




Suggested Testing Time: 4 hours

Remember:

- The practice test can give you a good indication of how you may perform on an actual test, but there is no guarantee that your results will be the same as on the actual test.
- The actual test looks and operates differently than this practice test. In addition, this test includes one or more assignments that allow you to handwrite and scan your responses. Review the [Testing Tutorials and Demonstrations \(././PageView.aspx?f=HTML_FRAG/GENRB_CBTTutorials.html\)](#) for more information about the actual test platform.
- [Formulas](#)  (././Docs/MTEL_65_Formulas.pdf) are provided on-screen with your actual test.

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1. Given that a is irrational and b is rational, which of the following expressions could result in a rational value?

- A. $a + b$
- B. $a \div b$
- C. a^b
- D. $a - b$

-
2. Use the diagram below to answer the question that follows.



Assuming that a rod represents x and a small square represents 1 unit, the algebra tiles shown in the diagram best represent which of the following expressions?

- A. $3x + 4$
- B. $3(x + 4)$
- C. $(x + 4)^3$
- D. $x^3 + 4^3$

3. If K is both a multiple of x and a factor of y , then which of the following statements must be true?

- A. $\frac{K}{y}$ is a whole number.

- B. $\frac{x}{k}$ is a whole number.
- C. y is a factor of x .
- D. y is a multiple of x .

4. The greatest common factor of 300, 480, and 840 is $2^a \cdot 3^b \cdot 5^c$. What is the value of $a + b + c$?
- A. 3
 - B. 4
 - C. 5
 - D. 8

5. Use the multiplication problem below to answer the question that follows.

$$\begin{array}{r}
 1 \ Y \ 3 \\
 \times \quad 2 \ 4 \\
 \hline
 \end{array}$$

The variable Y represents a single-digit number between 0 and 9. Which of the following expressions represents the amount that Y contributes to the total product?

- A. $20 \cdot Y$
- B. $24 \cdot Y$
- C. $40 \cdot Y$
- D. $240 \cdot Y$

6. The division problem $\left(2 \times 6^6 + 10 \times 6^4 + \frac{1}{2} \times 6^2\right) \div 2$ is equivalent to which of the following expressions?

- A. $2 \times 3^6 + 10 \times 3^4 + \frac{1}{2} \times 3^2$
- B. $2 \times 6^3 + 10 \times 6^2 + \frac{1}{2} \times 6$
- C. $6^3 + 5 \times 6^2 + \frac{1}{4} \times 6$

D. $6^6 + 5 \times 6^4 + \frac{1}{4} \times 6^2$

7. Which of the following sets of equations best illustrates the concept that multiplication and division are inverse operations?

A. $4 \times 1 = 4$
 $4 \div (-1) = -4$

B. $4 \times 0 = 0$
 $0 \div 4 = 0$

C. $4 \times 8 = 32$
 $32 \div 8 = 4$

D. $32 \times \frac{1}{4} = 8$
 $32 \div 8 = 4$

8. A beam of light originating from Saturn travels to Earth with a speed of 3×10^8 meters per second, and the positions of Saturn and Earth are aligned in diametrically opposite positions about the Sun. Saturn is approximately 1.5×10^{12} meters from the Sun and Earth is approximately 1.5×10^8 meters from the Sun. Which of the following computations provides the best estimate for the number of seconds that elapse until the light becomes visible on Earth?

A. $\frac{1}{3}(1,500 + 0.15)$

B. $\frac{1}{3}(15,000 + 1.5)$

C. $\frac{1}{3}(15,000 + 15)$

D. $\frac{1}{3}(150,000 + 150)$

9. Which of the following values is equivalent to $\frac{2^{-3} \cdot 3}{3^{-2} \cdot 5^2}$?

A. $\frac{3}{10}$

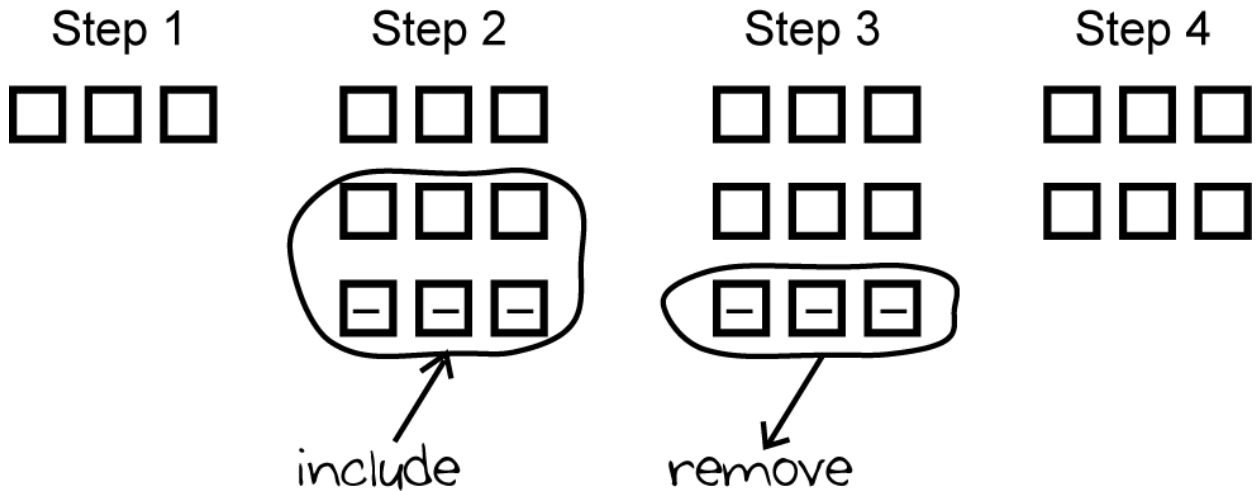
B. $\frac{8}{75}$

C. $\frac{27}{200}$

D. $\frac{75}{72}$

10. Use the information below to answer the question that follows.

A teacher uses algebra tiles to demonstrate $3 - (-3)$ to students. The teacher's work is shown below.



Which of the following properties best justifies Step 2 of the work shown?

- A. additive identity property
 - B. associative property
 - C. commutative property
 - D. multiplicative inverse property
-
11. Use the equations below to answer the question that follows.

$$A = 1 \times 10^{-1} + 6 \times 10^{-2}$$

$$B = 2 \times 10^0 + 7 \times 10^{-2}$$

Two numbers, A and B , are shown above in expanded notation. What is the sum of A and B ?

- A. 0.223
 - B. 0.286
 - C. 2.23
 - D. 2.86
-
12. Which of the following statements is true for all integers?
- A. $|m + n| \geq |m| + |n|$
 - B. $|m + n| \leq |m| + |n|$
 - C. $|m + n| < |m| + |n|$
 - D. $|m + n| = |m| + |n|$

A submarine is traveling 375 feet below sea level. It rises 183 feet and then dives 228 feet. If the submarine can come safely to the surface at 30 feet per second, approximately how long will it take to reach the surface?

- A. 11 seconds
- B. 14 seconds
- C. 20 seconds
- D. 26 seconds

14. An electronics store applies a 15% discount on a certain television, which is then followed by a 6.5% sales tax. If K represents the final amount a customer pays for the television, which of the following expressions can be used to find the original price of the television?

- A. $(1 - 0.15)(1.065)K$
- B. $(1 + 0.15)(0.935)K$
- C. $\frac{K}{(0.85)(1 - 0.065)}$
- D. $\frac{K}{(0.85)(1 + 0.065)}$

15. A coffee company recommends that consumers use $4\frac{1}{2}$ tablespoons of coffee grounds to make 6 cups of coffee. How many tablespoons of grounds should consumers use to make 10 cups of coffee?

- A. $7\frac{1}{6}$ tablespoons
- B. $7\frac{1}{2}$ tablespoons
- C. $8\frac{1}{2}$ tablespoons
- D. $13\frac{1}{3}$ tablespoons

16. **Use the information below to answer the question that follows.**

A business sells sedans and SUVs from two different brands. The distribution of vehicles in the business's inventory is partially described in the incomplete two-way frequency table below.

	SUVs	Sedans	Total
Brand A			

	SUVs	Sedans	Total
Brand B	135		
Total		80	

If 75% of the vehicles from Brand B are SUVs and 60% of all of the SUVs in the inventory are from Brand B, what fraction of all of the vehicles in the inventory are SUVs from Brand A?

- A. $\frac{2}{5}$
- B. $\frac{5}{9}$
- C. $\frac{18}{61}$
- D. $\frac{45}{61}$

17. Which of the following fractions represents the repeating decimal 0.050505...?

- A. $\frac{5}{9}$
- B. $\frac{5}{90}$
- C. $\frac{5}{99}$
- D. $\frac{5}{990}$

18. Use the fractions below to answer the question that follows.

$$\frac{A}{270}, \frac{B}{450}, \frac{C}{1250}, \frac{D}{3250}$$

Given that the four fractions shown are reduced to lowest terms, which one will have a terminating decimal equivalent?

- A. $\frac{A}{270}$
- B. $\frac{B}{450}$
- C. $\frac{C}{1250}$
- D. $\frac{D}{3250}$

-
19. If x and y are whole numbers whose greatest common factor is 3, which of the following expressions is the least common denominator for $\frac{2}{x} + \frac{5}{y}$?

- A. $10xy$
- B. $3xy$
- C. $\frac{xy}{3}$
- D. $\frac{xy}{10}$

-
20. Given that $\frac{a}{b}$ is a proper fraction greater than zero, which of the following inequalities is true for all positive integer values of c ?

- A. $\frac{a-c}{b-c} > \frac{a}{b}$
- B. $\frac{a+c}{b+c} > \frac{a}{b}$
- C. $\frac{ac}{bc} > \frac{a}{b}$
- D. $\frac{a \div c}{b \div c} > \frac{a}{b}$

-
21. A space probe that is moving at an average speed of 35,960 miles per hour needs to travel approximately 43.1 million miles more on its journey to Mars. Which of the following is the best estimate of the number of days it should take the probe to reach Mars?

- A. 24 days
- B. 50 days
- C. 240 days
- D. 500 days

-
22. Coasting down a hill, a bicyclist's speed increases at a constant rate of 0.75 mile per hour each second. If the bicyclist started timing the ride at the top of the hill when the speed was 5 miles per hour, how many seconds passed before the bicyclist reached a speed of 31 miles per hour?

- A. $19\frac{1}{2}$ seconds
- B. $23\frac{1}{4}$ seconds

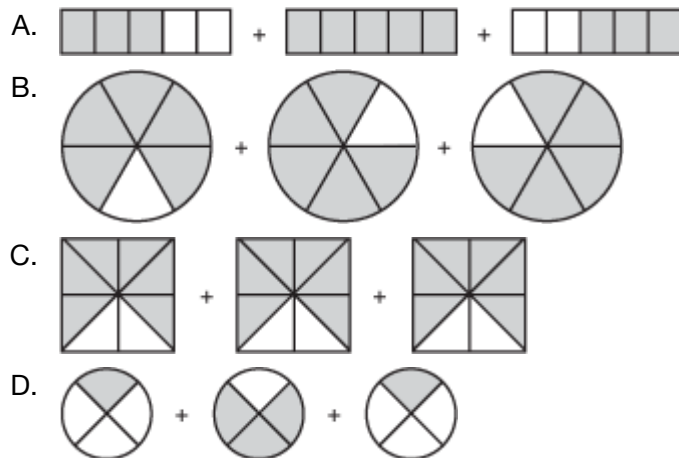
C. $34\frac{2}{3}$ seconds

D. $41\frac{1}{3}$ seconds

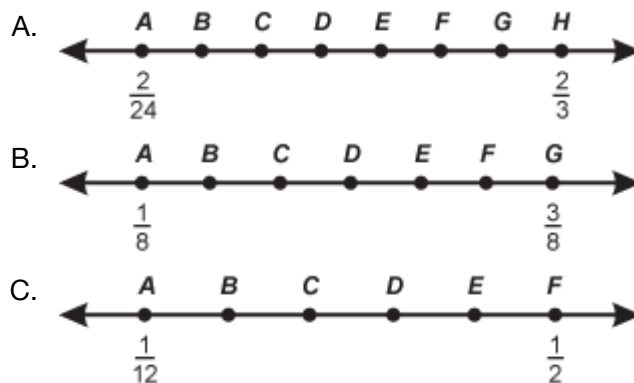
23. The average distance between Earth and the Sun is 149,598,000 kilometers. When Mars and Earth are on the same side of the Sun, the distance between them is approximately 0.5 times the distance from Earth to the Sun. A spacecraft is expected to take approximately 9 months to travel from Earth to Mars. Which of the following intervals is a reasonable estimate for the average speed of a spacecraft traveling from Earth to Mars?

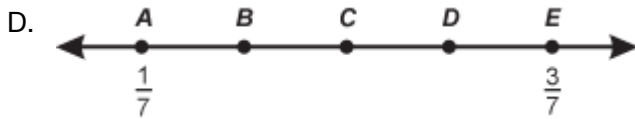
- A. 100,000 km/hour to 150,000 km/hour
- B. 10,000 km/hour to 15,000 km/hour
- C. 1,000 km/hour to 2,000 km/hour
- D. 100 km/hour to 200 km/hour

24. Which of the following figures describes mixed number $A\frac{b}{c}$ in simplest form such that $Abc = 8$?



25. Given that the points on each of the number lines shown below are equally spaced, on which of the following number lines does point D correspond with the fraction $\frac{1}{4}$?





26. Two rectangular house lots are for sale. Although the width is different for the two lots, they are both 110 feet long. The area of lot *A* is 4950 feet and the area of lot *B* is 7920 feet. What is the ratio of the width of lot *A* to the width of lot *B*?

- A. 5:8
- B. 5:13
- C. 8:5
- D. 8:13

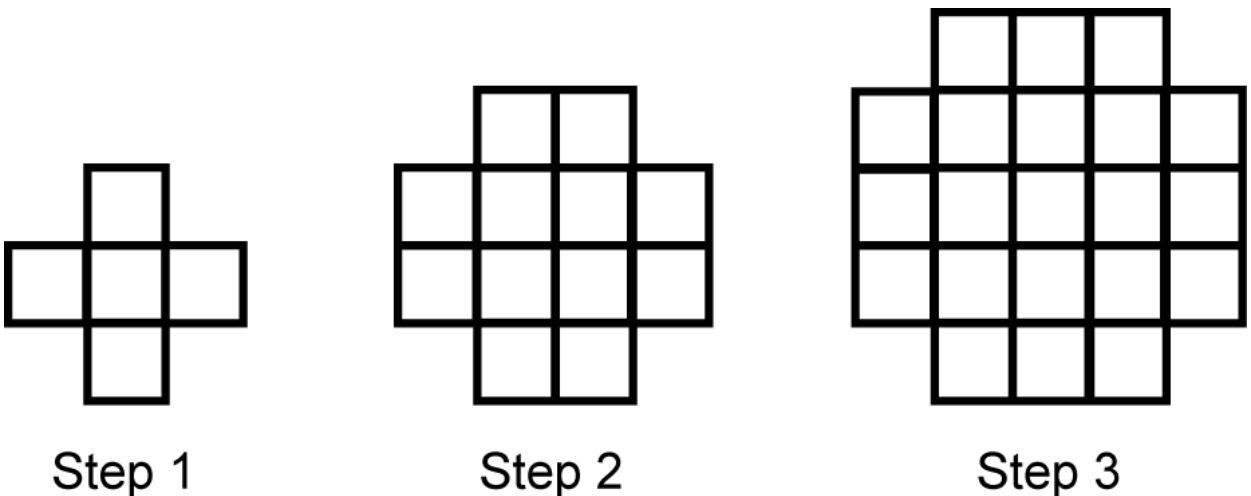
27. Use the table below to answer the question that follows.

Diameter (miles)	0	1	2	3	4	5
Days	0	4	9.5	16.5	25	35

The table shows the number of days an offshore oil well has been leaking as a function of the diameter in miles of the oil spill. Assuming that the pattern shown in the table continues, in how many days will the diameter of the oil spill be 8 miles?

- A. 50 days
- B. 65 days
- C. 74 days
- D. 82 days

28. Use the diagram below to answer the question that follows.



The diagram shows the first three steps of a pattern made with square blocks. Assuming that the pattern continues, which expression represents the number of blocks in the n th step?

- A. $n^2 + 4n$
 - B. $(3n)^2 - 4$
 - C. $(n + 2)^2$
 - D. $3n^2 - 4$
-

29. Use the sequence below to answer the question that follows.

1, 2, 4, 8, 16, 32, ...

Which of the following statements is true about the sequence shown?

- A. The sum of any two terms in the sequence is also within the sequence.
 - B. The product of any two terms in the sequence is also within the sequence.
 - C. The average of any two terms in the sequence is also within the sequence.
 - D. The quotient of any two terms in the sequence is also within the sequence.
-

30. Use the table below to answer the question that follows.

n	1	2	3	4
value	2	-6	-14	-22

If the sequence of numbers continues using the same pattern, which of the following expressions represents the value of the n th term in the sequence?

- A. $2 - 8n$
 - B. $10 - 8n$
 - C. $8n - 2$
 - D. $8n - 10$
-

31. A nurse administers 100 milligrams of a medication to a patient at noon. The amount of the medication in the patient's bloodstream decreases at a rate of 10% per hour. Which of the following types of mathematical function best describes the relationship between the number of hours since noon and the amount of medication in the patient's bloodstream at that time?

- A. exponential
 - B. linear
 - C. proportional
 - D. quadratic
-

32. Use the table below to answer the question that follows.

Celsius	Fahrenheit
10°	50°
15°	59°
20°	68°
25°	77°
30°	86°

The table shows the mathematical relationship between degrees Celsius and degrees Fahrenheit. This mathematical relationship is best described as:

- A. constant.
 - B. quadratic.
 - C. exponential.
 - D. linear.
-
33. A tournament has 256 participants. For each round of the tournament, half of the teams will move on to compete in the next round and half will be eliminated. Which of the following expressions describes the total number of teams that have been eliminated in the tournament after 3 rounds have been completed?

- A. $2^8 + 2^6 + 2^4$
 - B. $2^8 + 2^7 + 2^6$
 - C. $\frac{1}{2}(2^7 + 2^6 + 2^5)$
 - D. $\frac{1}{2}(2^8 + 2^7 + 2^6)$
-

34. Use the table below to answer the question that follows.

Volume (cm.³)	20	25	30	36	40	45
Pressure (lb./in.²)	180	144	120	100	90	80

The table shows the relationship between the volume in cubic centimeters of a particular gas and its pressure in pounds per square inch at a constant temperature. The relationship between volume and pressure can best be defined as:

- A. exponential.
- B. inversely proportional.
- C. linear.
- D. quadratic.

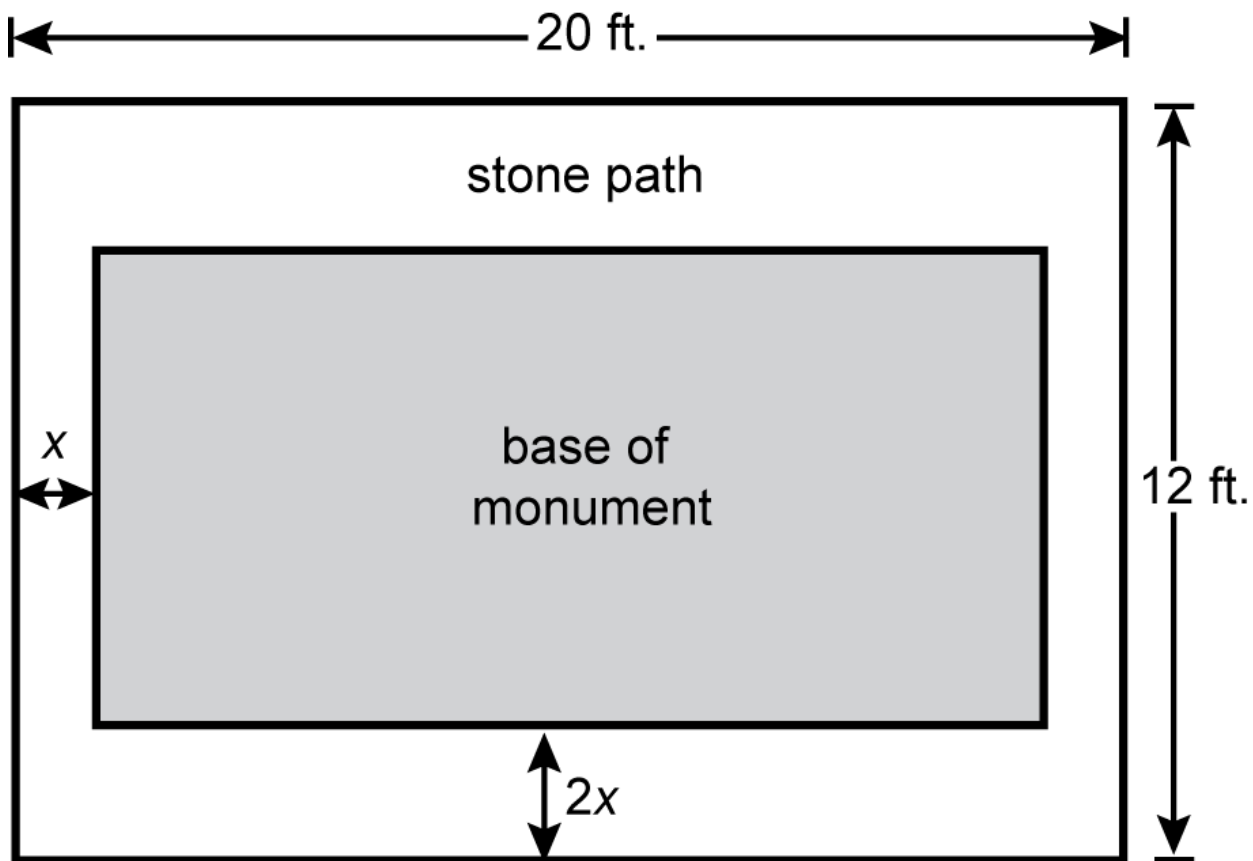
35. Use the diagram below to answer the question that follows.



