

Question 1 in this sampler is to be solved without the use of a calculator.

**MULTIPLE-CHOICE ITEMS**

1. Simplify:  $7^{-8} \times 7^{-4}$

A.  $\frac{1}{7^{12}}$

B.  $\frac{1}{7^4}$

C.  $7^{12}$

D.  $7^{32}$

$$7^{-12} = \frac{1}{7^{12}}$$

A calculator is permitted for use in solving questions 2-17 in this sampler.

2. Which equation shows how to find the product of 1,000,000 and 1,000,000 using scientific notation?

- (A)  $1,000,000 \times 1,000,000 = (1 \times 10^6) \times (1 \times 10^6) = 1 \times 10^{(6+6)} = 1 \times 10^{12}$   
 B.  $1,000,000 \times 1,000,000 = (1 \times 10^6) \times (1 \times 10^6) = 1 \times 10^{(6 \times 6)} = 1 \times 10^{36}$   
 C.  $1,000,000 \times 1,000,000 = (1 \times 10^7) \times (1 \times 10^7) = 1 \times 10^{(7+7)} = 1 \times 10^{14}$   
 D.  $1,000,000 \times 1,000,000 = (1 \times 10^7) \times (1 \times 10^7) = 1 \times 10^{(7 \times 7)} = 1 \times 10^{49}$

$$1,000,000 = 1 \times 10^6$$

$$(1 \times 10^6)(1 \times 10^6)$$

$$1 \times 10^{6+6}$$

$$1 \times 10^{12}$$

3. Mr. Carter is mapping the boundaries of a park on a coordinate grid. The park's headquarters are located at the origin. The equations shown below represent two boundaries of the park.

$$y = 2x - 5$$

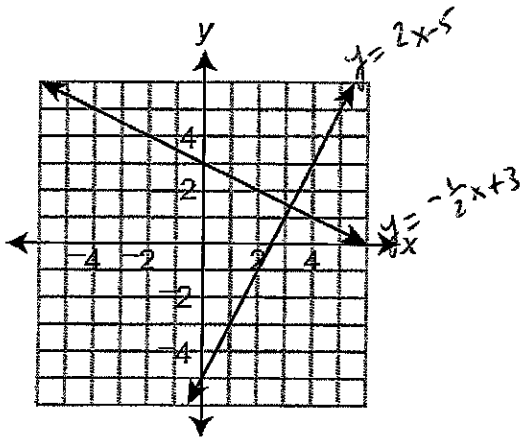
$$2x + 4y = 12$$

$$4y = -2x + 12$$

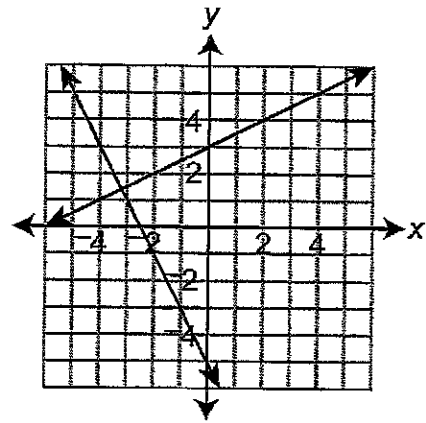
$$y = -\frac{1}{2}x + 3$$

The park's entrance is located at the intersection of these two boundaries. Which coordinate grid correctly shows the two boundaries and the park's entrance?

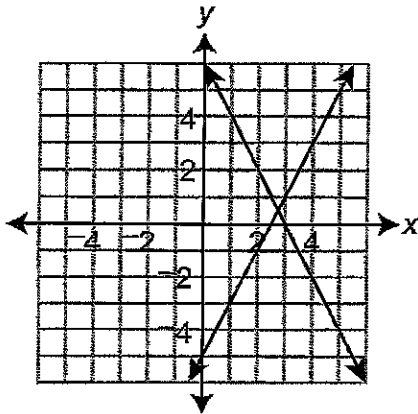
A.



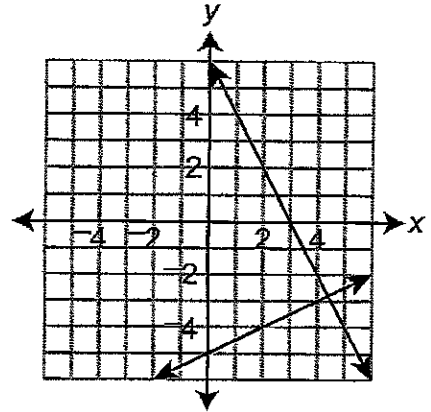
~~B.~~



C.



~~D.~~



4. A cleaning company charges  $x$  dollars per hour to clean floors and  $y$  dollars per hour to clean the rest of a house.

- A) • When the company spends 2 hours to clean floors and 3 hours to clean the rest of a house, the total charge is \$84.
- B) • When the company spends 1 hour to clean floors and 4 hours to clean the rest of a house, the total charge is \$87.

