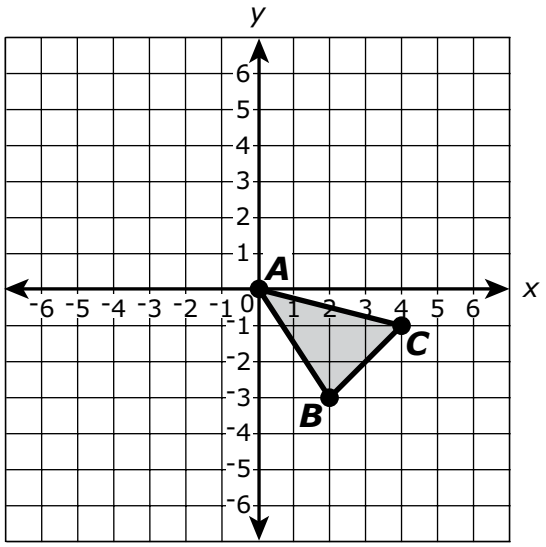
Ⓐ $1,500

Ⓑ $2,500

Ⓒ $3,000

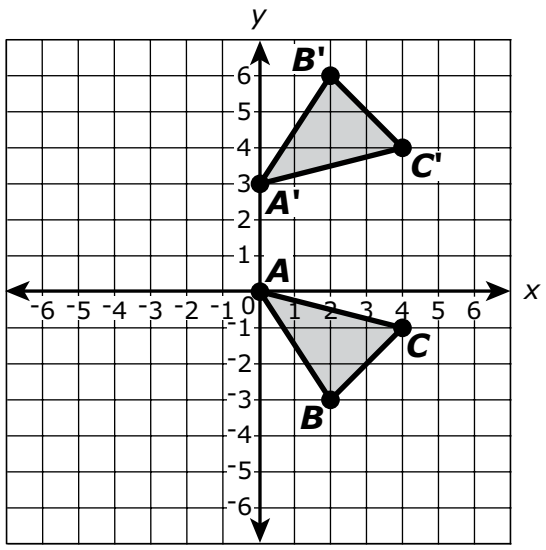
Ⓓ $4,000

20 Triangle *ABC* is shown on this coordinate plane.

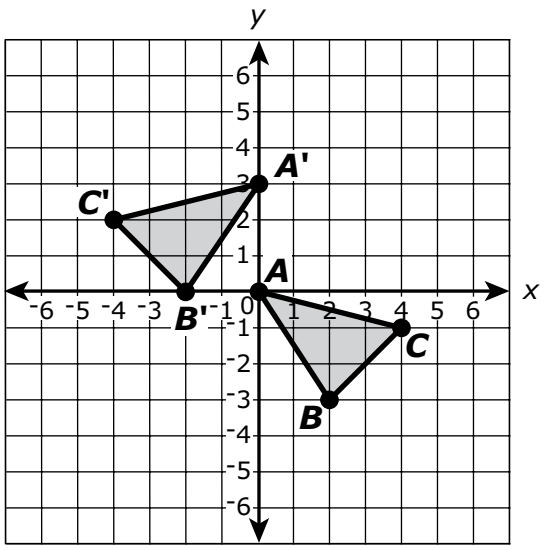


Triangle *ABC* will be reflected over the *x*-axis and then translated 3 units up to create its image, triangle *A'B'C'*. Which of the following shows the correct location of triangle *A'B'C'* on the coordinate plane?