In the diagram above, which of the following equations represents the relationship between the number of dots, d , in a triangle and the number of rows, R , in that triangle?

- A. $d = \frac{2(R + 3)}{2}$
- B. $d = \frac{R(R + 1)}{2}$
- C. $d = \frac{2(R + 6)}{3}$
- D. $d = \frac{2(R^2)}{3}$

36. Use the diagram below to answer the question that follows.



The diagram shows how the rectangular base of a monument is surrounded by a stone path, where x represents the narrower path-width. The width of the stone path on the longer side of the monument is twice the width on the shorter side. If the region containing the stone path and monument is a 20-foot by 12-foot rectangle, which of the following expressions represents the area of the base of the monument in square feet?

- A. $2(x^2 - 22x + 120)$
- B. $2(x^2 - 26x + 120)$
- C. $8(x^2 - 11x + 30)$
- D. $8(x^2 - 13x + 30)$

37. A sports stadium can accommodate a maximum of 6200 spectators. For any given event, at least 2500 seats must be sold to cover the stadium's operating costs. If 800 spectators are already inside the stadium and additional spectators enter at a constant rate of 26 people per minute, which of the following inequalities represents m , the number of minutes the gates should remain open to admit new spectators?

- A. $26m \leq 6200 - 2500 + 800$
- B. $26m + 800 \leq 6200 - 2500$
- C. $2500 \leq 26m + 800 \leq 6200$
- D. $2500 + 800 \leq 26m \leq 6200$

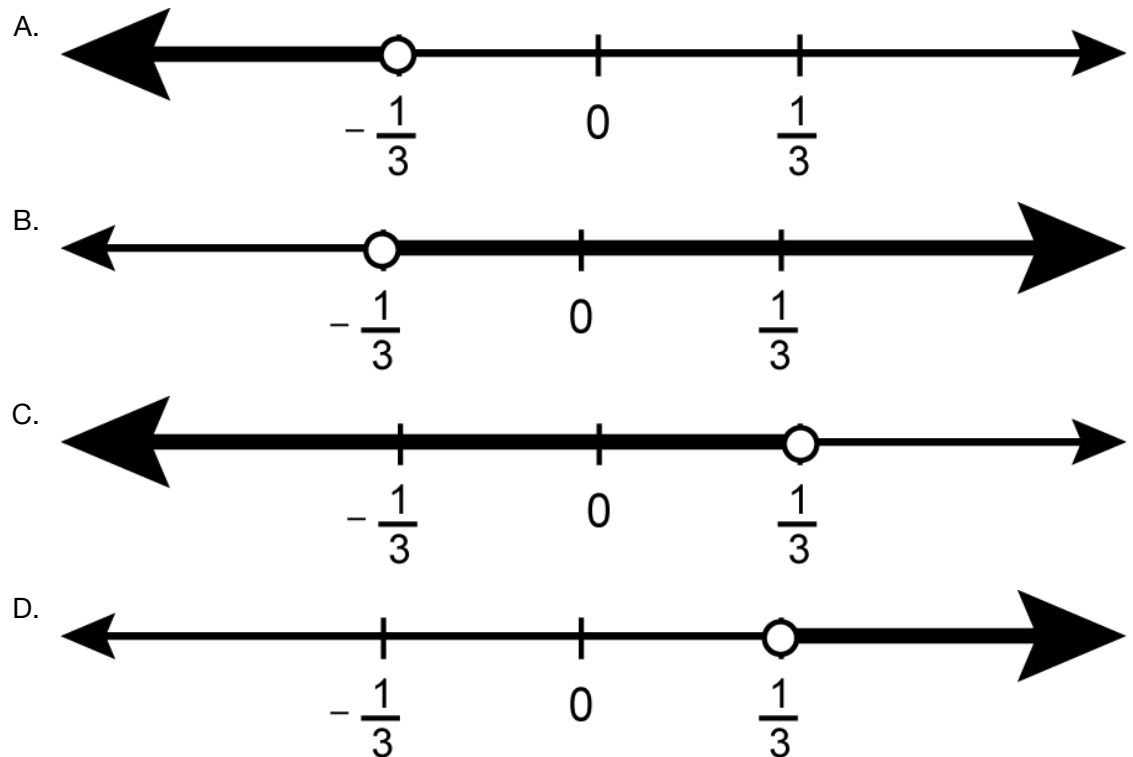
38. Which of the following equations can be used to determine x , the number of liters of 15% acid solution that must be added to 3 liters of a 3% acid solution to obtain a 12% acid solution?

- A. $0.09x + 0.15 = 0.12x$
- B. $0.15x + 0.09 = 0.12x + 3$
- C. $0.15x + 0.09 = 0.12x + 0.36$
- D. $0.09x + 0.15 = 0.12x + 0.36$

39. What is the value of $2x^{-2} - 4x^{-1}$ when $x = \frac{2}{5}$?

- A. 0
- B. $\frac{5}{2}$
- C. $\frac{15}{16}$
- D. $\frac{32}{25}$

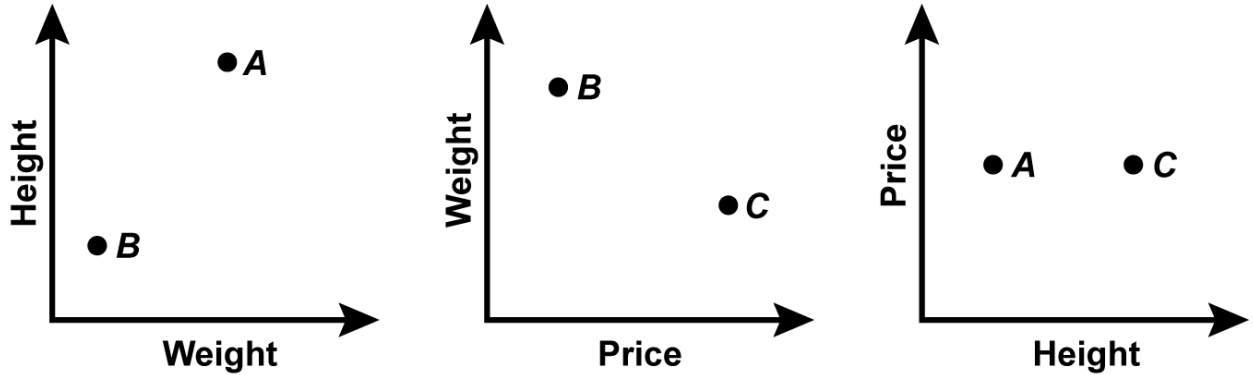
40. Which of the following graphs displays the solution set for the inequality $-\frac{2}{3}(3m - 2) < \frac{1}{2}(m + 1)$?



41. Which of the following expressions represents the value of $\frac{(a + c)^b}{b(a^2 - c^2)}$ when $a = 5$, $b = 4$, and $c = -2$?

- A. $\frac{1}{28}$
- B. $\frac{1}{2}$
- C. $\frac{81}{116}$
- D. $\frac{27}{28}$

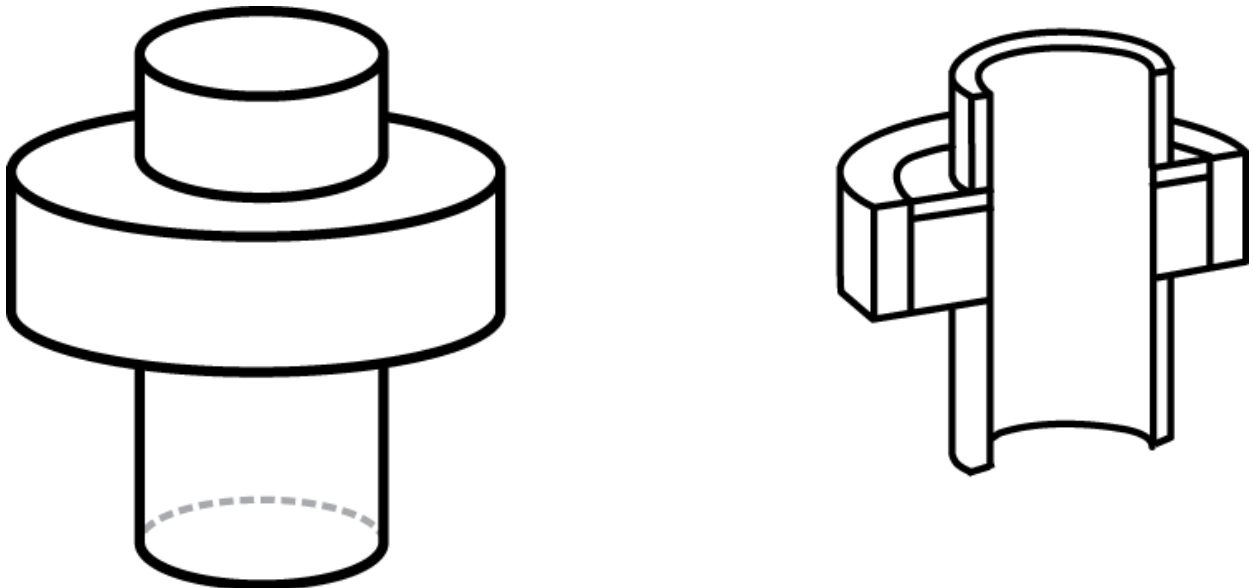
42. Use the graphs below to answer the question that follows.



The height, weight, and price of 3 soup cans, *A*, *B*, and *C*, are compared and the results are shown in the graphs. Based on the information in the graphs, which of the following statements is true?

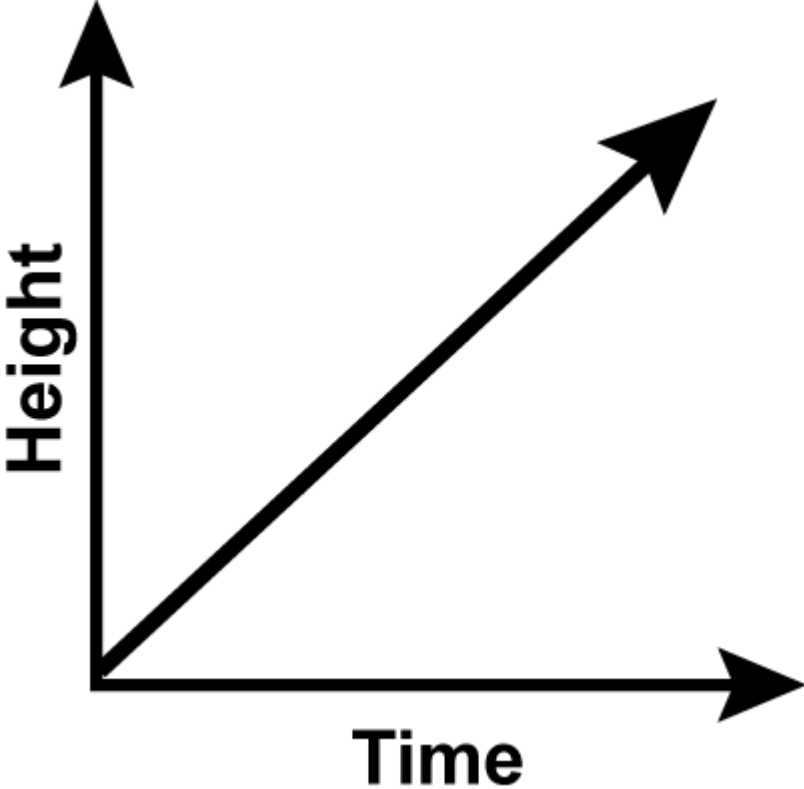
- A. Can *C* weighs the least.
- B. Cans *A* and *B* are the same height.
- C. Can *B* is the most expensive.
- D. Can *A* is the tallest.

43. Use the information below to answer the question that follows.

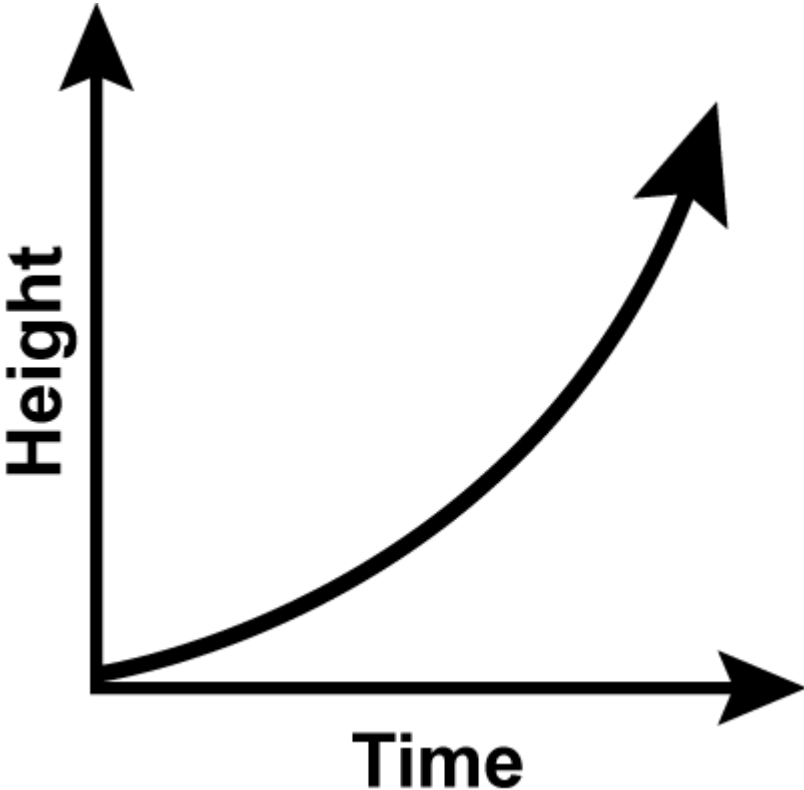


A container is made up of different cylindrical sections as shown in the diagram. Water is poured into the container at a constant rate. Which of the following graphs best shows the relationship between time and height of water in the container?

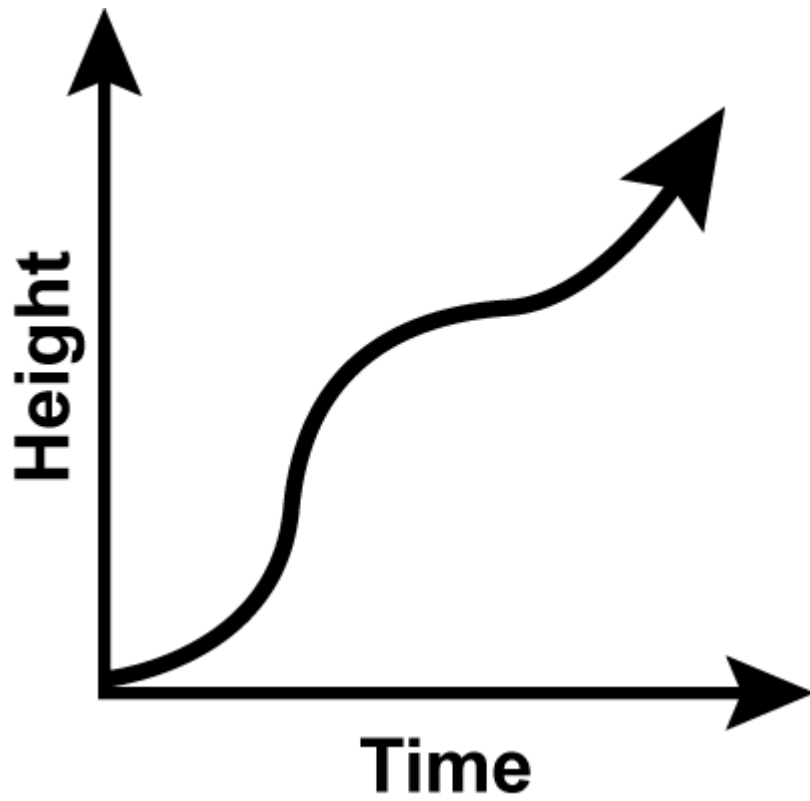
A.



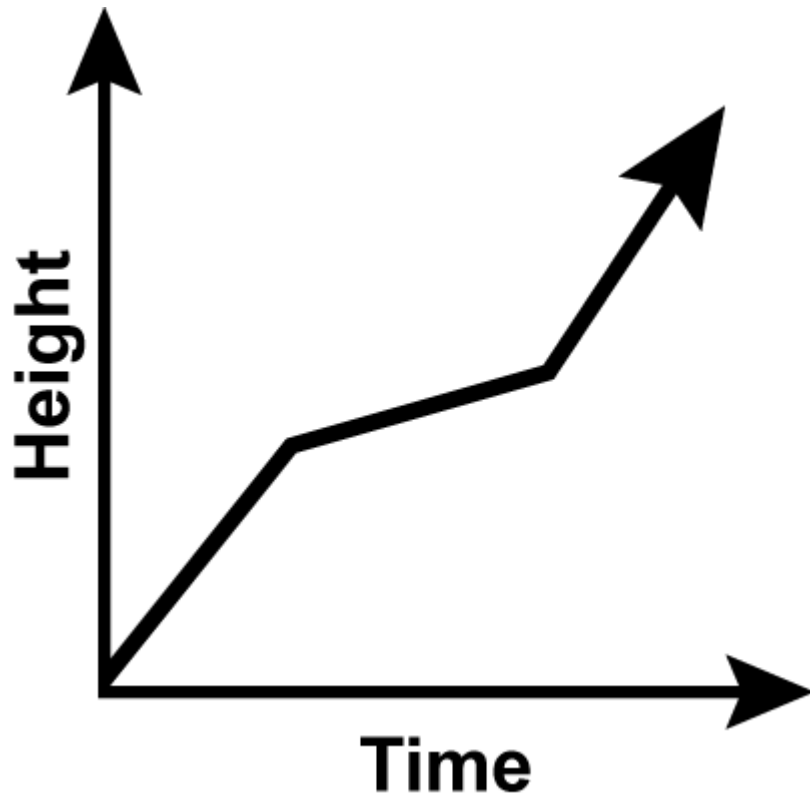
B.



C.



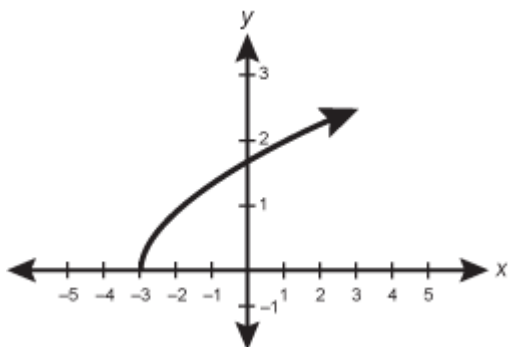
D.



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44. Given that $f(x) = x^2$ and $g(x) = (x + 5)^2$, which of the following statements describes the relationship between $f(x)$ and $g(x)$?
- A. The graph of $g(x)$ is equivalent to the graph of $f(x) - 5$.
 - B. Shifting the graph of $g(x)$ to the left 5 units results in the graph of $f(x)$.
 - C. The graph of $f(x)$ is equivalent to the graph of $g(x) - 5$.

D. Shifting the graph of $f(x)$ to the left 5 units results in the graph of $g(x)$.

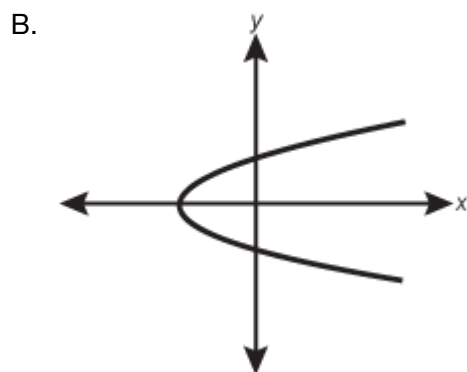
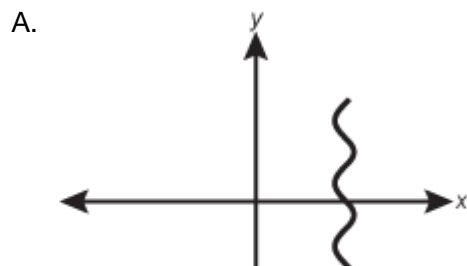
45. Use the graph below to answer the question that follows.



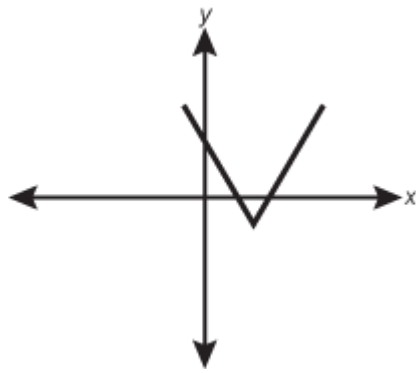
The graph of the function $f(x) = \sqrt{x+3}$ is shown. Which of the following functions, $g(x)$, represents a translation of the graph of $f(x)$ four units to the left on the x -axis?

- A. $g(x) = \sqrt{x+7}$
- B. $g(x) = \sqrt{x-1}$
- C. $g(x) = \sqrt{x+3} + 4$
- D. $g(x) = \sqrt{x+3} - 4$

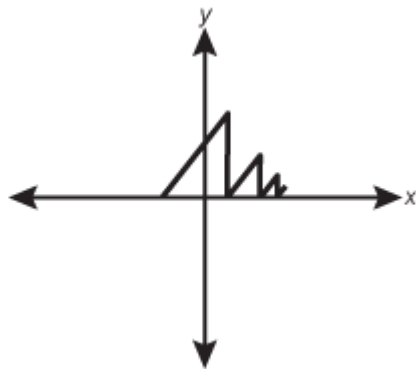
46. Which of the following graphs represents a function?



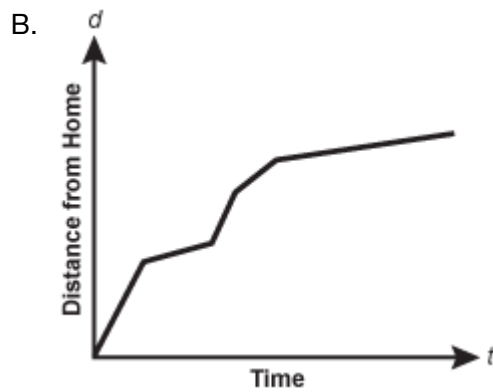
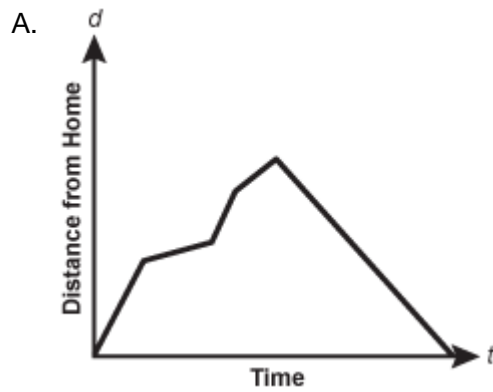
C.

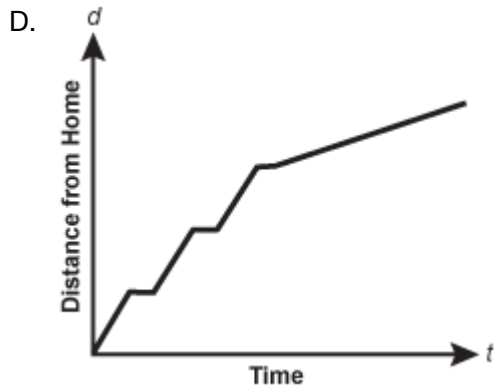
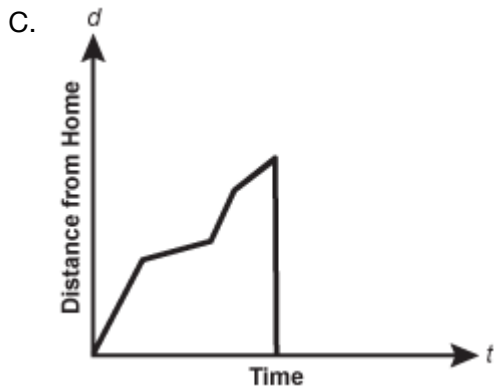


D.



47. The first part of a long car trip is made at highway speed. The driver then reduces the speed of the car in traffic, later resuming highway speed before exiting the highway and following local roads to the destination. The return home is at a steady rate on local roads. Which of the following graphs represents the relationship of distance from home, d , to time, t , for the round trip?



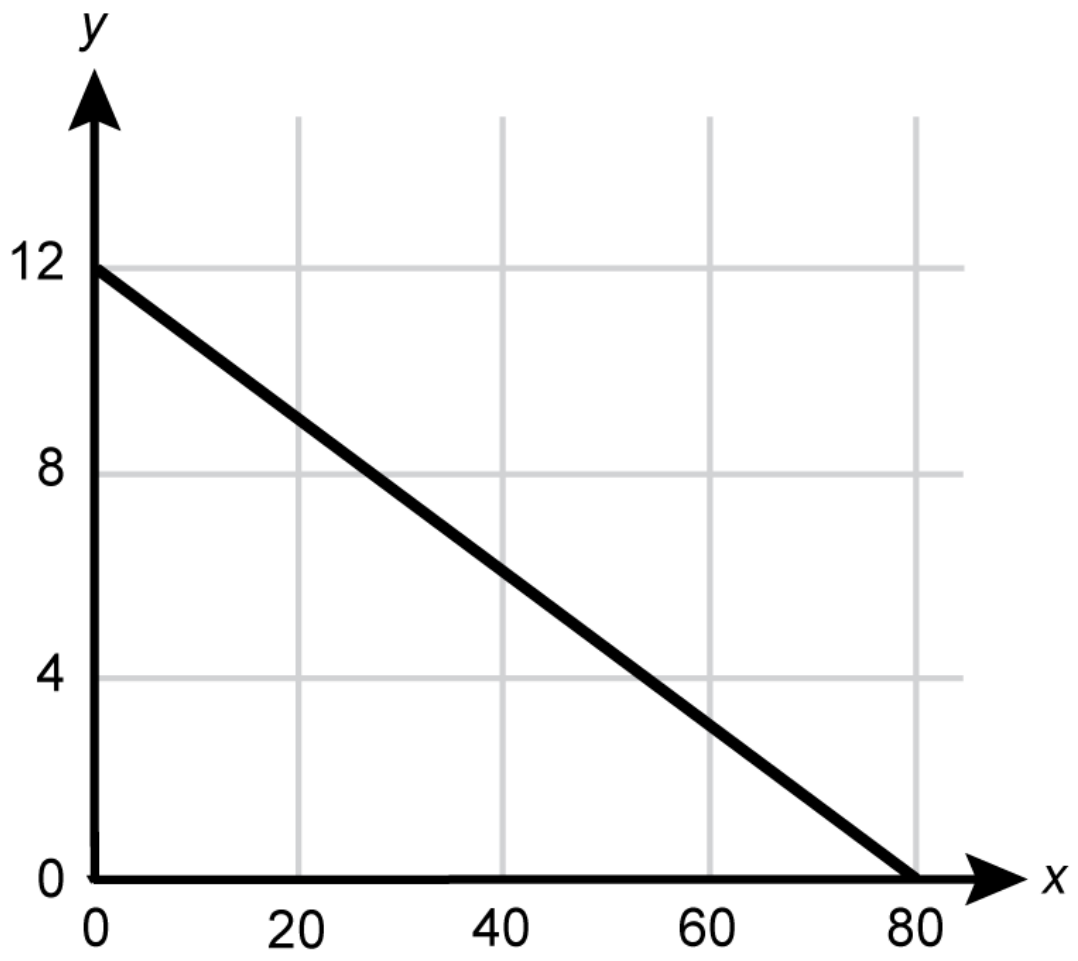


48. Given that $f(x)$ represents a direct variation function with constant of variation $-\frac{2}{3}$, and (x, y) is any point on the graph of $f(x)$, which of the following coordinate pairs represents another point on the graph of $f(x)$?

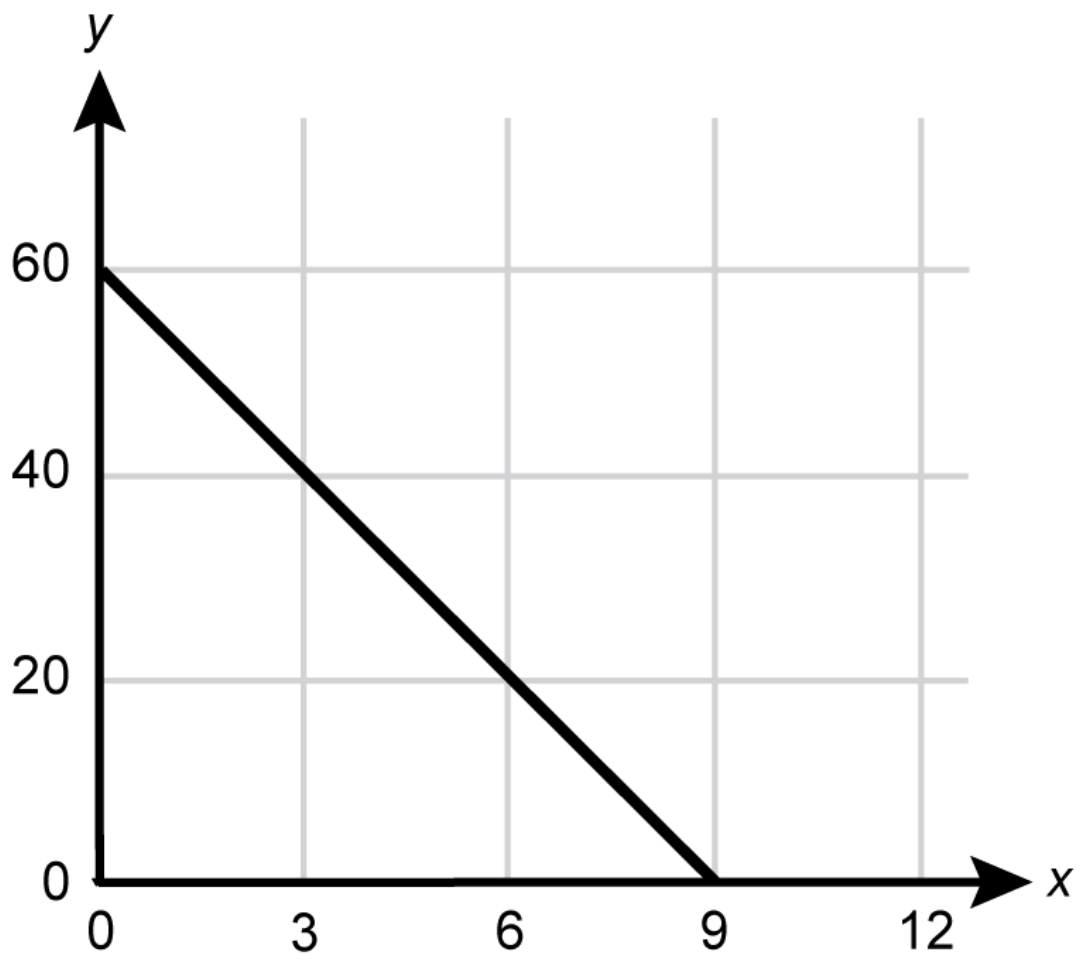
- A. $(-2x, 2y)$
- B. $(2x, 2y)$
- C. $(-2x, 3y)$
- D. $(2x, 3y)$

49. A local school requires 3 teachers as chaperones for every 20 students attending a field trip. Which of the following graphs best relates x , the number of students, to y , the number of teachers, on any given field trip?

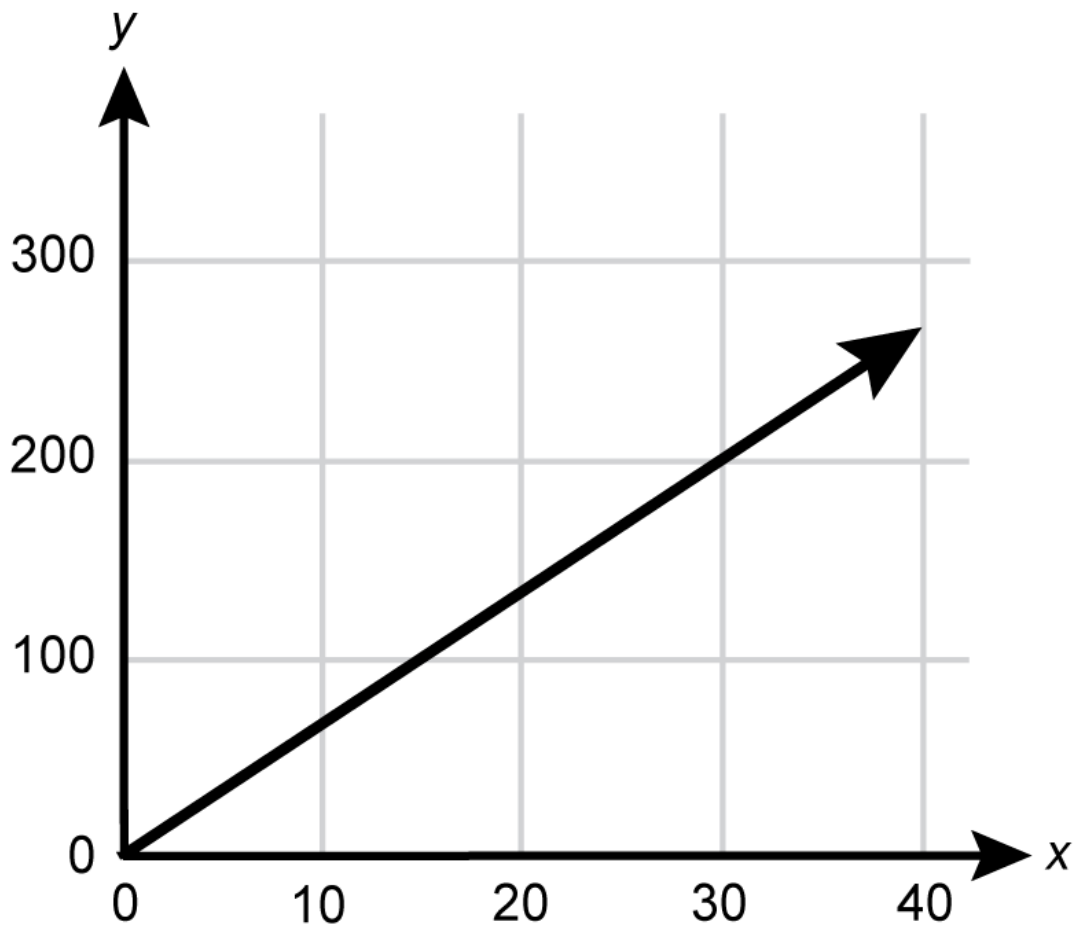
A.



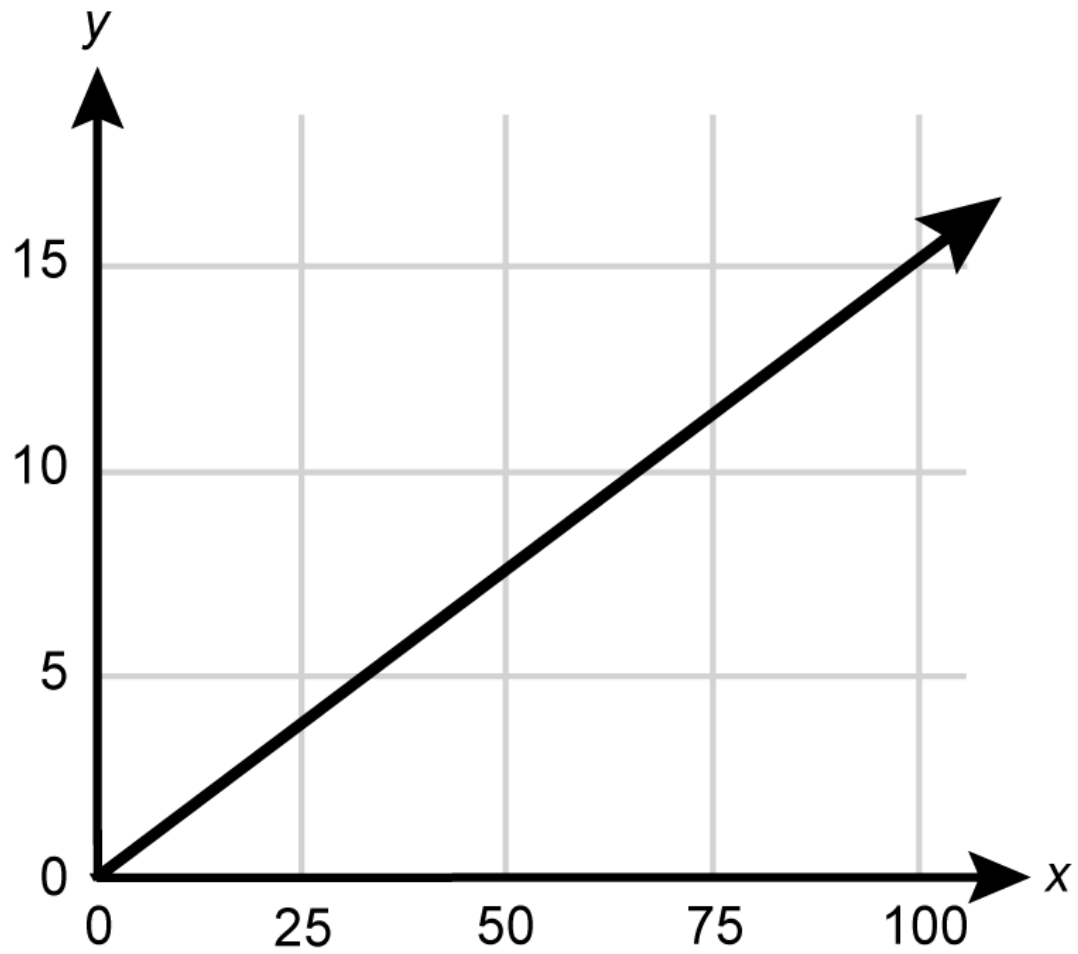
B.



C.



D.



50. Two points, $(-2, k + 8)$ and $(2, k)$, lie on line ℓ . Which of the following expressions represents the x -intercept of line ℓ in terms of k ?

- A. $k + 4$
 - B. $-k - 4$
 - C. $\frac{k + 4}{2}$
 - D. $\frac{k - 4}{2}$
-

51. A landscaping company charges a fixed price per cubic yard for mulch plus an additional delivery charge. For a delivery of 8 cubic yards, the total cost is \$328, and for 11 cubic yards, the total cost is \$424. Assuming that the delivery charge is constant, what is the y -intercept of the graph that relates x , the number of cubic yards of mulch delivered, to y , cost?

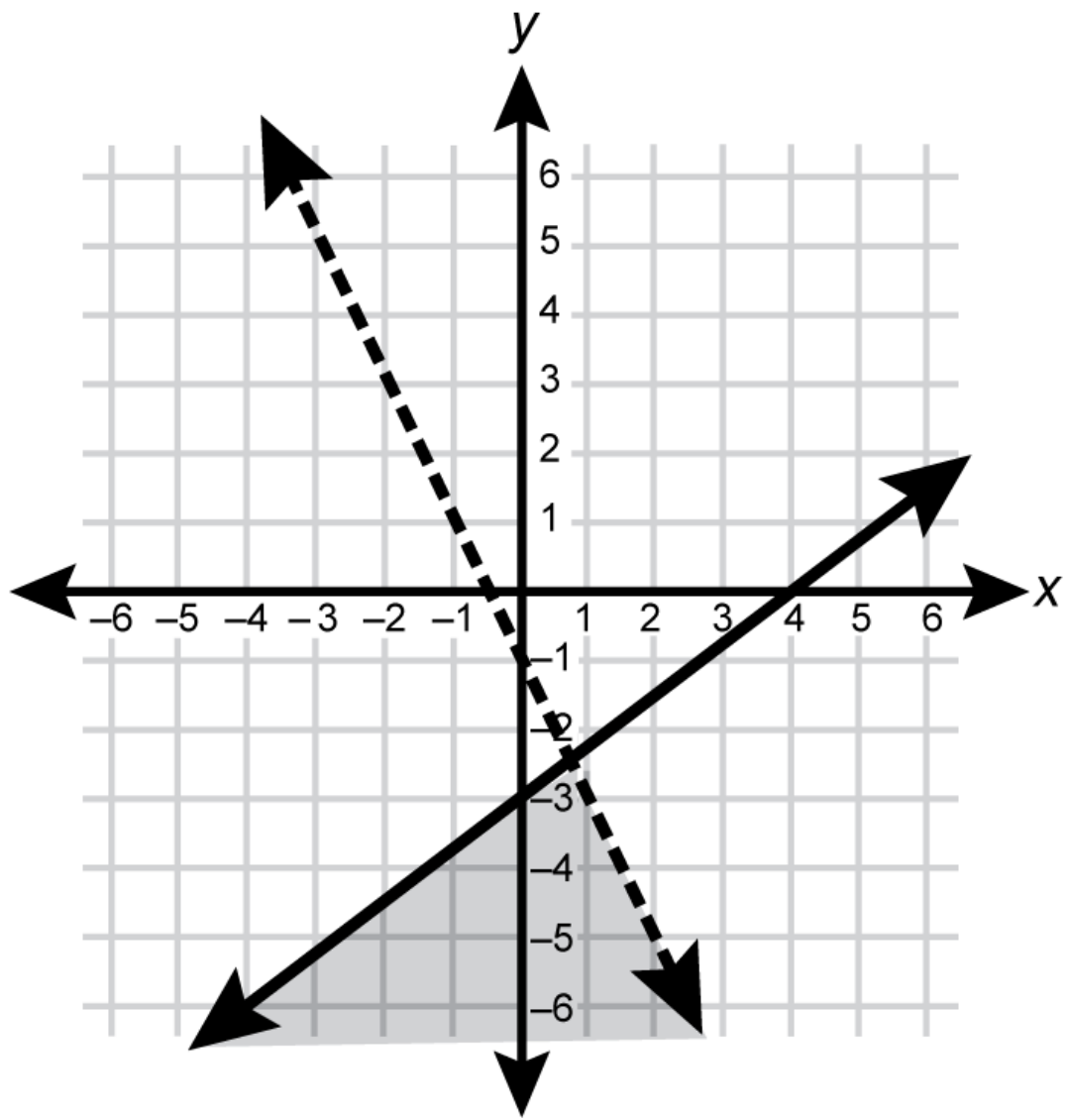
- A. 12
 - B. 32
 - C. 72
 - D. 96
-

52. Two lines, k and p , are parallel. If the equation for line k is $3x + Ay = B$, and line p passes through the point $(-4, 0)$, which of the following equations represents line p ?