Ⓐ



Ⓑ



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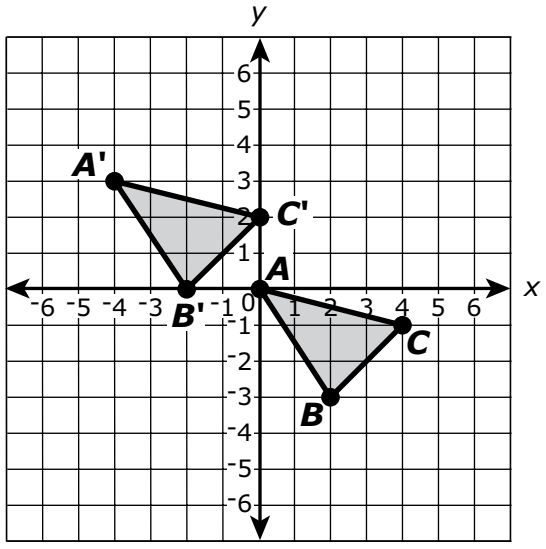
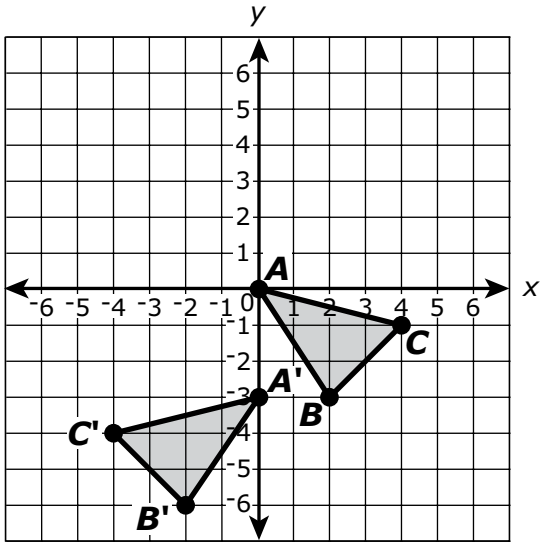


Ⓓ



21 Which of the following has the same solution as this system of equations?

$$4x + 9y = 10$$
$$2x + 3y = 12$$

Ⓐ $4x + 9y = 10$
$4x + 3y = 24$

Ⓑ $4x + 9y = 10$
$2x + 9y = 36$

Ⓒ $4x + 9y = 10$
$4x + 6y = 24$

Ⓓ $4x + 9y = 10$
$2x + 9y = 12$

STOP!

Grade 10 Mathematics

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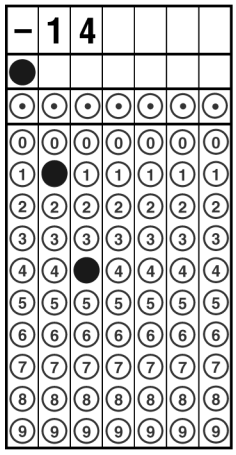
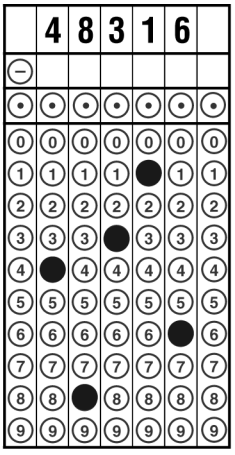
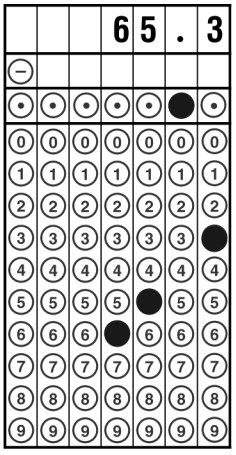
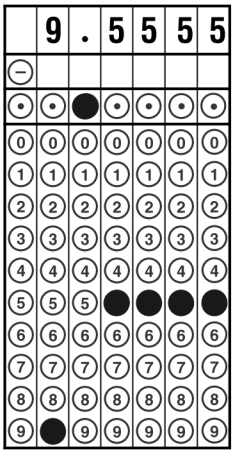
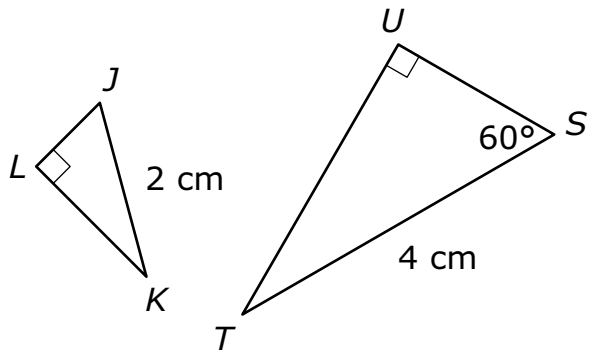








22 In this diagram, $\triangle JKL \sim \triangle STU$.



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

Ⓐ 15°

Ⓑ 30°

Ⓒ 45°

Ⓓ 60°

23 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?