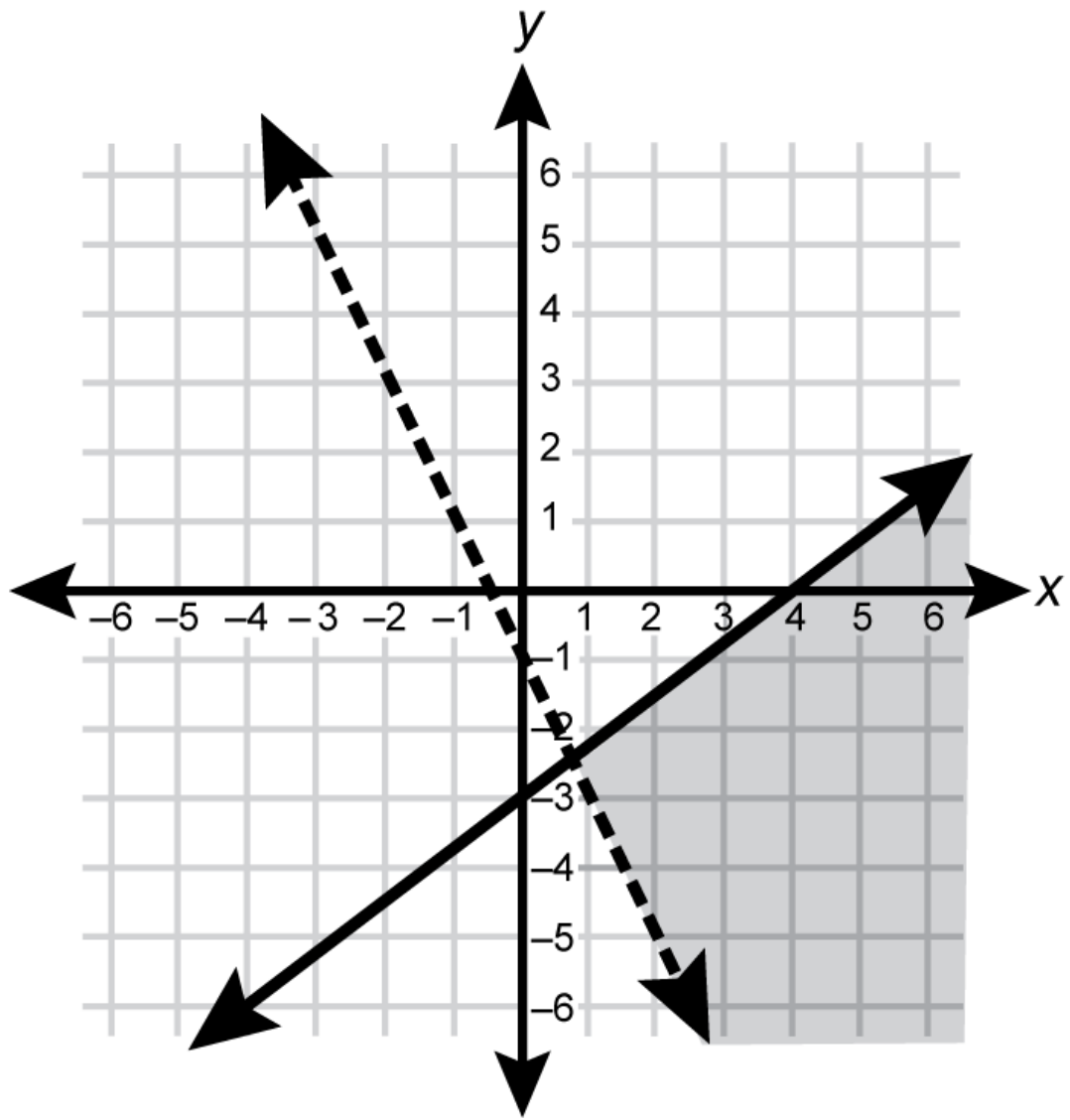
- A. $y = \frac{3}{A}(x - 4)$
 - B. $y = \frac{3x}{A} - 4$
 - C. $y = -\frac{3}{A}(x + 4)$
 - D. $y = -\frac{3x}{A} + 4$
-

53. Which of the following graphs shows the solution to the system of inequalities $-2(x - 3) < y + 7$ and $3x - 4y \geq 12$?

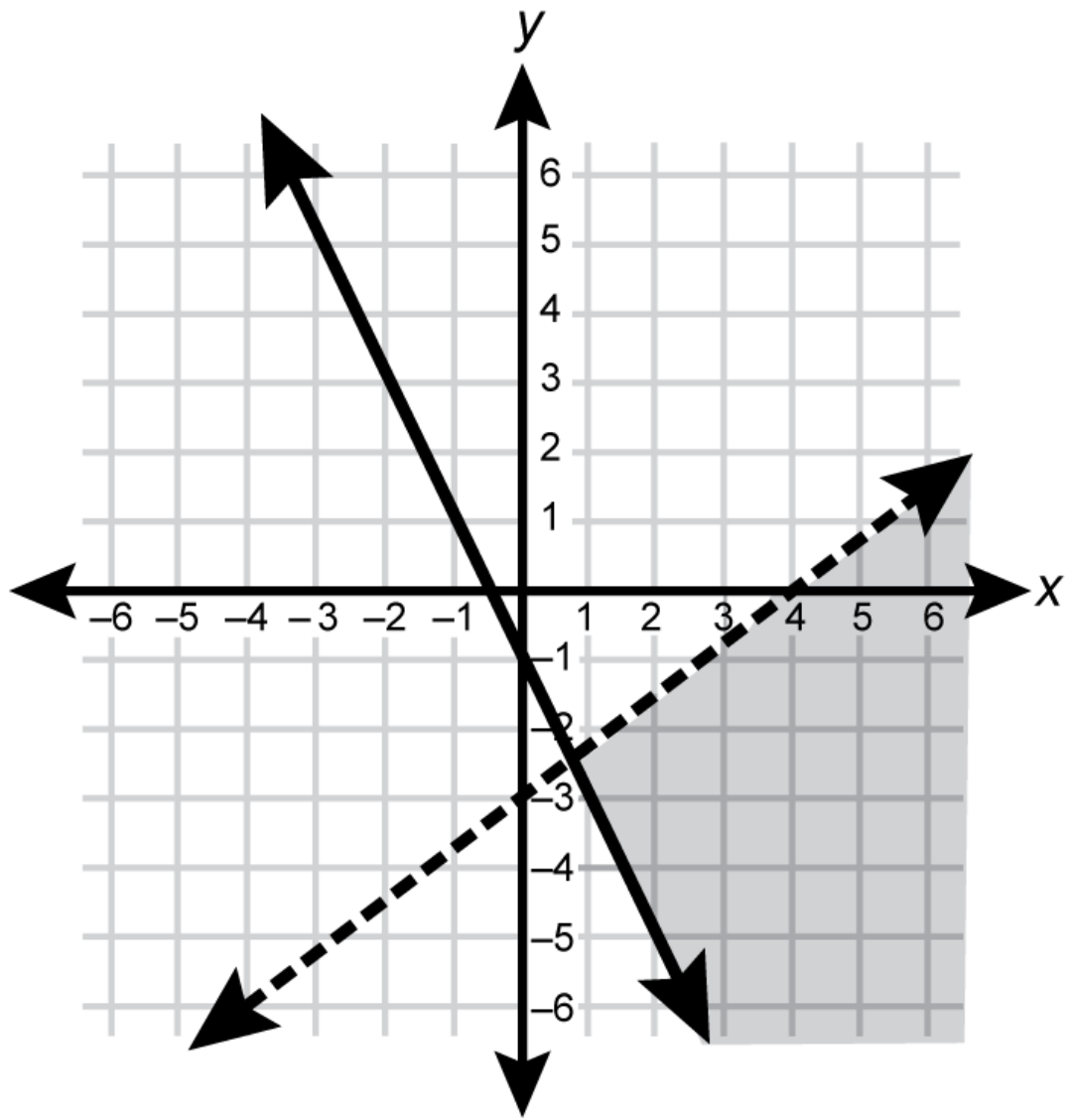
A.



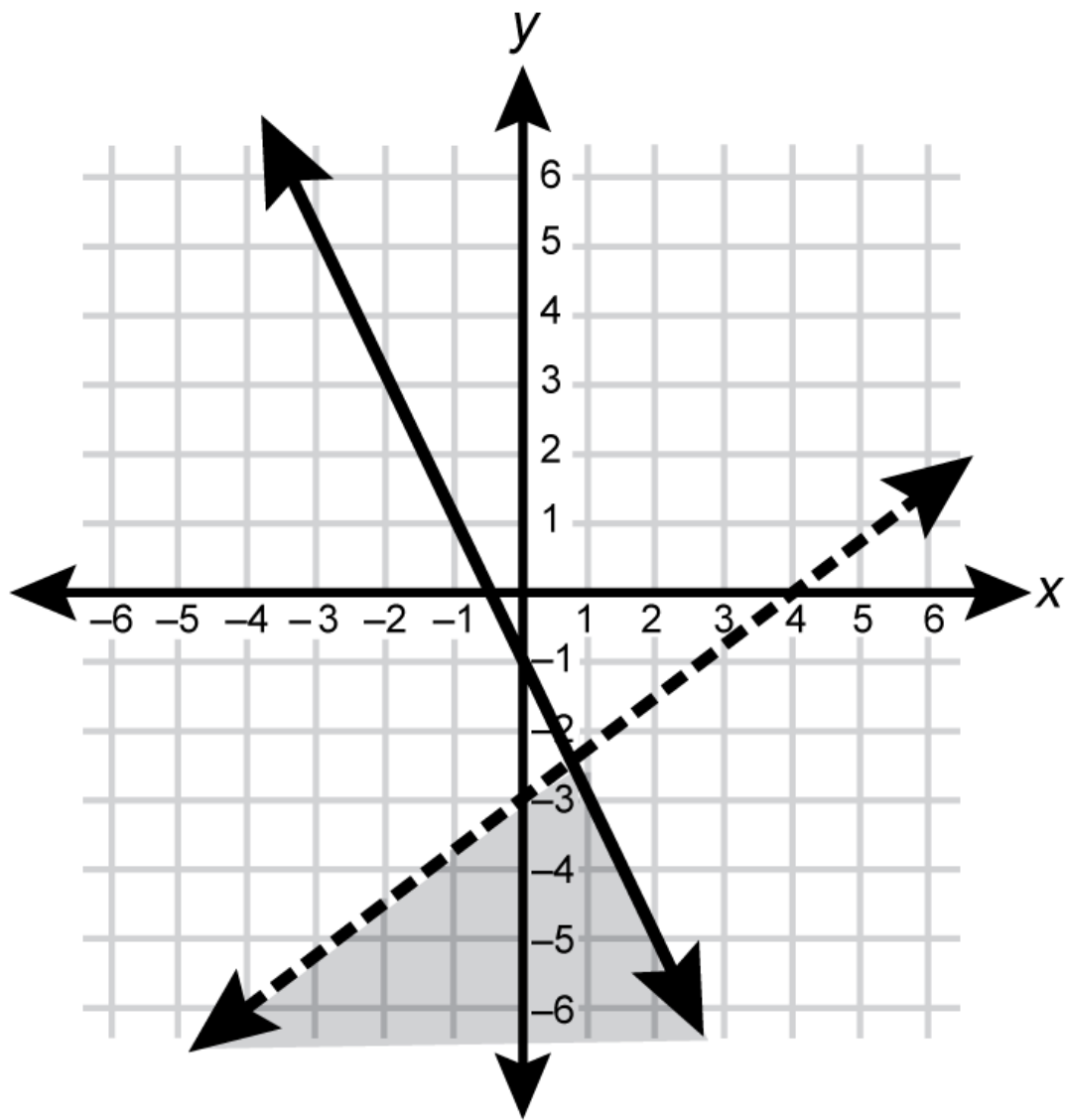
B.



C.



D.



54. If $3x + 4y = -20$ and $2x - 3y = -2$, then what is the value of x ?

- A. $x = -4$
- B. $x = -2$
- C. $x = -\frac{28}{5}$
- D. $x = -\frac{22}{17}$

55. A teacher has 2-inch-thick textbooks weighing 6 pounds each and 2.5-inch-thick lab manuals weighing 5 pounds each. If the classroom contains a 3-foot-long shelf that can hold up to 85 pounds, which of the following systems of equations represents the number of textbooks, x , and lab manuals, y , that can be placed on the shelf?

- A. $6x + 5y < 85$
 $2x + 2.5y < 36$

B. $\frac{x}{6} + \frac{y}{5} < 85$

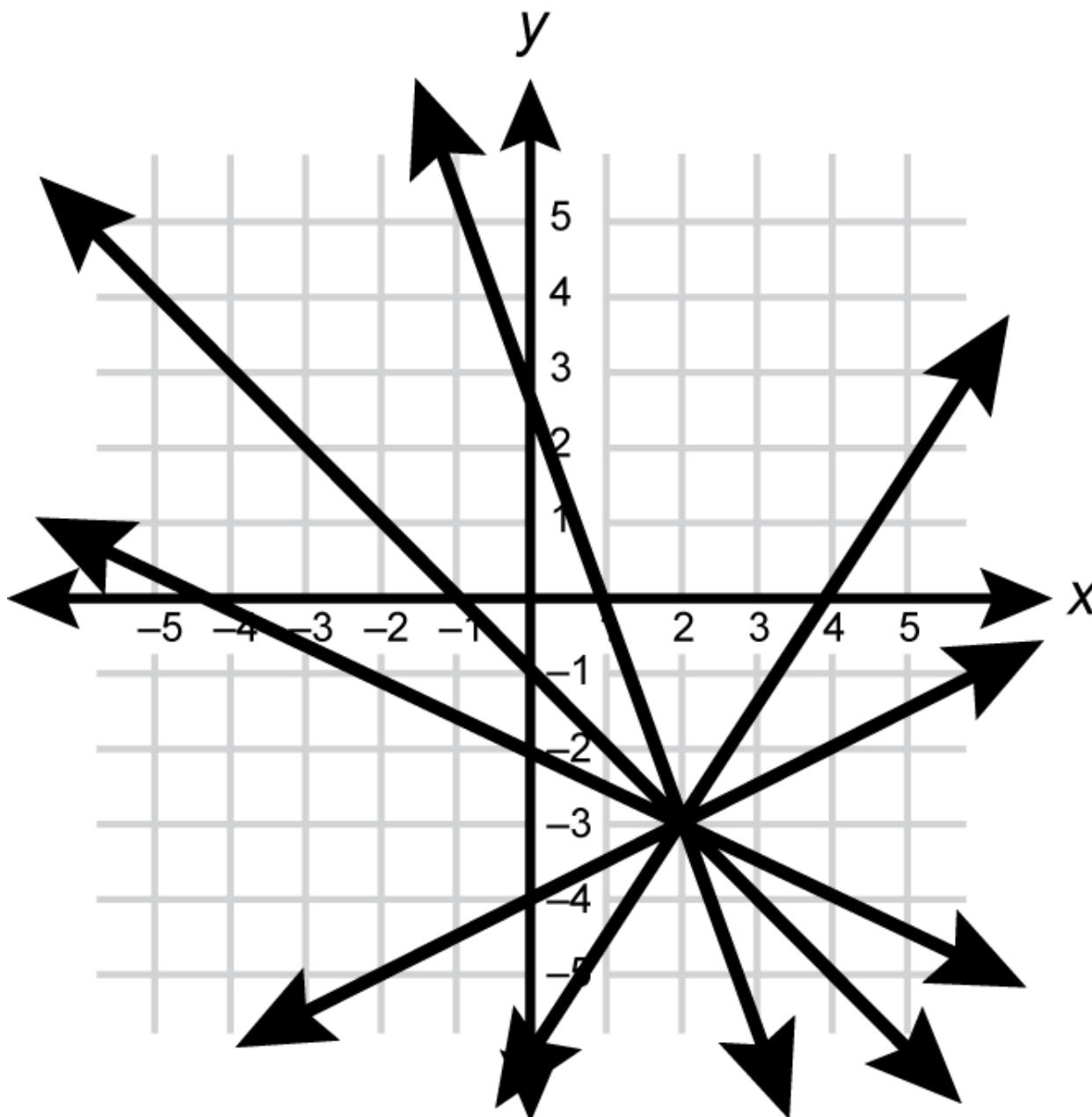
$\frac{x}{2} + \frac{y}{2.5} < 36$

C. $6x + 5y \leq 85$
 $2x + 2.5y \leq 36$

D. $\frac{x}{6} + \frac{y}{5} \leq 85$

$\frac{x}{2} + \frac{y}{2.5} \leq 36$

56. Use the graph below to answer the question that follows.



Given that k is a slope value, the family of lines shown in the graph can be described using which of the following equations?

- A. $y + 3 = kx - 2$
 - B. $y + 3 = k(x - 2)$
 - C. $y = kx + 2 - 3$
 - D. $y = k(x + 2) - 3$
-

57. Use the table below to answer the question that follows.

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

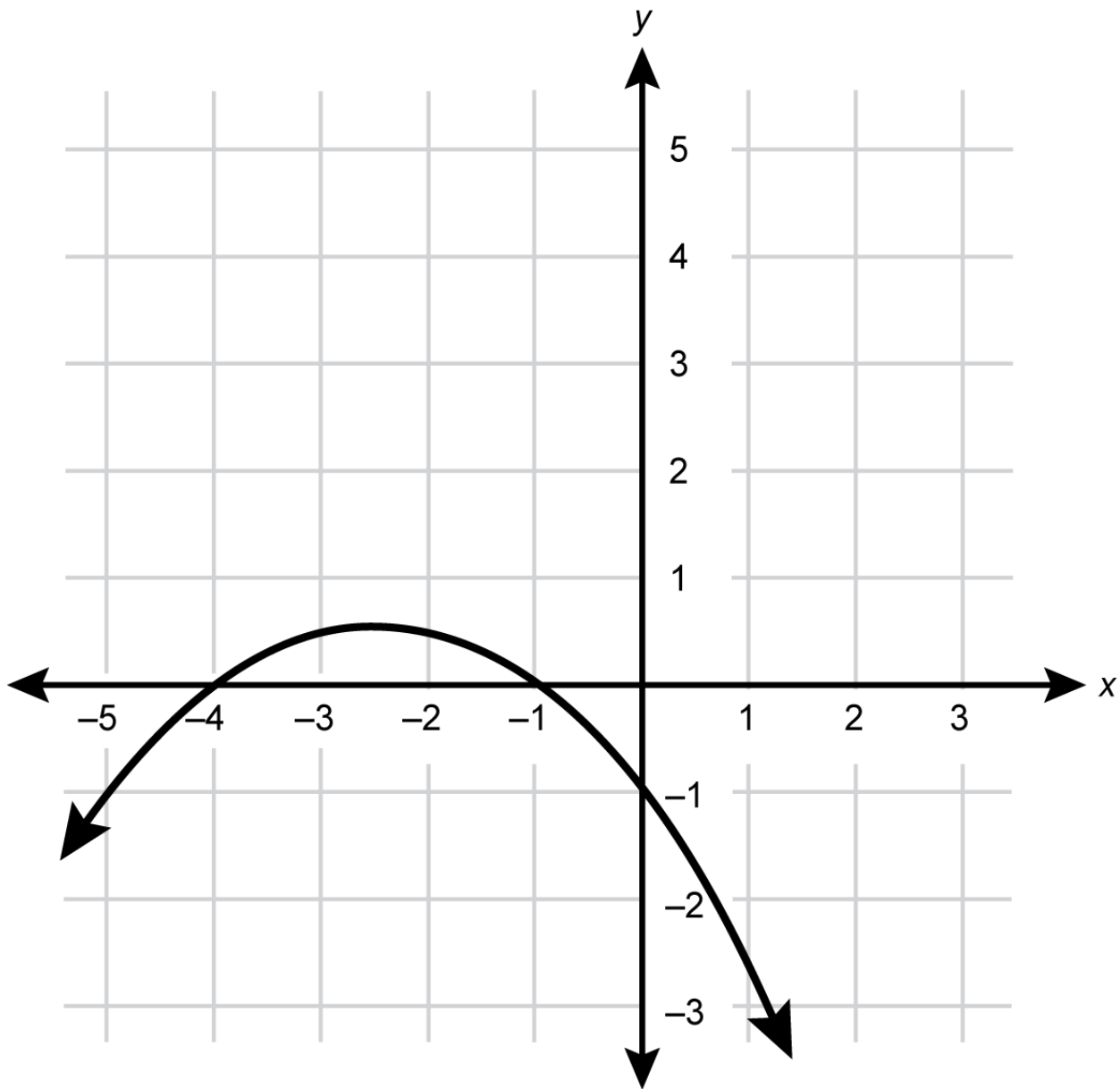
Which of the following equations represents the function described by the points in the table?

- A. $x - 3y = 6$
 - B. $3y - x = 6$
 - C. $2x + 3y = 12$
 - D. $2y + 3x = 12$
-

58. A particular vehicle loses 15% of its value each year. Which of the following expressions represents the value of this vehicle 3 years ago, given that the vehicle is currently valued at \$27,500?

- A. $27,500(1 + 0.15)^3$
 - B. $27,500(1 - 0.15)^3$
 - C. $\frac{27,500}{(1 + 0.15)^3}$
 - D. $\frac{27,500}{(1 - 0.15)^3}$
-

59. Use the graph below to answer the question that follows.



When the equation of the parabola shown is written in the form $y = a(x + b)(x + c)$, what is the value of a ?

- A. -3
- B. -1
- C. $-\frac{1}{4}$
- D. $-\frac{1}{2}$

60. A farmer triples the area of a square chicken pen by increasing its length by 4 meters and its width by 2 meters. Which of the following equations could be a step in the process of finding x , the side length of the original pen?

- A. $x^2 - 3x - 4 = 0$
- B. $x^2 + 6x + 8 = 0$
- C. $2x^2 + 6x - 8 = 0$

D. $3x^2 - 2x - 4 = 0$

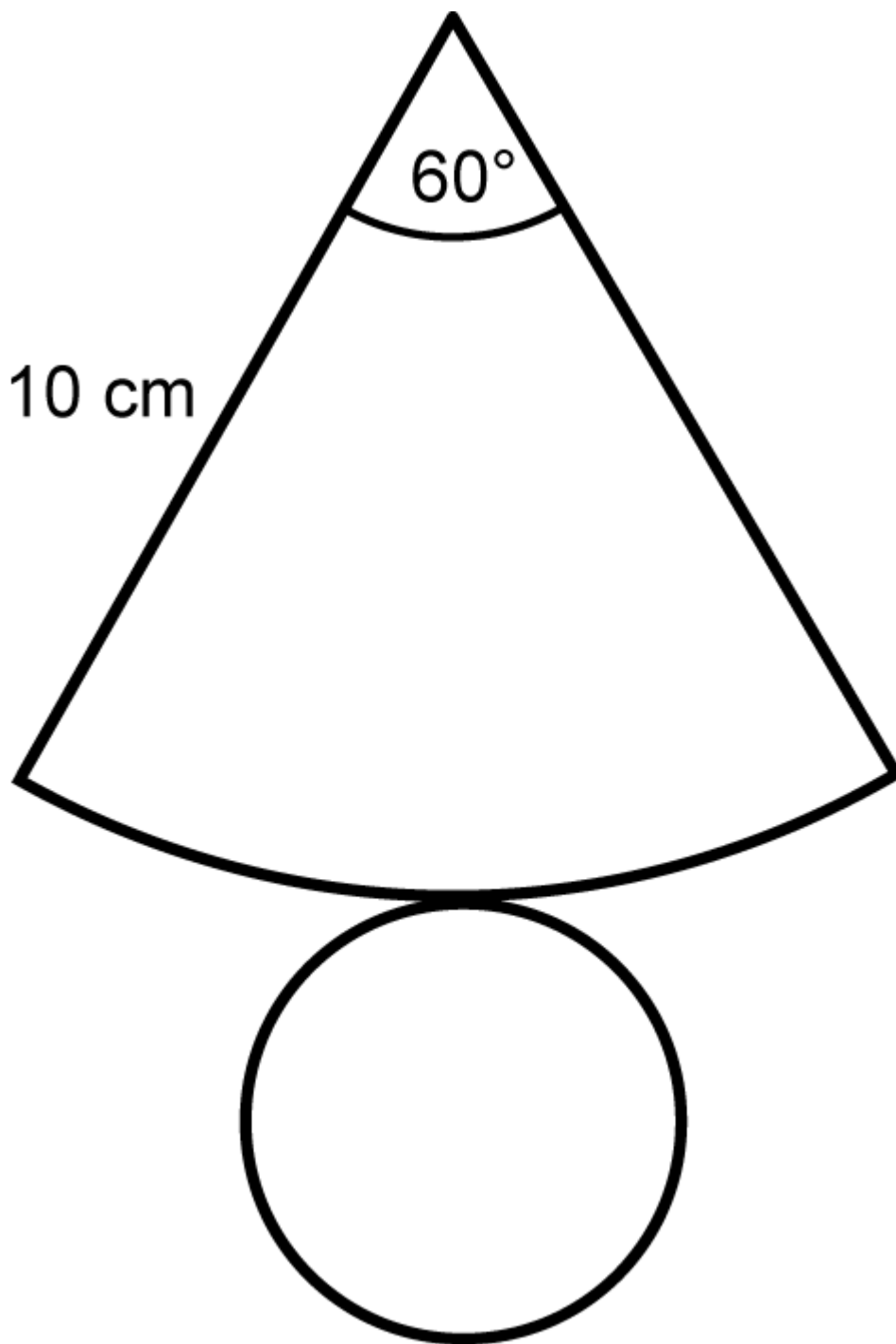
61. The graph of a parabola of the form $y = x^2 + bx + c$ crosses the y -axis at -36 and the x -axis at $x = 3$. At what other point does the graph cross the x -axis?

- A. $x = -12$
 - B. $x = -9$
 - C. $x = 9$
 - D. $x = 12$
-

62. Each year, the profits at a company increase by 7%. If the profits at the end of the first year are \$4000, which of the following expressions represents the profits at the end of the 10th year?

- A. $4000(9)(0.7)$
 - B. $4000(10)(1.07)$
 - C. $4000 + 10(1.07)^{10}$
 - D. $4000(1.07)^9$
-

63. **Use the diagram below to answer the question that follows.**



The diagram shows the net of a right cone. Which of the following expressions represents the area of the cone's base in square centimeters?

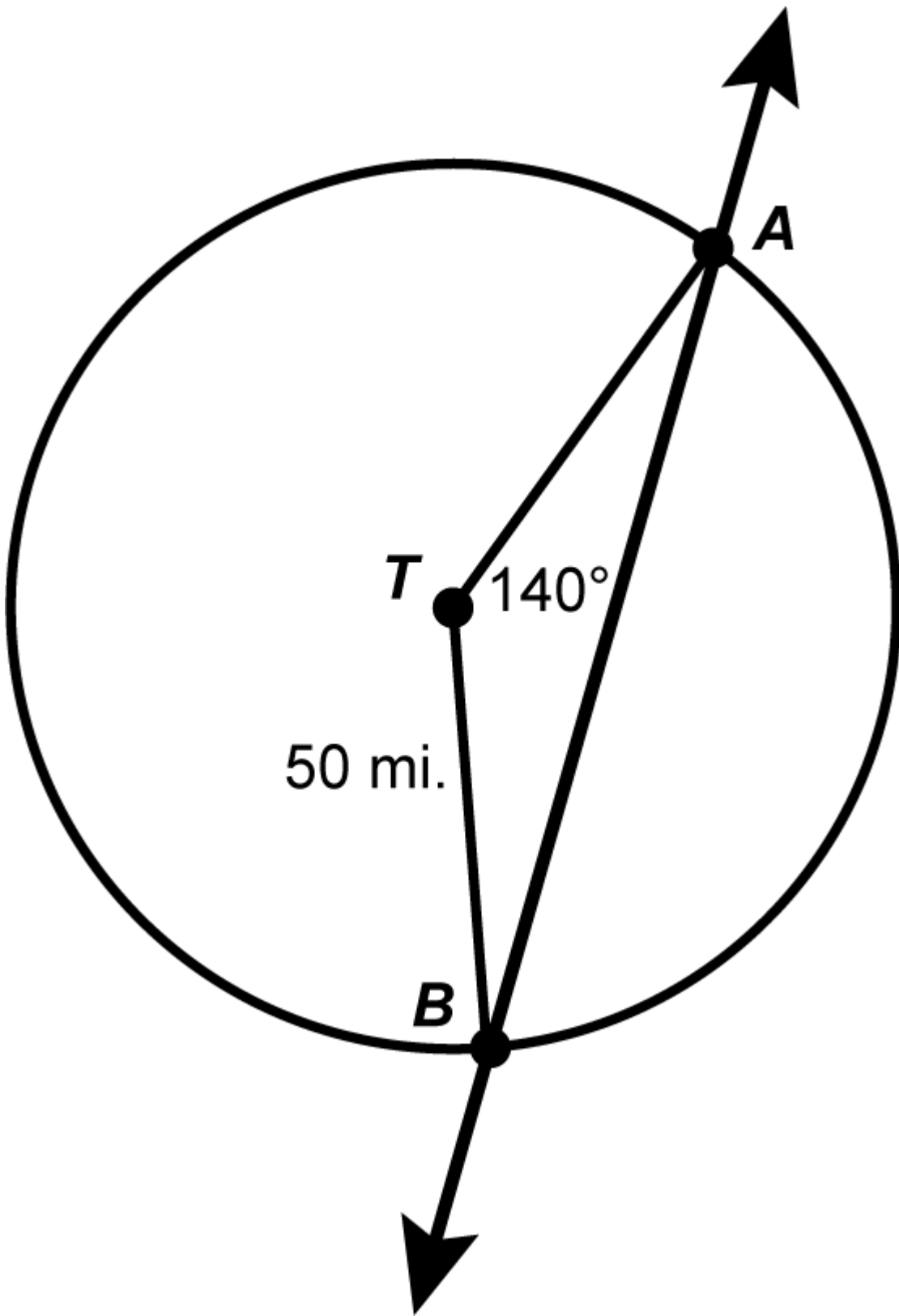
- A. $\frac{25}{3}\pi$
 - B. $\frac{25}{6}\pi$
 - C. $\frac{25}{9}\pi$
 - D. $\frac{25}{36}\pi$
-

64. The edges of a small cube are scaled by a factor of 4. How does the surface area-to-volume ratio for the larger cube compare to that of the smaller cube?
- A. The ratio is smaller by a factor of 4.
 - B. The ratio is smaller by a factor of 2.
 - C. The ratio is larger by a factor of 2.
 - D. The ratio is larger by a factor of 4.
-

65. The edge of a cube measures 10 inches, rounded to the nearest inch. Using the rounded length, a student calculates the volume of the cube to be 1000 cubic inches. Which of the following computations is most relevant to establishing the maximum amount of error in the student's reported volume?
- A. $(10.49 - 10)^3$
 - B. $(10.49 - 9.5)^3$
 - C. $10^3 - 9^3$
 - D. $10.49^3 - 10^3$
-

66. Points A and B are on a circle with center O and radius 12. If arc AB has length 9π , what is the measure of angle AOB ?
- A. 108°
 - B. 135°
 - C. 216°
 - D. 270°
-

67. **Use the diagram below to answer the question that follows.**



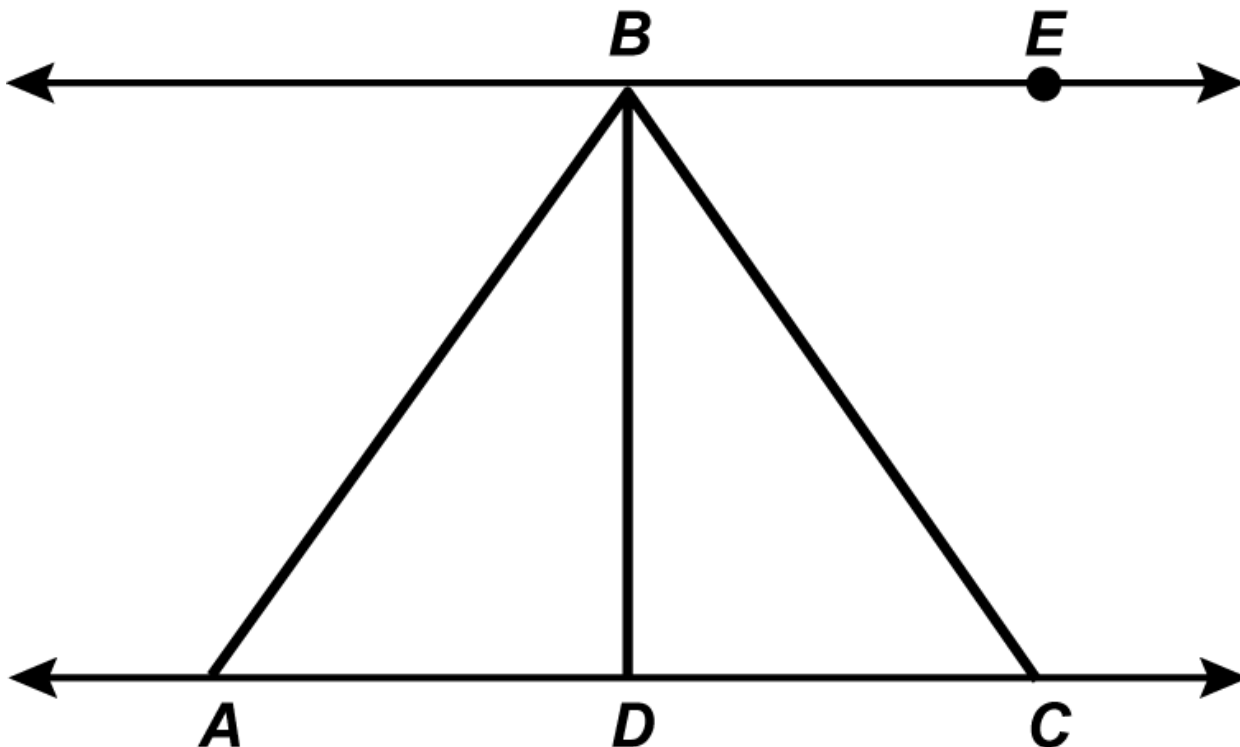
The signal from cell tower T extends over a circular area for a radius of 50 miles with highway AB passing through the service area as shown. If angle $ATB = 140^\circ$, which of the following expressions represents the length, in miles, of highway AB within the service area?

- A. $50 \sin 140^\circ$
- B. $100 \sin 70^\circ$
- C. $50 \cos 140^\circ$
- D. $100 \cos 70^\circ$

68. Which of the following expressions is equal to the area of an isosceles triangle with a base angle θ , a base of length 16, and legs of length 12?

- A. $48 \cos \theta$
- B. $96 \cos \theta$
- C. $48 \sin \theta$
- D. $96 \sin \theta$

69. Use the diagram below to answer the question that follows.



Which of the following assumptions can be made about the figure shown?

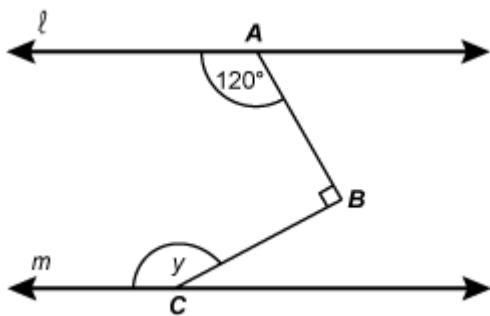
- A. Point A is on \overleftrightarrow{DC}
- B. $\overline{AC} \cong \overline{BC}$
- C. $\angle ADB$ is a right angle
- D. $\overleftrightarrow{BE} \parallel \overleftrightarrow{DC}$

70. Which of the following statements is true in Euclidean space?

- A. If $\overline{AM} \cong \overline{MB}$, then M is the midpoint of \overline{AB} .
- B. If $m\angle A + m\angle B = 180^\circ$, then $\angle A$ and $\angle B$ are a linear pair.
- C. Only one line exists that is parallel to a given line through a point not on the line.
- D. If the angles formed by two pairs of rays are congruent, then the corresponding rays

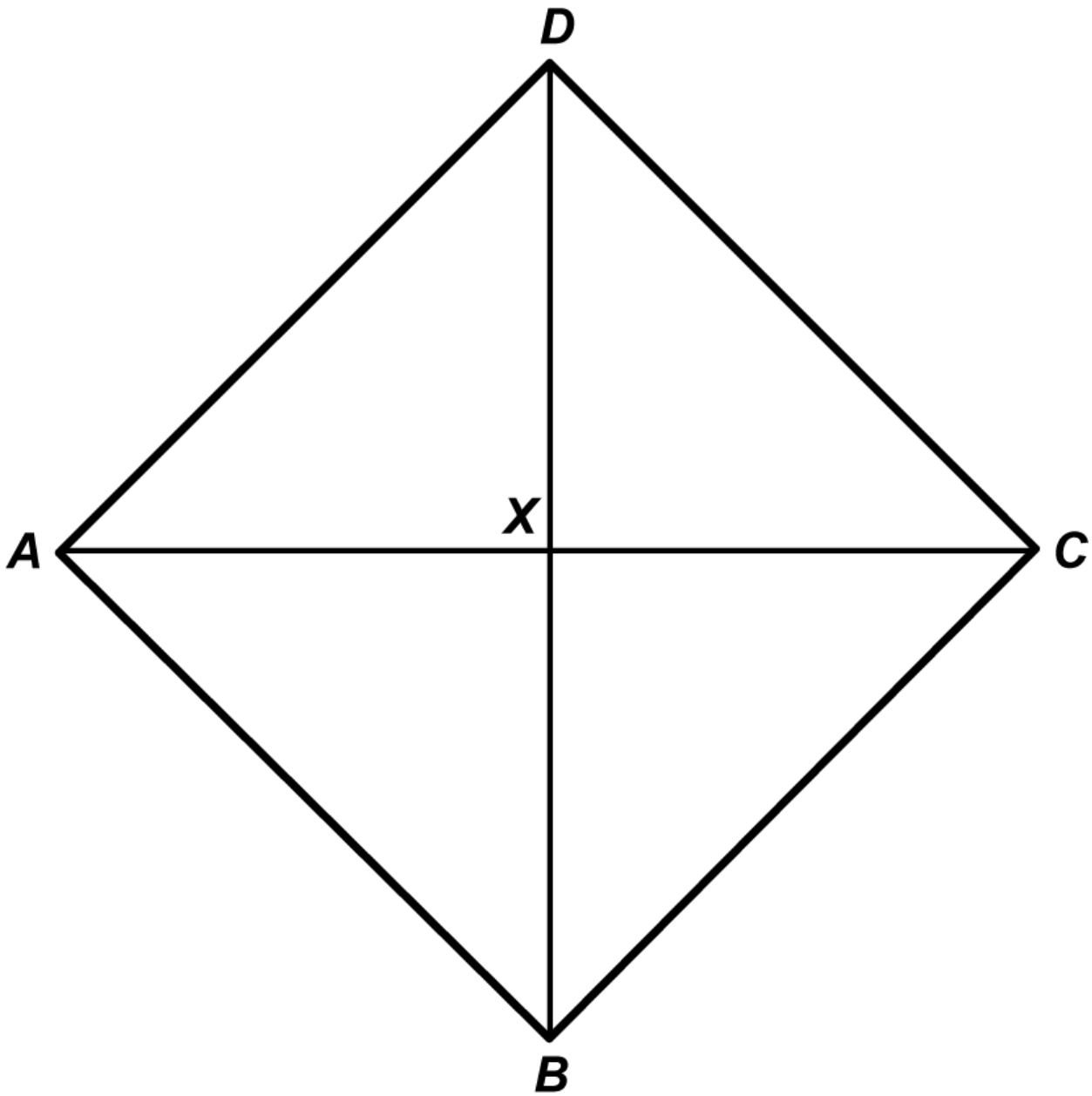
are parallel.

71. Use the diagram below to answer the question that follows.



Given that line ℓ is parallel to line m , what is the measure of angle y ?

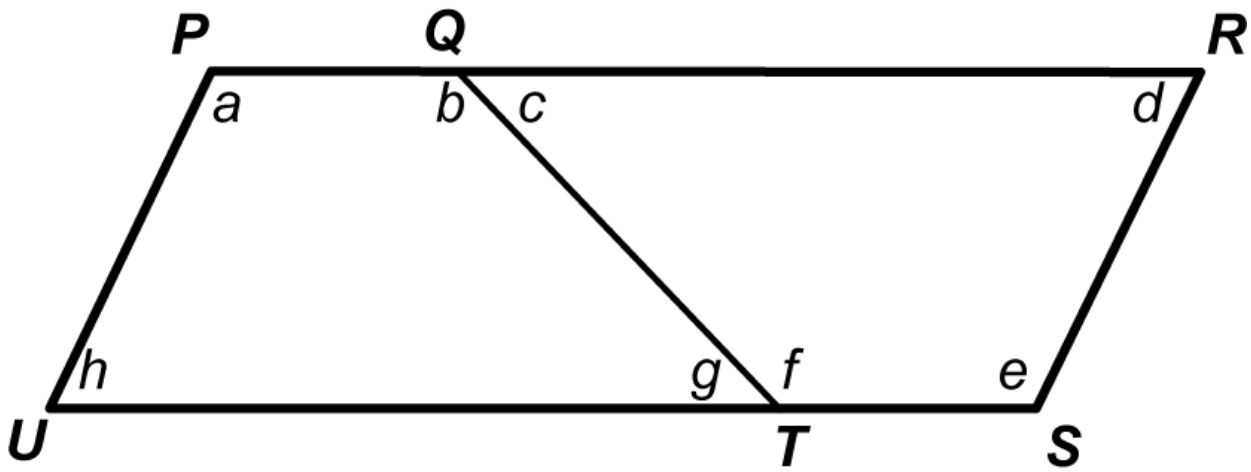
- A. 120°
 - B. 135°
 - C. 150°
 - D. 165°
72. Triangle ABC is a right triangle with hypotenuse AB . Segment MN is drawn parallel to side AC with M on hypotenuse AB and N on side CB . If $AC = 20$, $CN = 12$, and $MN = 12$, what is the length of side CB ?
- A. 16
 - B. 18
 - C. 20
 - D. 30
73. Use the diagram and information below to answer the question that follows.



If $\overline{AD} \cong \overline{AB}$ and $\overline{DC} \cong \overline{BC}$, then which of the following statements must be true?