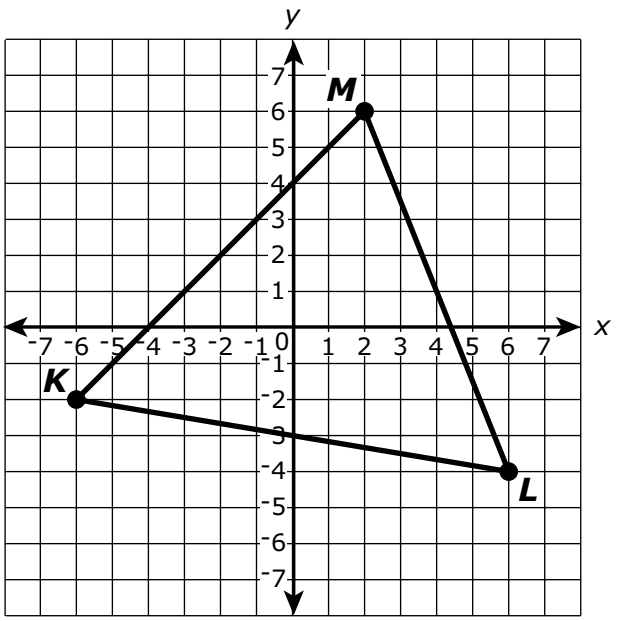
Ⓐ 5

Ⓑ 8

Ⓒ 12

Ⓓ 15

24 Triangle *KLM*, shown on this coordinate plane, will be dilated by a scale factor of $\frac{1}{2}$ with respect to the origin.



What are the ordered pairs that represent the vertices of the image of triangle *KLM* after the dilation?

Select the **three** correct ordered pairs.

Ⓐ (−3, −1)

Ⓑ (−2, 3)

Ⓒ (−1, −3)

Ⓓ (1, 3)

Ⓔ (2, −2)

Ⓕ (3, −2)

25 A customer purchased a pumpkin at a farm stand.

- The customer paid $1.38 per pound for the pumpkin.
- The mass of the pumpkin was 4.8 **kilograms**, rounded to the nearest tenth of a kilogram.

Which of the following could have been the total amount the customer paid for the pumpkin?

Ⓐ $6.62

Ⓑ $9.66

Ⓒ $13.32

Ⓓ $14.46

26 Which of the following **cannot** be modeled by a linear function?

Ⓐ 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.

Ⓓ The total cost of purchasing apples increases by 60 cents for each additional apple purchased.

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

27 A marketing researcher surveyed 1,000 shoppers about whether they had watched a television commercial about a company's shampoo and whether they had ever bought the shampoo. This table shows some of the results of the survey.

Marketing Research

	Bought Shampoo	Did Not Buy Shampoo	Totals
Watched Commercial	300		750
Did Not Watch Commercial	50	200	250
Totals	350	650	1,000

A. How many of the shoppers watched the commercial but did **not** buy the shampoo? Show or explain how you got your answer.

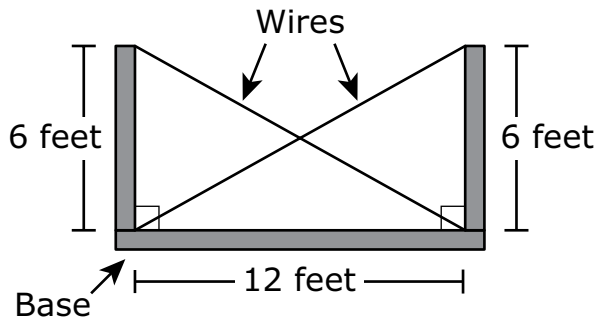
B. Based on the survey data, what is the probability that a randomly selected shopper watched the commercial but did **not** buy the shampoo? Show or explain how you got your answer.

C. Based on the survey data, what is the probability that a shopper bought the shampoo, given that the shopper watched the commercial? Show or explain how you got your answer.

D. Based on the survey data, are watching the commercial and buying the shampoo independent events? Show or explain how you got your answer.

27

28 A storage rack has two wires that help support the sides of the rack. Each wire connects the top of one side to the base of the rack. The sides form right angles with the base of the rack. The rack and its interior dimensions are shown in this diagram.