- A. $\overline{DX} \cong \overline{BX}$
- B. $\overline{AX} \cong \overline{CX}$
- C. $\angle DAX \cong \angle ADX$
- D. $\angle DBC \cong \angle BDA$

74. Use the diagram below to answer the question that follows.

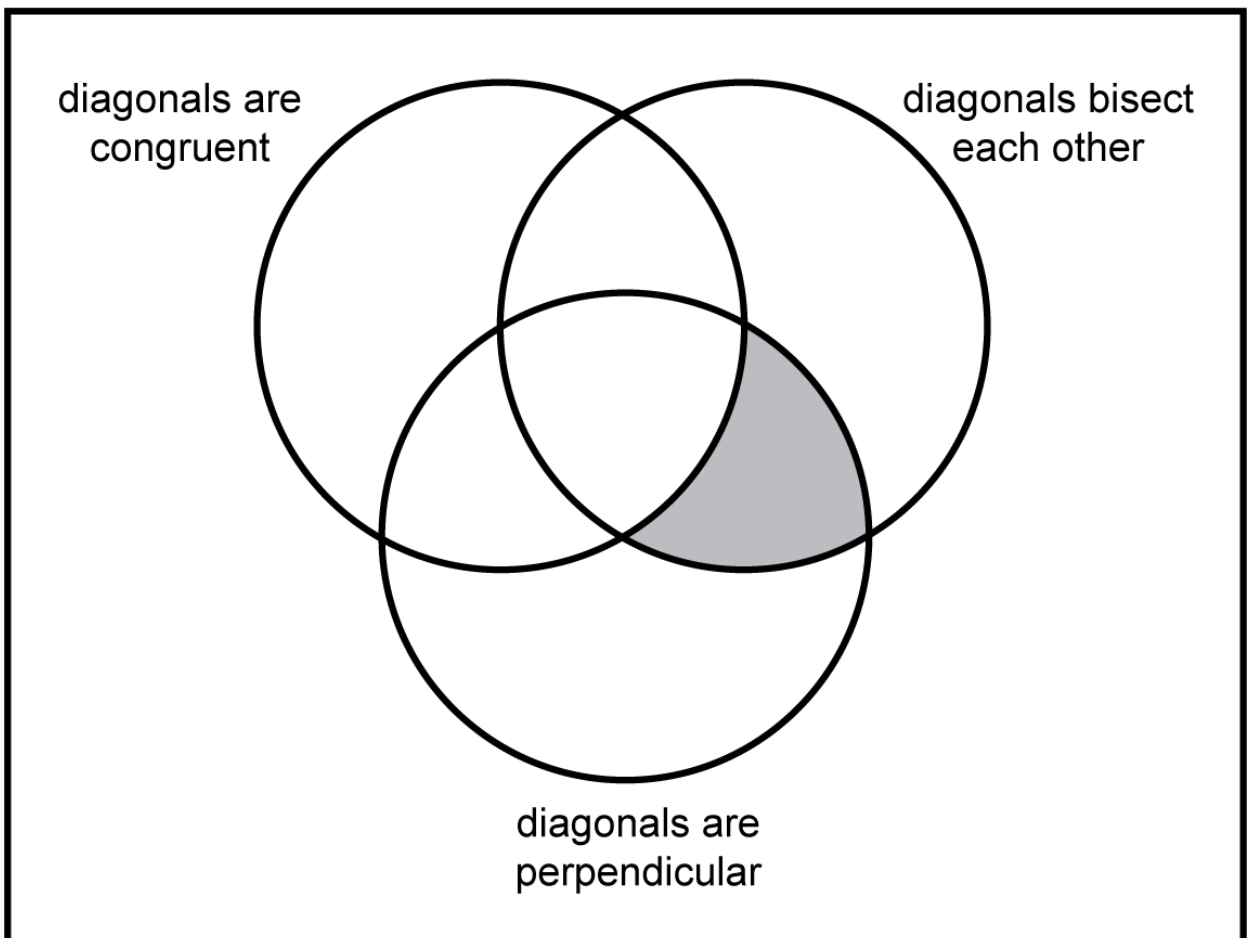


Trapezoid $PQTU$ is congruent to trapezoid $STQR$. After showing that PQR and UTS are line segments, which of the following observations best justifies that \overline{PU} and \overline{RS} are parallel?

- A. $PU = RS$
- B. $m\angle d = m\angle h$ and $m\angle a = m\angle e = 180^\circ - m\angle d$
- C. $PQ + QR = UT + TS$
- D. $m\angle c = m\angle g$ and $m\angle b = m\angle f = 180^\circ - m\angle c$

75. Use the information below to answer the question that follows.

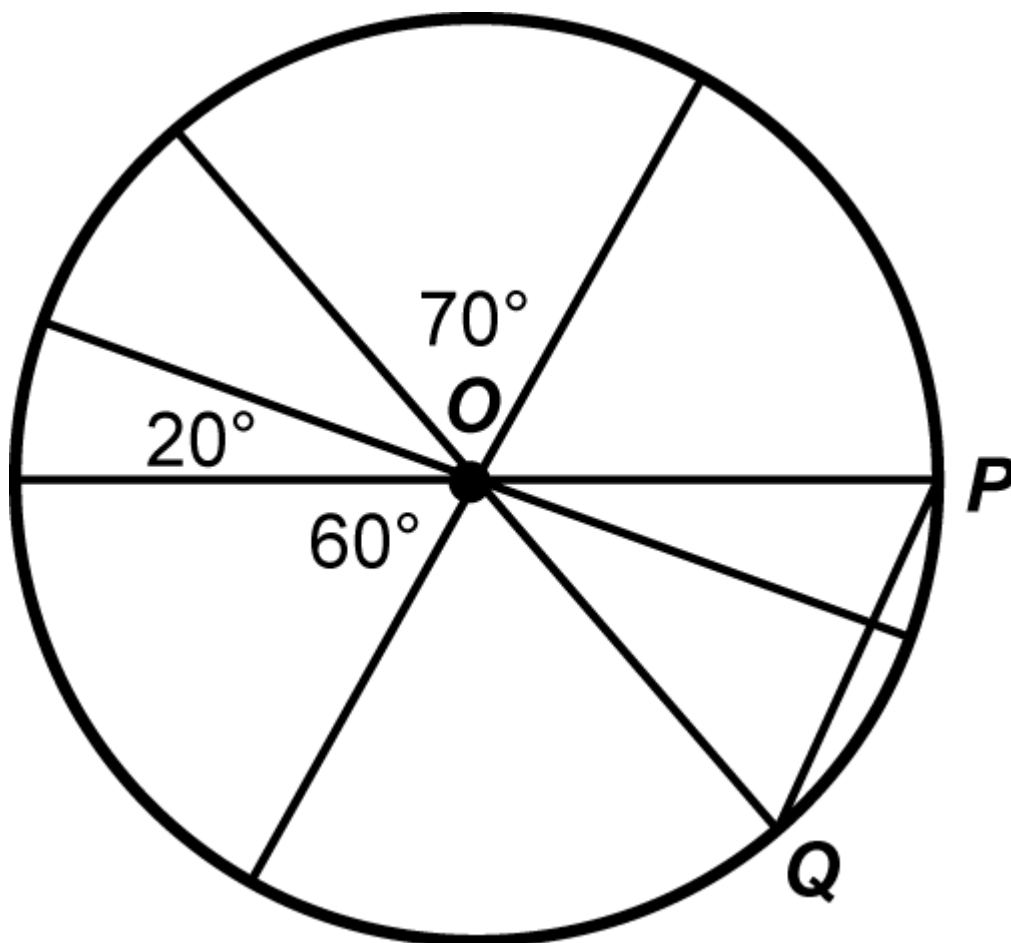
Quadrilaterals are placed in the appropriate sections of a Venn diagram based on the properties of their diagonals, as shown below.



Which of the following quadrilaterals is included in the shaded section?

- A. kite
- B. rectangle
- C. rhombus
- D. parallelogram

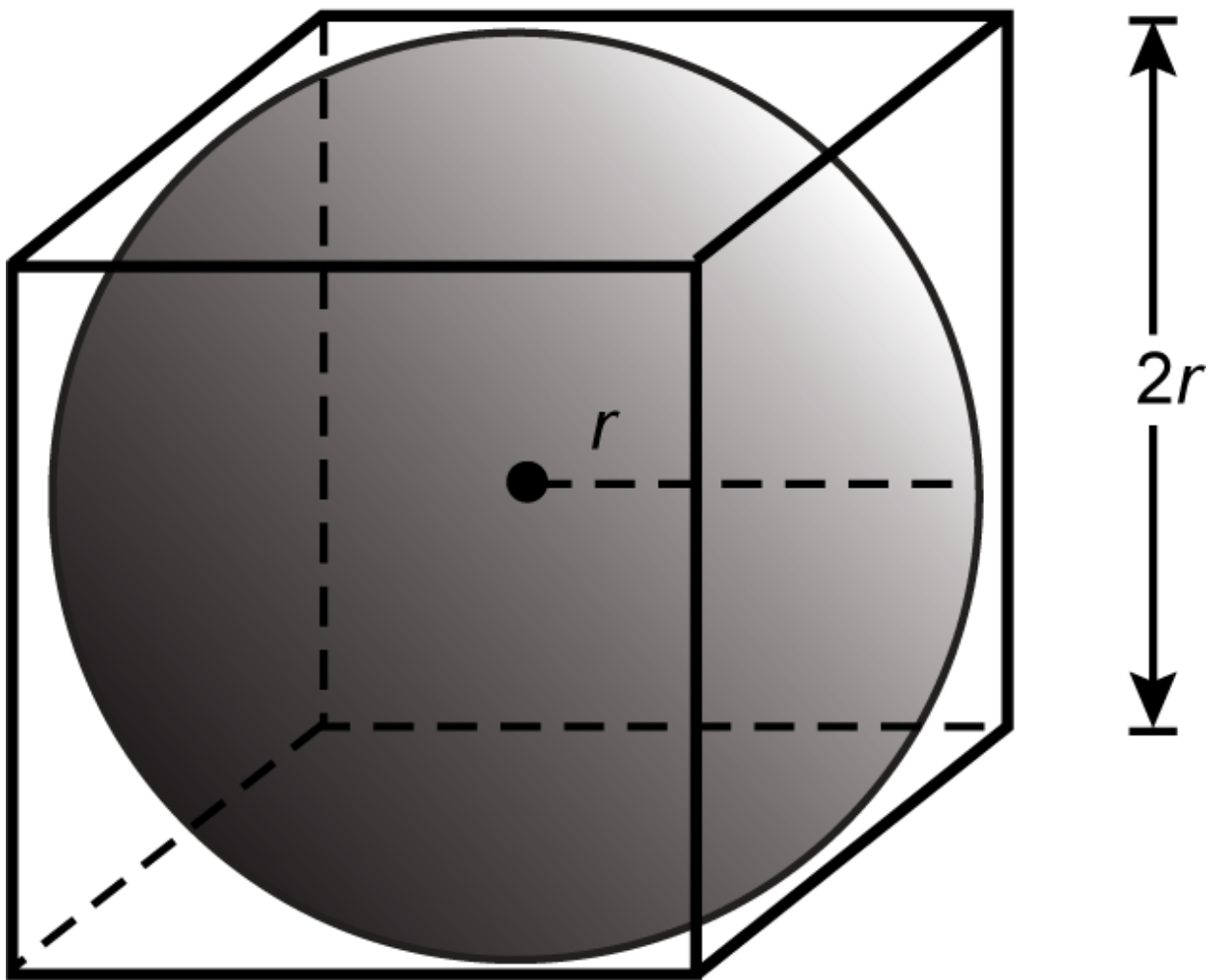
76. Use the diagram below to answer the question that follows.



The diagram shows circle O with four diameters and chord PQ . What is the measure of $\angle OPQ$?

- A. 55°
- B. 60°
- C. 65°
- D. 70°

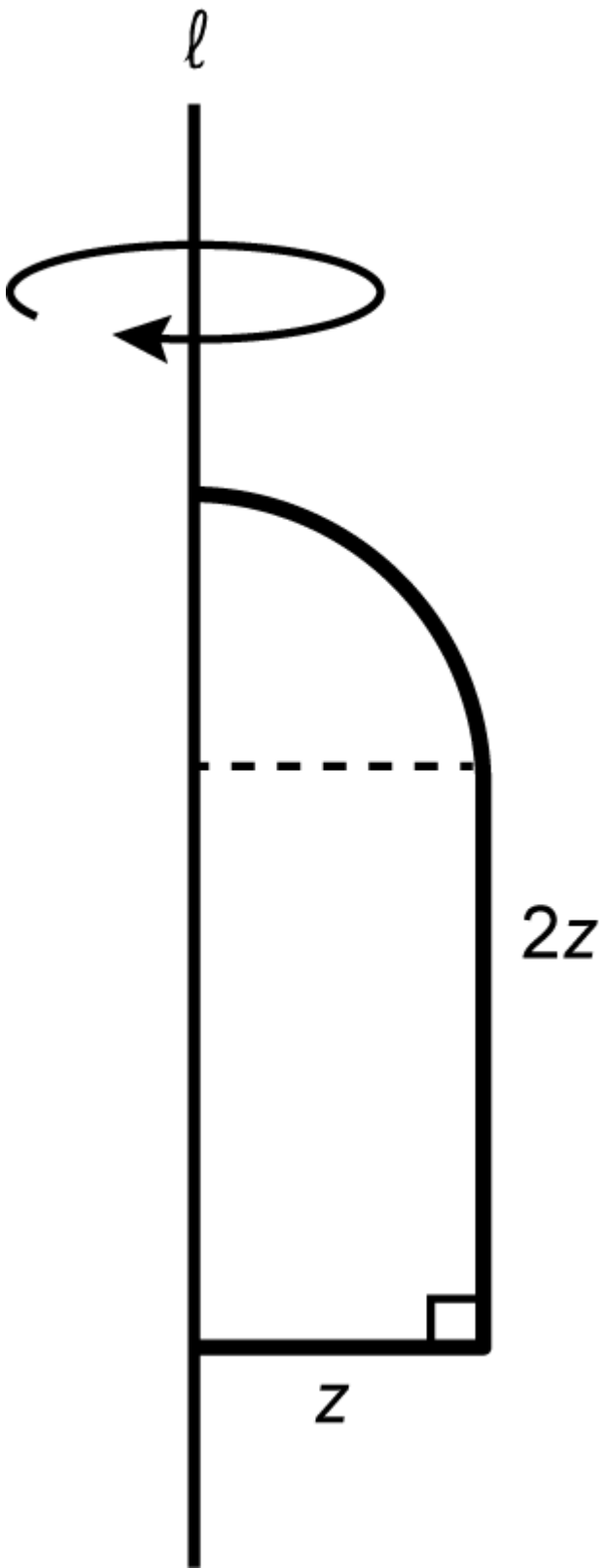
77. Use the diagram below to answer the question that follows.



A sphere is inscribed in a cube as shown in the diagram above. If the volume of the cube is 64 cubic inches, what is the approximate volume of the sphere?

- A. 19 cubic inches
- B. 33 cubic inches
- C. 41 cubic inches
- D. 50 cubic inches

78. Use the diagram below to answer the question that follows.



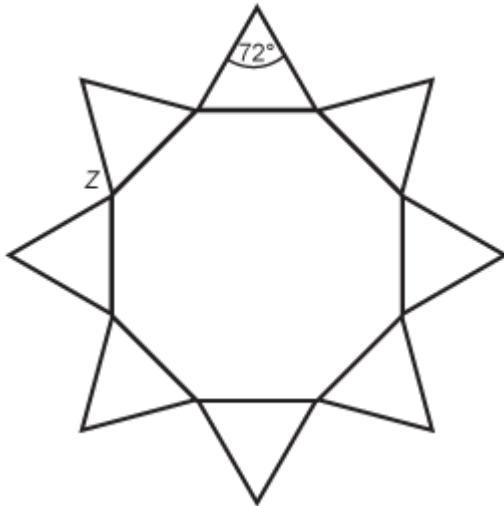
The diagram shows a figure made up of a quarter of a circle adjacent to a rectangle that has dimensions $z \times 2z$. If the figure is rotated about line ℓ , which of the following expressions represents the volume of the rotated figure?

- A. $\frac{7\pi z^3}{3}$
- B. $\frac{8\pi z^3}{3}$

C. $\frac{10\pi z^3}{3}$

D. $\frac{14\pi z^3}{3}$

79. Use the diagram below to answer the question that follows.



The diagram above was created by adding isosceles triangles to the sides of a regular octagon. What is the measure of angle Z ?

- A. 135°
- B. 126°
- C. 117°
- D. 108°

80. A circle with a circumference of 16π is constructed on a coordinate grid. The center of the circle is located at $(5, 5)$. Which of the following coordinates could be a point on the circle?

- A. $(5, -3)$
- B. $(5, 1)$
- C. $(-3, -3)$
- D. $(21, 5)$

81. On the coordinate plane, the bases of an isosceles trapezoid are parallel to the y -axis. If three of its vertices are $(-1, 7)$, $(5, 9)$, and $(5, -1)$, what is its area?

- A. 42 square units
- B. 48 square units
- C. 56 square units
- D. 64 square units

82. Points $A(2, a)$, $B(5, b)$, and $C(9, c)$ are plotted on a coordinate grid to form $\triangle ABC$. If $\angle ABC$ is a right angle, which of the following relationships must be true?

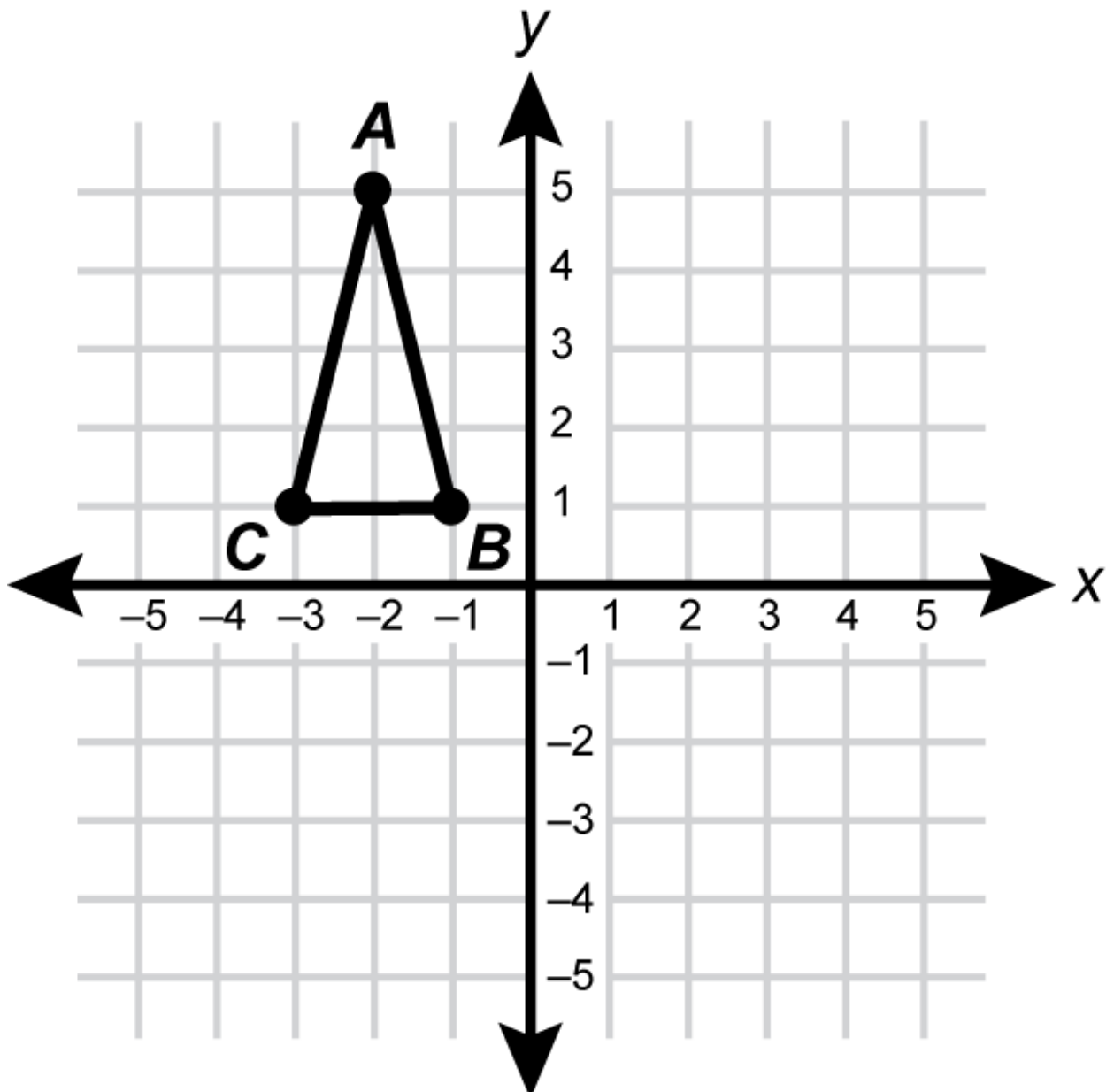
A. $\frac{a-b}{2-5} = \frac{5-9}{c-b}$

B. $\frac{a-b}{2-5} = \frac{9-2}{a-c}$

C. $\frac{a-c}{2-9} = \frac{5-9}{c-b}$

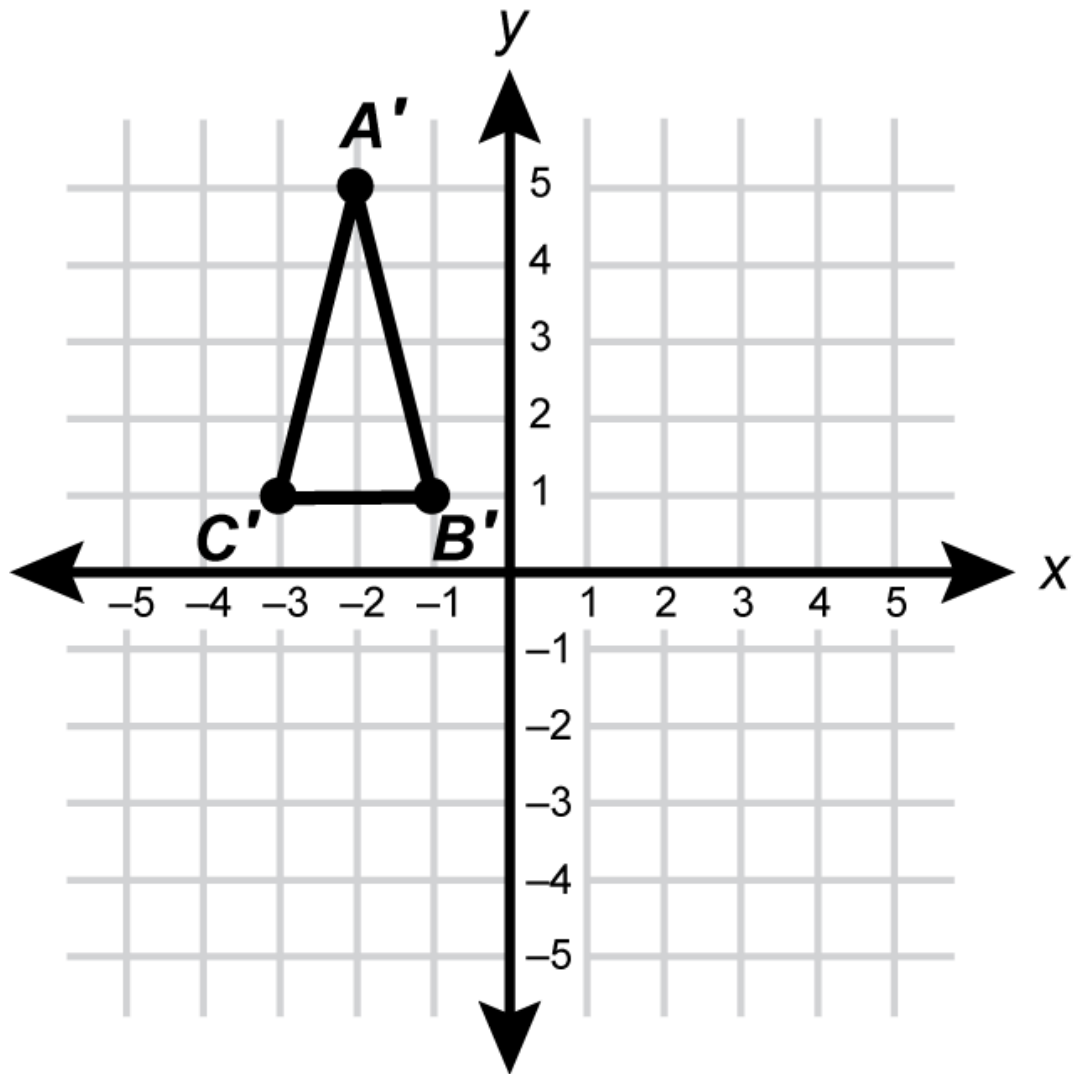
D. $\frac{a-c}{2-9} = \frac{9-5}{c-b}$

83. Use the graph below to answer the question that follows.

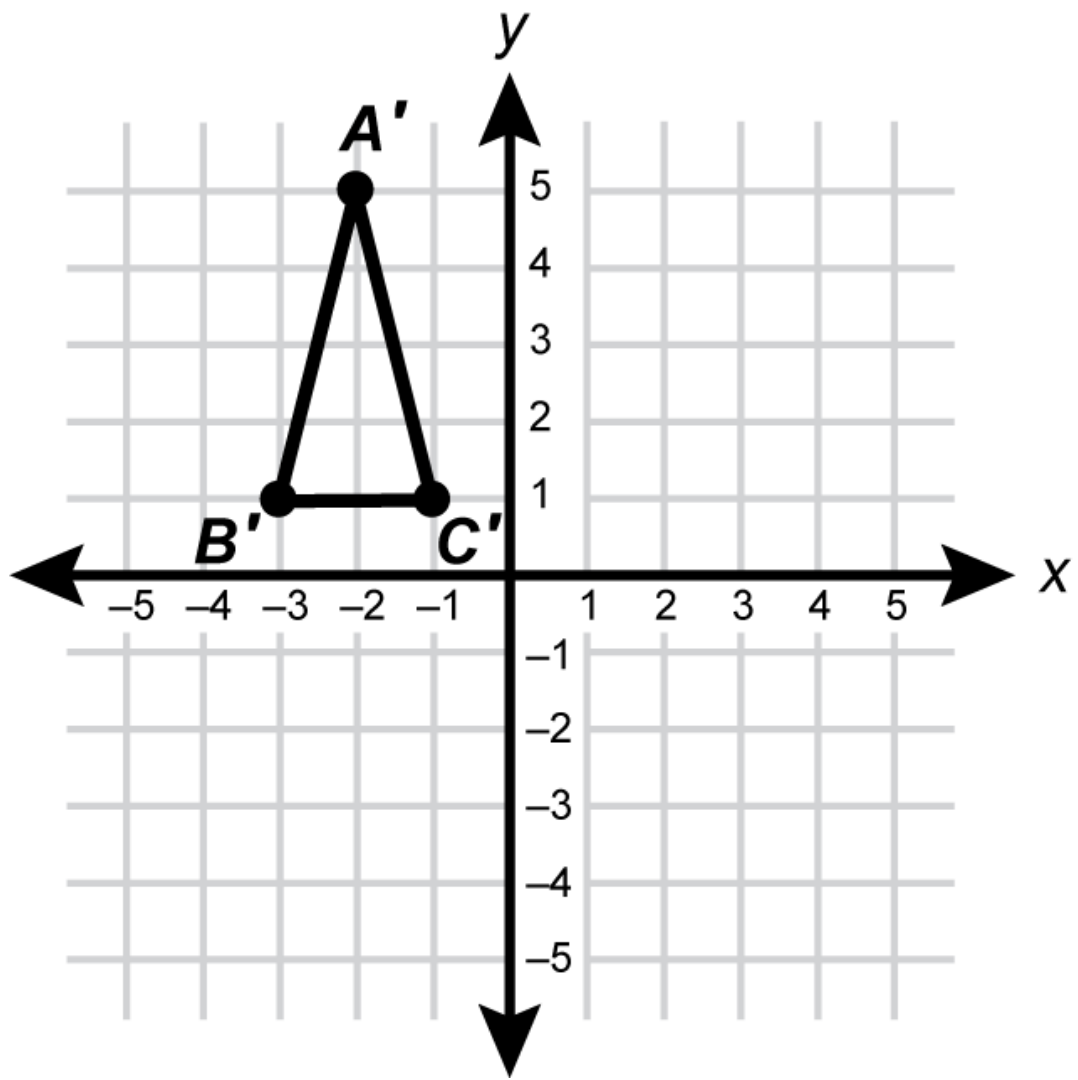


$\triangle ABC$ is reflected over $y = x$ and then rotated 180° counterclockwise about the origin to create $\triangle A'B'C'$. Which of the following graphs represents $\triangle A'B'C'$?

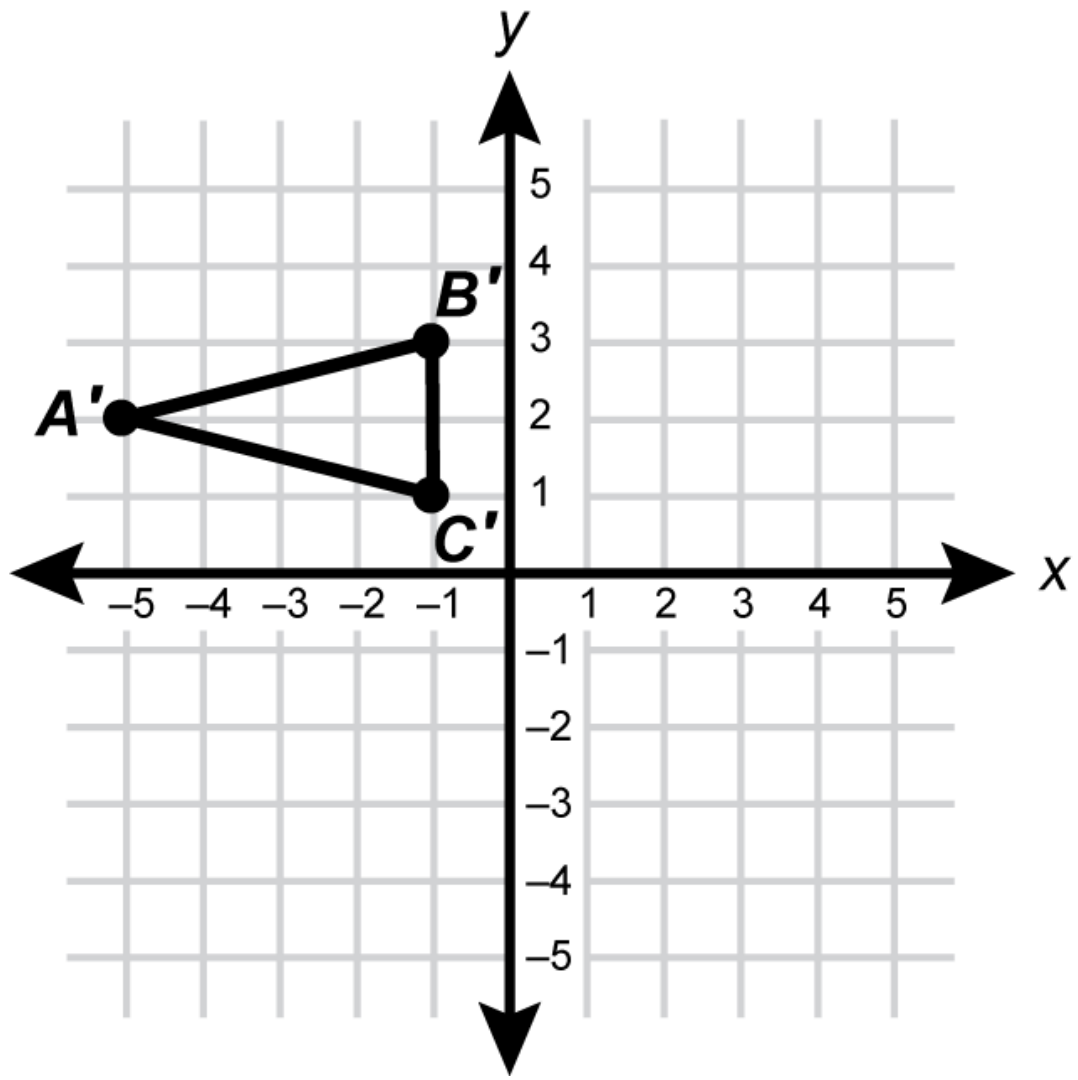
A.



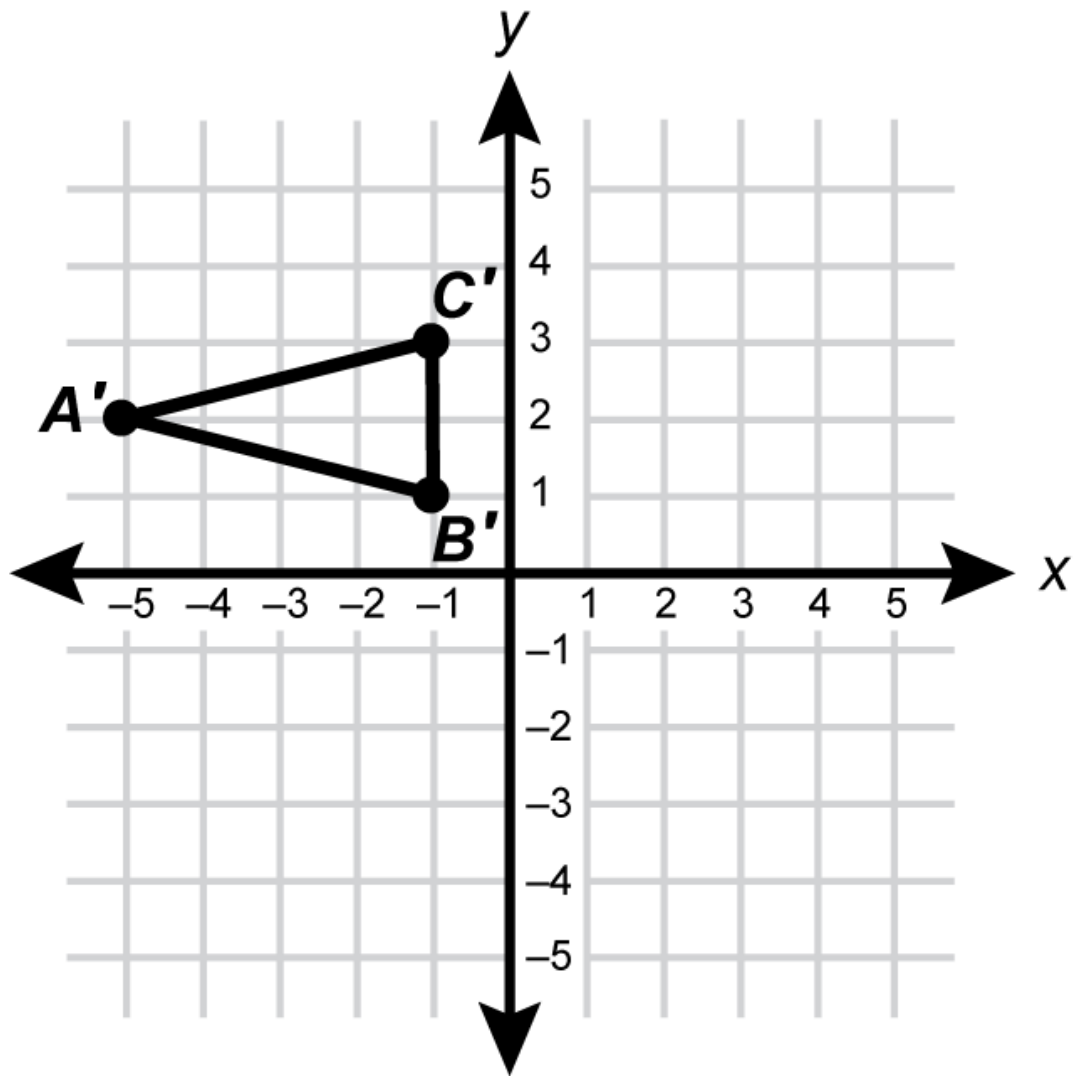
B.



C.



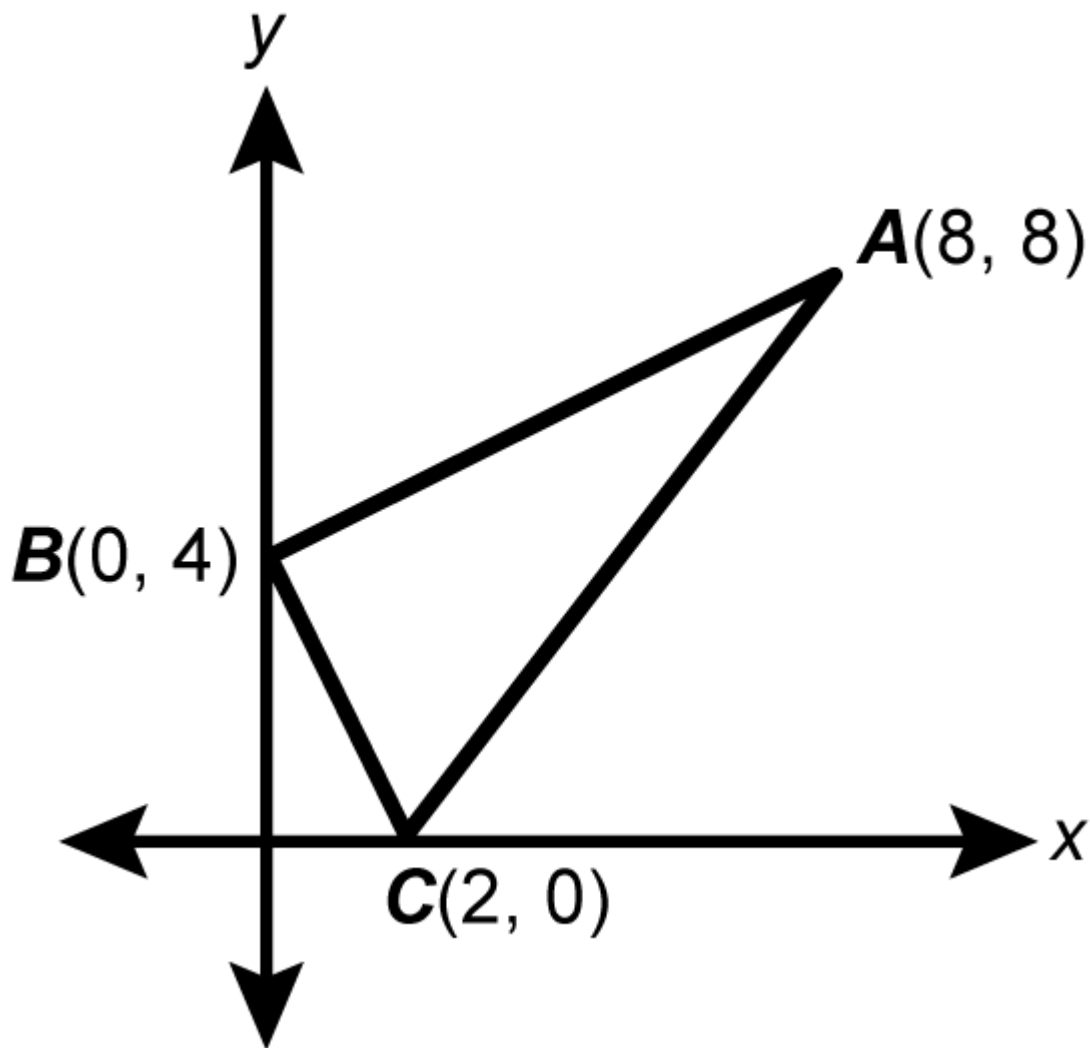
D.



-
84. Trapezoid $ABCD$ is graphed on a coordinate plane with vertices $A(2, 1)$, $B(3, 2)$, $C(4, 2)$, and $D(5, 1)$. The trapezoid is reflected over the line $y = x$. A dilation centered at the origin with scale factor $\frac{3}{2}$ is applied to the reflected image. What are the coordinates of C' , the final image of vertex C ?

- A. $(3, 3)$
- B. $(3, 6)$
- C. $(6, 3)$
- D. $(6, 6)$

-
85. Use the graph below to answer the question that follows.



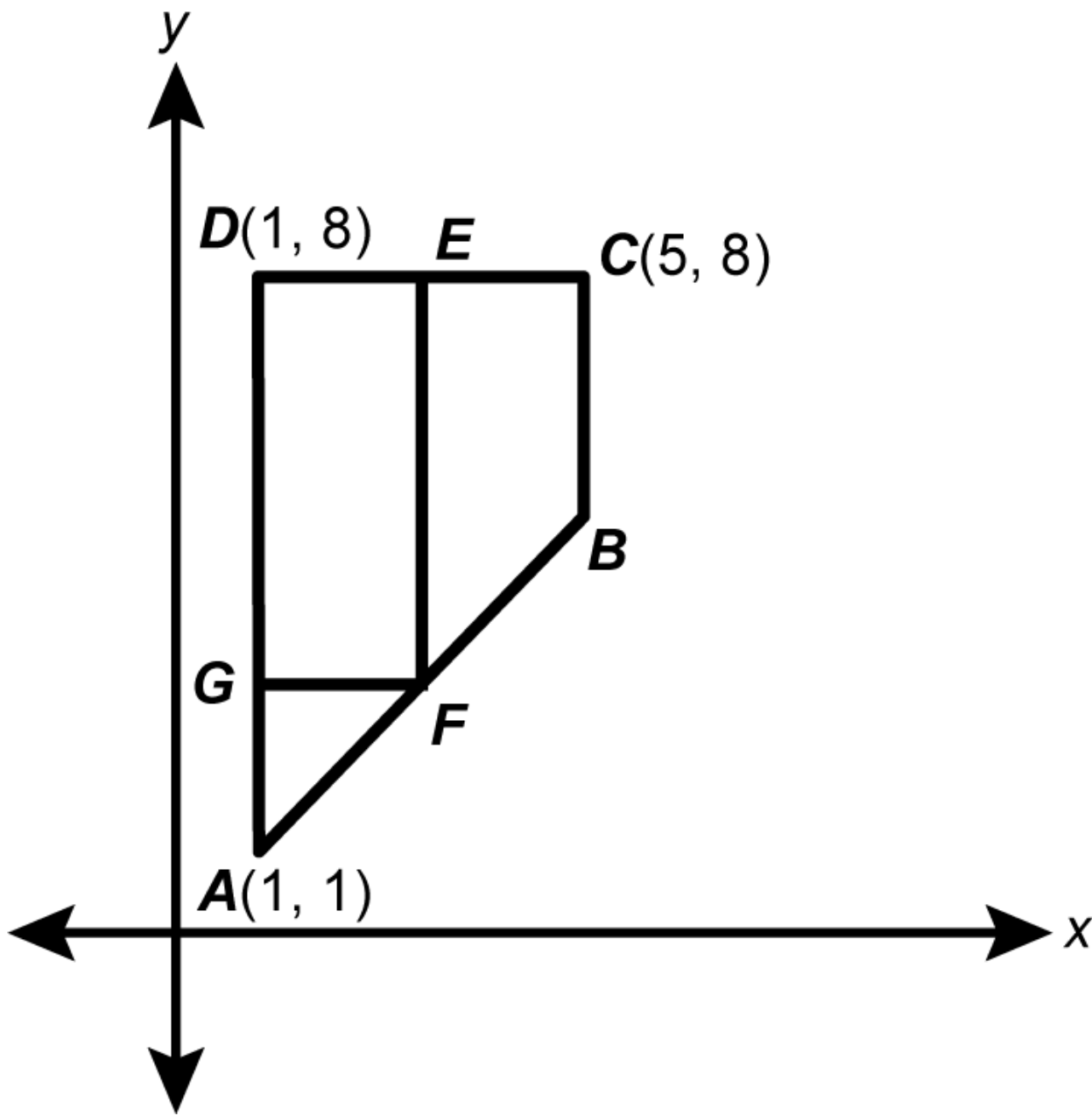
Which of the following expressions represents the area of the circle that circumscribes $\triangle ABC$, given that AC is the diameter of the circle?