Which of the following is **closest** to the length, in feet, of each wire?

Ⓐ 9

Ⓑ 10.4

Ⓒ 13.4

Ⓓ 18

29 This table lists some input and output values for a function, $f(x)$.

x	$f(x)$
−1	8.1
0	2.5
1	−1.1
2	−2.7

Which of the following statements correctly describes this function?

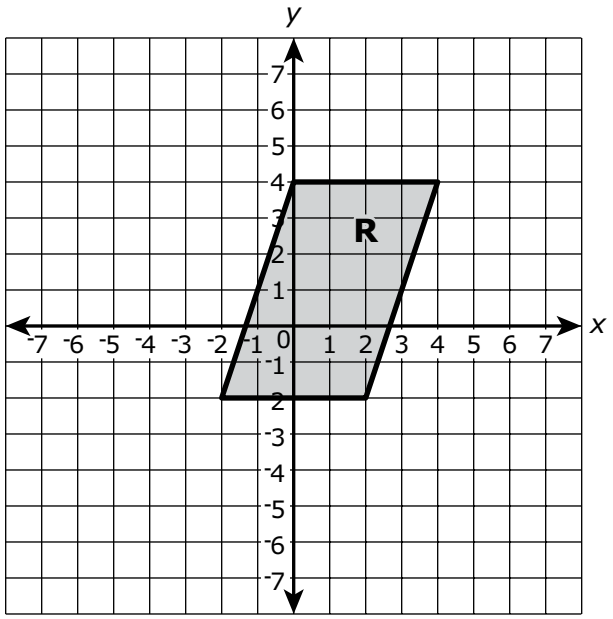
Ⓐ On average, $f(x)$ increases by 1.6 units as x increases by 1 unit over the interval $-1 \leq x \leq 2$.

Ⓑ On average, $f(x)$ decreases by 1.6 units as x increases by 1 unit over the interval $-1 \leq x \leq 2$.

Ⓒ On average, $f(x)$ increases by 3.6 units as x increases by 1 unit over the interval $-1 \leq x \leq 2$.

Ⓓ On average, $f(x)$ decreases by 3.6 units as x increases by 1 unit over the interval $-1 \leq x \leq 2$.

30 Figure R is shown on this coordinate plane.



Which of the following transformations would carry Figure R onto itself?

Ⓐ a reflection over the line $y = 1$

Ⓑ a reflection over the line $x = 1$

Ⓒ a 90° clockwise rotation about the point (1, 1)

Ⓓ a 180° clockwise rotation about the point (1, 1)

31 A worker at the Rainbow Garden Center planted multiple rows of flowers.

- There are 3 flowers in the first row.
- Each of the remaining rows has 4 more flowers than the previous row.

How many flowers do rows 20 and 35 each have?

Ⓐ Row 20 has 83 flowers and row 35 has 143 flowers.

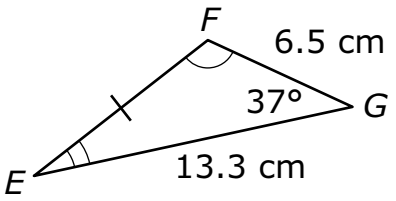
Ⓑ Row 20 has 83 flowers and row 35 has 106 flowers.

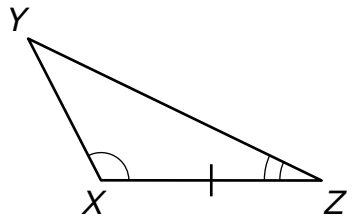
Ⓒ Row 20 has 79 flowers and row 35 has 139 flowers.

Ⓓ Row 20 has 79 flowers and row 35 has 83 flowers.

This question has two parts.

32 Two triangles and some of their measurements are shown in this diagram.





Part A

Based on the diagram, which of the following **must** be true?

Ⓐ $\angle E \cong \angle Y$

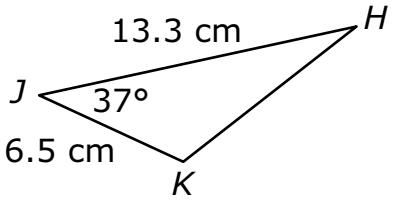
Ⓑ $\angle G \cong \angle Z$

Ⓒ $\overline{EF} \cong \overline{YX}$

Ⓓ $\overline{FG} \cong \overline{XY}$

Part B

This diagram shows $\triangle JHK$ and some of its measurements.