- A. 5π
- B. 10π
- C. 20π
- D. 25π

86. For any triangular region, the center of mass is located at the intersection of its three medians. If the center of mass of triangle $A(0, 0)$, $B(14, 0)$, $C(4, 12)$ is located at $(k, 4)$, what is the value of k ?

- A. $\frac{8}{3}$
- B. $\frac{10}{3}$
- C. 6
- D. 7

87. Use the diagram below to answer the question that follows.



Quadrilateral $ABCD$ is constructed on a coordinate plane, as shown in the diagram. \overline{EF} bisects \overline{DC} and \overline{AB} , and triangle AGF is isosceles. What is the area of the rectangle $DEFG$?

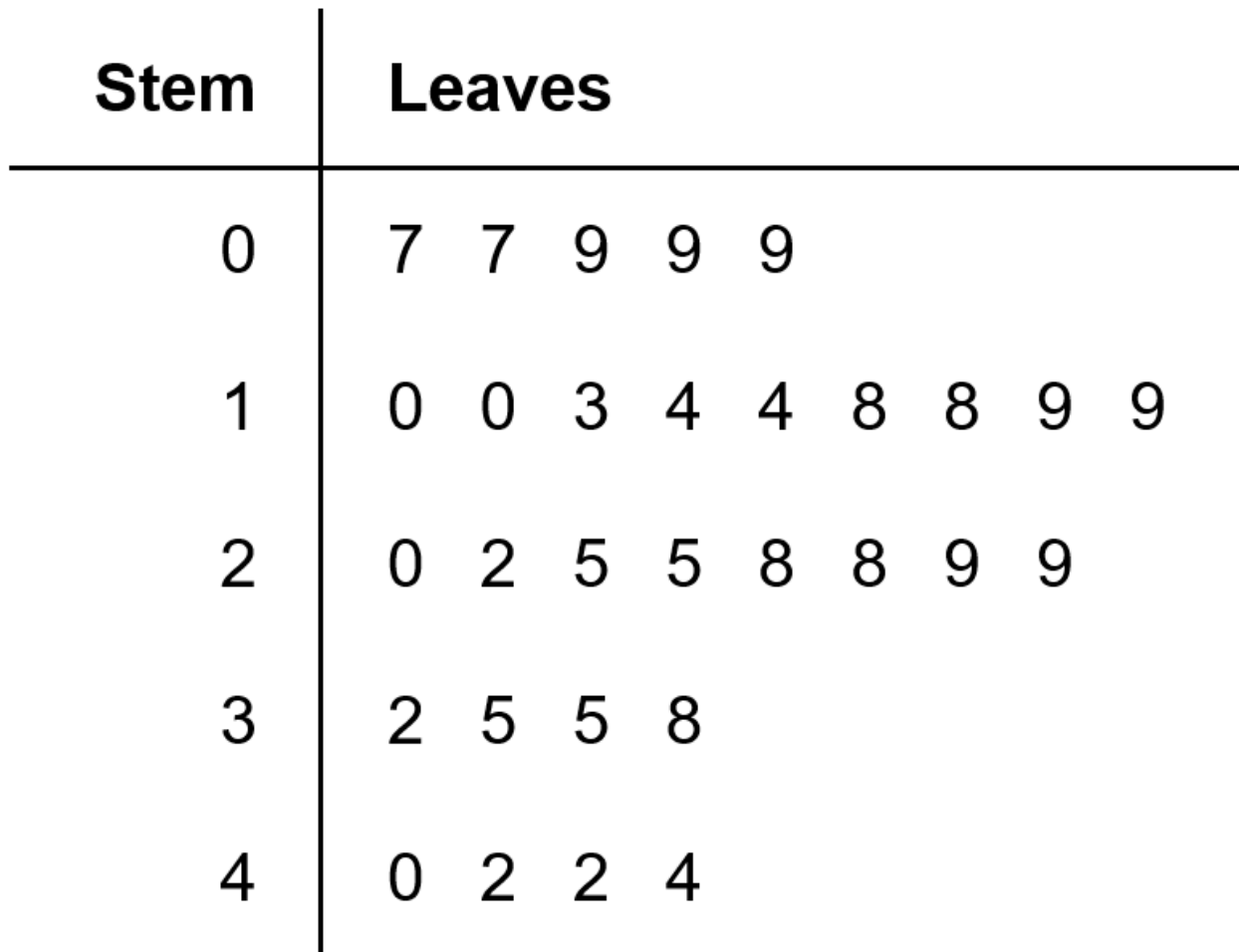
- A. 10
- B. 12
- C. 14
- D. 20

-
88. A bar graph would be the best choice for displaying which of the following sets of data?
- A. the percentage of total pieces of carry-on luggage that fall within various weight ranges for a particular airline
 - B. the relationship between the number of hours a group of students spend reading and their scores on a standardized verbal skills test
 - C. the number of pairs of sneakers of each of six brands sold in a season by a particular

sporting goods store

D. the average weekly earnings for construction workers over the last 20 years

89. Use the stem-and-leaf plot below to answer the question that follows.



Key: 1 | 0 = 10

An athletic team plays ten games per season. The team's scores for the last three seasons are shown in the stem-and-leaf plot. What are the median score and interquartile range for these scores?

- A. median = 21, interquartile range = 19
- B. median = 23, interquartile range = 19
- C. median = 21, interquartile range = 37
- D. median = 23, interquartile range = 37

90. Use the data set below to answer the question that follows.

0, 0, 1, 1, 1, 2, 4, 4, 4, 4, 5, 6, 6, 7, 8

A human resources manager is compiling data on the number of sick days taken by employees during the previous year. The data are shown above. Which of the following statistics will be **least** affected if an employee who took 15 sick days is included in the data set?

- A. maximum
 - B. mean
 - C. median
 - D. range
-

91. In a particular study, the heights of 50,000 16-year-old students were found to be normally distributed with a mean height of 168 cm and standard deviation 5 cm. Approximately how many students had a height of at least 173 cm?

- A. 8,000
 - B. 16,000
 - C. 34,000
 - D. 42,000
-

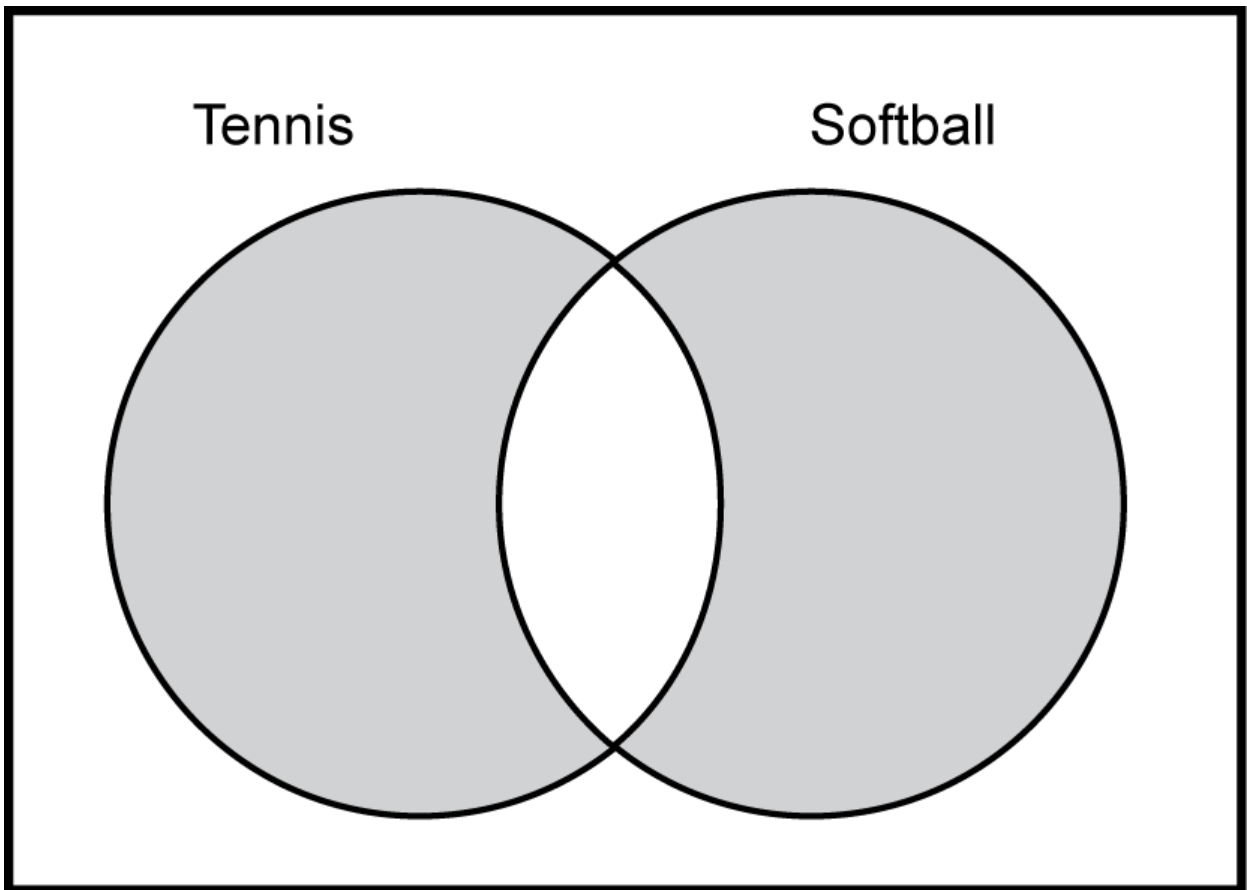
92. A state representative tracks constituents' communications by phone, mail, or e-mail regarding a bill to be voted on. The representative counts 1500 total communications, with 70 percent in favor of the bill. Which of the following statements describes the validity of these results in representing the opinions of all constituents?

- A. The results must be valid because a large number of people made the effort to communicate with their representative.
 - B. The results must be valid because all constituents have access to at least one of these methods of communication.
 - C. The results may not be valid because a special interest group or groups may have been responsible for most of the favorable communications.
 - D. The results may not be valid because the outcome of the vote for the bill is not yet known.
-

93. A two-way frequency table would be most appropriate for displaying which of the following data sets?

- A. the numbers of gas-powered, hybrid, or electric cars owned by people in the age groups 16–30, 31–45, 46–65, and over 65
- B. the percent of movies released last year in each of six rating categories established by the Motion Picture Association of America
- C. the number of oil spills associated with each of seven categories of causes of these spills over the past 25 years
- D. the proportion of students entering U.S. colleges next year who are from the eastern, western, and middle regions of the country and from outside the country

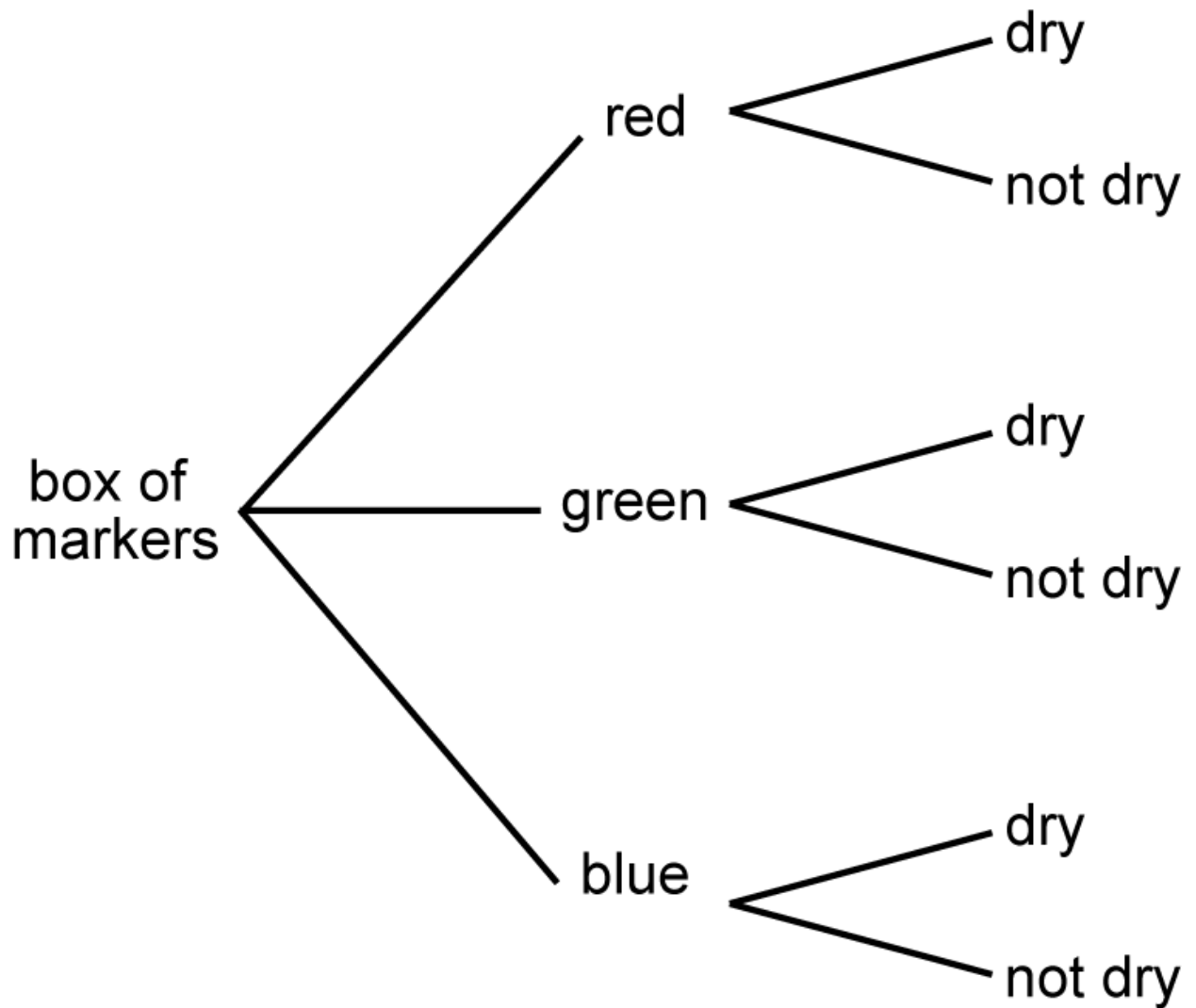
94. Use the Venn diagram below to answer the question that follows.



The Venn diagram represents students participating in two spring sports, tennis and softball. The shaded region of the Venn diagram can be used to answer which of the following questions?

- A. What is the probability that a randomly selected student is participating in tennis but not softball?
 - B. What is the probability that a randomly selected student is participating in tennis or softball, but not both?
 - C. What is the probability that a randomly selected student is participating in tennis or softball?
 - D. What is the probability that a randomly selected student is participating in neither tennis nor softball?
-
95. A student surveyed peers about two movies that were released over the weekend, a comedy movie and an animated movie. Of the peers the student surveyed, 55% of them had seen the comedy movie, 28% had seen the animated movie, and 14% had seen both movies. If the survey is representative of all students at the school, what is the probability that a randomly selected student saw neither movie?
- A. 13%
 - B. 17%
 - C. 31%
 - D. 41%

96. Use the diagram below to answer the question that follows.



The diagram above shows the composition of a box of used color markers in a classroom. There are 2 red markers, 4 green markers, and 6 blue markers. One-half of the red markers have dried out, 25% of the green markers are dry, and 50% of the blue markers are dry. What is the probability that a marker randomly selected from the box will be dried out?

- A. $\frac{3}{12}$
- B. $\frac{5}{12}$
- C. $\frac{6}{12}$
- D. $\frac{7}{12}$

97. A student places in a bag a blue number cube and two red number cubes, each with 6 faces numbered from 1 to 6. A friend will select two number cubes at random and then roll them. What is the probability that the result will be two red number cubes with a sum of 3?

- A. $\frac{1}{54}$
 - B. $\frac{1}{36}$
 - C. $\frac{1}{22}$
 - D. $\frac{1}{18}$
-

98. In a bag containing only red and green grapes, there are 25 red grapes. After a child eats 5 green grapes, the probability of randomly choosing a green grape is less than 25%. What is the largest number of grapes that the bag could have contained originally?

- A. 43
 - B. 39
 - C. 38
 - D. 31
-

99. A statistician is interested in determining the probability of getting at least one vowel (A, E, I, O, U) in random samples of the English alphabet. Which of the following simulations would generate data to answer this question?

- A. using a computer to randomly select 1000 five-letter words from a dictionary
 - B. assigning the numbers 1–26 to the letters A–Z and using a calculator or computer to generate 100 random sets of five numbers
 - C. designating each side of five coins as either vowel or consonant and flipping the set of five coins 100 times
 - D. writing each letter of the alphabet on pieces of paper and randomly drawing a group of five-letter samples until a sample is drawn with only one vowel
-

100. Three red and three blue flags are arranged randomly along a wire. What is the probability that the six flags alternate in color?

- A. $\frac{1}{20}$
 - B. $\frac{1}{10}$
 - C. $\frac{1}{4}$
 - D. $\frac{1}{2}$
-

Open-Response Items

The directions shown below represent what you will see on the actual test. For the purposes of this practice test, you will be able to type your written responses in the boxes provided on the answer key.

This section of the test consists of two open-response item assignments. You will be asked to prepare a written response of approximately 150–300 words, or 1–2 pages, for each assignment.

Read the assignments carefully before you begin your responses. Think about how you will organize your responses. You may use the erasable sheet(s) to make notes, write an outline, or otherwise prepare your responses. **However, your final response to each assignment must be either:**

1. typed into the on-screen response box,
2. written on a response sheet and scanned using the scanner provided at your workstation, or
3. provided using both the on-screen response box (for typed text) and a response sheet (for calculations or drawings) that you will scan using the scanner provided at your workstation.

Instructions for scanning your response sheet(s) are available by clicking the "Scanning Help" button at the top of the screen.

As a whole, your response to each assignment must demonstrate an understanding of the knowledge of the field. In your response to each assignment, you are expected to demonstrate the depth of your understanding of the subject area by applying your knowledge rather than by merely reciting factual information.

Your responses to the assignments will be evaluated based on the following criteria.

- **Purpose:** the extent to which the response achieves the purpose of the assignment
- **Subject Knowledge:** appropriateness and accuracy in the application of subject knowledge
- **Support:** quality and relevance of supporting evidence
- **Rationale:** soundness of argument and degree of understanding of the subject area

The open-response item assignments are intended to assess subject knowledge. Your responses must be communicated clearly enough to permit valid judgment of the evaluation criteria by scorers. Your responses should be written for an audience of educators in this field. The final version of each response should conform to the conventions of edited American English. Your responses should be your original work, written in your own words, and not copied or paraphrased from some other work.

Be sure to write about the assigned topics. Remember to review your work and make any changes you think will improve your responses.

Any time spent responding to an assignment, including scanning the response sheet(s), is part of your testing time. Monitor your time carefully. When your testing time expires, a pop-up message will appear on-screen indicating the conclusion of your test session. Only response sheets that are scanned before you end your test or before time has expired will be scored. Any response sheet that is not scanned before testing ends will NOT be scored.

101. **Use the information below to complete the assignment that follows.**

Standard

The Massachusetts Mathematics Curriculum Framework for grade 7 provides the following content standard:

Ratios and Proportions (7.RP)

3. Use proportional relationships to solve multi-step ratio, rate, and percent problems.

Problem Situation

A teacher leads students in a paper-folding activity. The students begin with a single sheet of paper. They observe that folding the paper in half once separates the sheet of paper into two sections. They also notice that folding the paper again doubles the number of boxes. The students are asked to record ratios that compare the number of times a paper is folded to the number of boxes that are formed. From these ratios, they are asked to predict how many folds will generate 128 boxes.

Assignment

Use your knowledge of mathematics to develop a response of approximately 150–300 words, or 1–2 pages, in which you analyze the number system with respect to content standard 7.RP.3. In your response:

- identify 2–3 related prerequisite concepts or skills, and explain their relevance to the mathematics described in the standard;
- create 2–3 appropriate representations (e.g., graphical, numerical, pictorial, verbal, physical) to model the mathematics described in the standard, and explain why each representation is appropriate; and
- critique whether the problem situation is aligned with the content standard in terms of the mathematics involved.

Be sure to show your work and explain the reasoning you use in analyzing the standard.

102. **Use the information below to complete the assignment that follows.**

A business is deciding whether to fulfill a customer's order for highly customized devices by using the services of their own manufacturing department or by arranging to have another manufacturer create the devices. The business will sell each device for \$3500 regardless of who manufactures them.

In the process used by this business:

- \$700 worth of labor and materials is required to begin the first stage of manufacturing for each device. Upon completion of this stage, the device is tested for quality.
- The company expects that 80% of the devices created will meet quality standards and proceed to the second stage. The rest are discarded.
- An additional \$500 worth of labor and materials is required to begin the second stage of manufacturing for each device. Upon completion of this stage, the device is again tested for quality.
- The company expects that 75% of the devices that get to the second stage will meet quality standards and be sold to the client. The rest are discarded.

Use your knowledge of probability to develop a response of approximately 150–300 words, or 1–2 pages, in which you analyze the probabilities of specified outcomes. In your response:

- draw a tree diagram of the situation, including all appropriate labels, and use it to summarize the net profit or loss associated with every possible outcome in attempting to manufacture a

single device;

- predict how many total manufacturing attempts will be needed to create 3 devices that can be sold;
- recommend whether the business should attempt to create the devices through their own manufacturing department or purchase 3 completed devices from another manufacturer for \$9000 total; and
- discuss any influences that can cause variations in your recommendation.

Be sure to show your work and explain the reasoning you use in analyzing and solving the problem.