Based on the diagram, which of the following statements is true?

Ⓐ $\triangle HJK \cong \triangle EFG$

Ⓑ $\triangle HKJ \cong \triangle EFG$

Ⓒ $\triangle JHK \cong \triangle EFG$

Ⓓ $\triangle JKH \cong \triangle EFG$

33 This compound inequality can be used to determine X, the approximate range of temperatures, in degrees Fahrenheit, at which zinc is a liquid.

$$419.5 \leq \frac{5}{9}(X - 32) \leq 907$$

What is the **approximate** range of temperatures, in degrees Fahrenheit, at which zinc is a liquid?

Ⓐ 250.8 to 521.7

Ⓑ 265.1 to 535.9

Ⓒ 787.1 to 1664.6

Ⓓ 812.7 to 1690.2

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

34 Ellis runs around a track at a constant speed.

- The distance around the track is $\frac{1}{4}$ mile.
- It takes Ellis 3.2 minutes to run around the track once.

A. What is the total amount of time, in minutes, it takes Ellis to run one mile? Show or explain how you got your answer.

B. What is the total distance, in **feet**, Ellis runs in 1 minute? Show or explain how you got your answer.

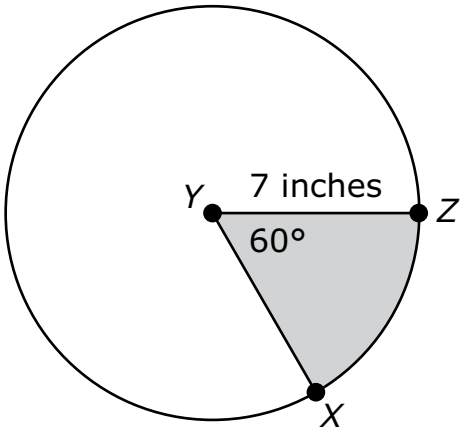
C. What is the rate, in miles per hour, Ellis runs around the track? Show or explain how you got your answer.

D. Ellis will run for 40 minutes every day for 5 days, with a goal of running a total of 15 miles. Will Ellis meet this goal? Explain your reasoning.

34

This question has two parts.

35 This diagram shows circle *Y*, with one shaded sector.



In the diagram,

- the measure of angle *XYZ* is 60°, and
- the radius of circle *Y* is 7 inches.

Part A

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

Ⓐ 25.7 square inches

Ⓑ 51.3 square inches

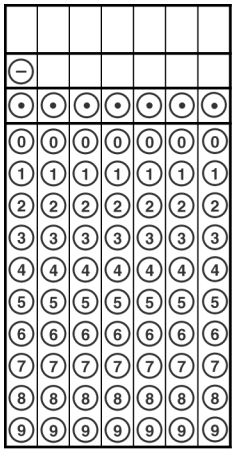
Ⓒ 128.3 square inches

Ⓓ 153.9 square inches

Part B

What is the length, to the nearest tenth of an inch, of minor arc *XZ*?

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



36 A travel agent surveyed people in two age groups about whether or not they like traveling. Which two-way table shows the possible results of the survey?

Ⓐ

Travel Survey

	Likes Traveling	Dislikes Traveling	Totals
Ages 18–30	40	10	50
Ages 31–60	20	30	50
Totals	60	40	100

Ⓑ

Travel Survey

	Likes Traveling	Dislikes Traveling	Totals
Ages 18–30	30	10	50
Ages 31–60	30	10	50
Totals	60	40	100

Ⓒ

Travel Survey

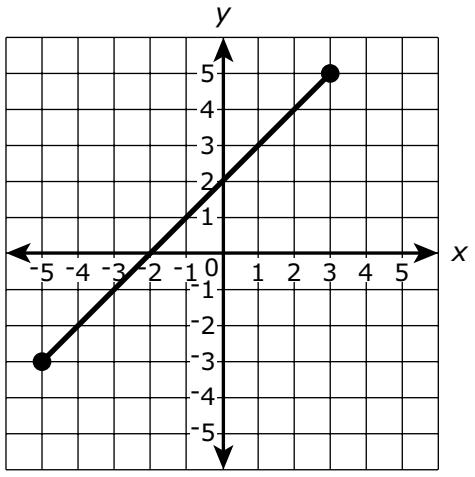
	Likes Traveling	Dislikes Traveling	Totals
Ages 18–30	40	10	50
Ages 31–60	10	30	50
Totals	60	40	100

Ⓓ

Travel Survey

	Likes Traveling	Dislikes Traveling	Totals
Ages 18–30	30	10	50
Ages 31–60	40	10	50
Totals	60	40	100

37 The graph of a function is shown on this coordinate plane.



What are the domain **and** the range of the function?

Select the **two** correct answers.

Ⓐ The domain is $-5 \leq x \leq 3$.

Ⓑ The domain is $-3 \leq x \leq 5$.

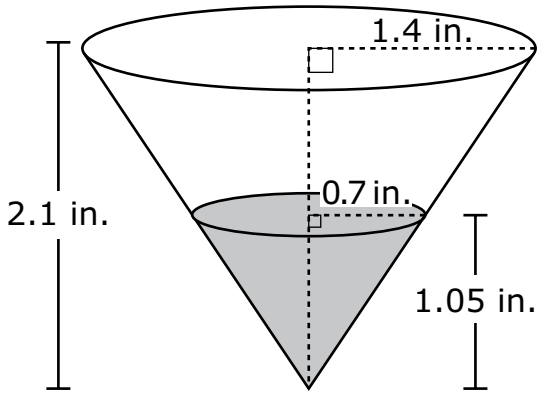
Ⓒ The domain is $0 \leq x \leq 5$.

Ⓓ The range is $-5 \leq y \leq 5$.

Ⓔ The range is $-3 \leq y \leq 5$.

Ⓕ The range is $-2 \leq y \leq 2$.

38 A cup is in the shape of a right circular cone. The cup is filled with water to half its height, as shown.



Based on the measurements shown, which of the following expressions represents the volume, in cubic inches, of the empty part of the cup?

Ⓐ $\frac{1}{3}\pi(2.8)^2(2.1) - \frac{1}{3}\pi(1.4)^2(1.05)$

Ⓑ $\frac{1}{3}\pi(1.4)^2(2.1) - \frac{1}{3}\pi(0.7)^2(1.05)$

Ⓒ $\frac{1}{3}\pi(1.4)^2(1.05)$

Ⓓ $\frac{1}{3}\pi(0.7)^2(1.5)$

This question has two parts.

39 The population of each of four towns is predicted to increase or decrease at a constant rate. These equations can be used to predict the population, P, of each town t years from today.

Population Predictions

Town	Equation
Pinehill	$P = 800 - 20t$
Rye	$P = 500 + 15t$
Smithfield	$P = 10t + 950$
Troy	$P = -50t + 600$

Part A

Based on the equations in the table, which statements about the populations of these towns are true?

Select **two** true statements.

Ⓐ The population of Troy is decreasing.

Ⓑ The population of Pinehill is increasing.

Ⓒ The populations of Rye and Smithfield are each increasing.

Ⓓ The populations of Smithfield and Troy are each decreasing.

Ⓔ The populations of all four of the towns are each increasing.

Part B

Which of the following lists the towns, based on their populations **today**, from least to greatest population?

Ⓐ Pinehill, Rye, Smithfield, Troy

Ⓑ Rye, Troy, Pinehill, Smithfield

Ⓒ Smithfield, Pinehill, Rye, Troy

Ⓓ Troy, Pinehill, Smithfield, Rye

40 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°

41 A student computed the correlation coefficient, *r*, for a set of data. The result of the computation is shown.

$$r = 0.92$$

Based on the correlation coefficient, which of the following statements about the data is true?

Ⓐ The data have a weak positive correlation.

Ⓑ The data have a weak negative correlation.

Ⓒ The data have a strong positive correlation.

Ⓓ The data have a strong negative correlation.

42 Each **exterior** angle of a regular polygon has a measure of 30°. What is the total number of sides of the polygon?

Ⓐ 6

Ⓑ 9

Ⓒ 12

Ⓓ 15

STOP!