Which ordered pair represents the hourly charges to clean floors and to clean the rest of the house?

- A. (12, 20)
- B. (15, 18)
- C. (18, 15)
- D. (20, 12)

A

$$2x + 3y = 84$$

B

$$1x + 4y = 87$$

Elimination.

$$\begin{array}{r} 2x + 3y = 84 \\ 2(1x + 4y = 87) \end{array}$$

$$\begin{array}{r} 2x + 3y = 84 \\ 2x + 8y = 174 \end{array}$$

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$$-5y = -90$$

$$y = 18$$

only answer B has a y-value of 18.

5. Marianna has been adding \$30 to her savings account every month. Which model could represent the money in Marianna's savings account ( $y$ ) after  $x$  months?

~~A~~  $y = 10x + 30$

~~B~~  $y = 10 - 30x$

rate of change = slope

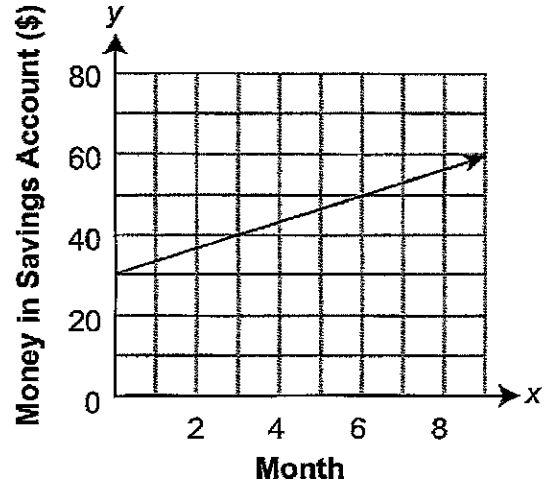
C.

Marianna's Savings Account

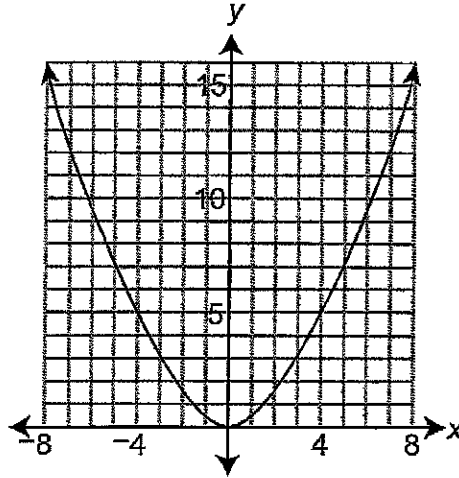
Month ( $x$ )	Money in Savings Account ( $y$ )
3	\$100
5	\$160
7	\$220

D.

Marianna's Savings Account



6. The graph below represents a function.



Which single transformation could be applied to the graph so that it no longer represents a function?

- A. reflection across the  $x$ -axis
- B. reflection across the  $y$ -axis
- C. rotation of  $90^\circ$  clockwise about the origin
- D. translation 5 units to the left

7. Two linear functions of  $x$  are shown below.

**Function 1**  
 $y = 30x + 19$

**Function 2**

$x$	$y$
-12	-311
-8	-211
-3	-86
1	14

$$\text{slope} = \frac{14 - (-86)}{1 - (-3)} = \frac{100}{4} = 25$$

Which statement about the functions is true?

- A. Function 2 can be described by the equation  $y = 35x - 109$ .
- B. Function 2 can be described by the equation  $y = 100x - 11$ .
- C. The  $y$ -intercept of function 1 is less than the  $y$ -intercept of function 2.
- D. The rate of change of function 1 is greater than the rate of change of function 2.

$$m = 30$$

$$m = 25$$

8. Luis is building a new deck and needs to have a slab of concrete poured. He knows the contractor charges an initial cost of \$75 plus an additional \$2.50 per square foot of concrete. Which equation can be used to determine the cost ( $y$ ), in dollars, to pour a concrete slab with an area of  $x$  square feet?

A.  $y = 2.5x + 75$

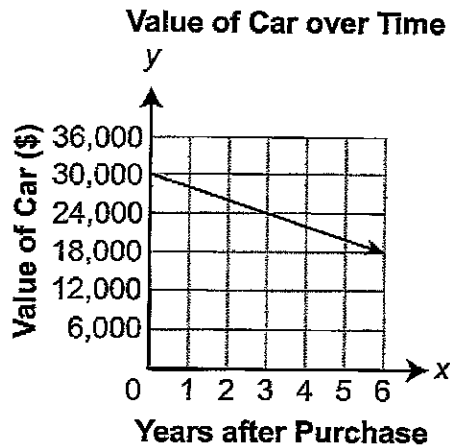
B.  $y = 7.5x + 2.5$

C.  $y = 75x + 2.5$

D.  $y = 77.5x$



9. The graph below shows the relationship between the number of years after a car is purchased and the car's value.

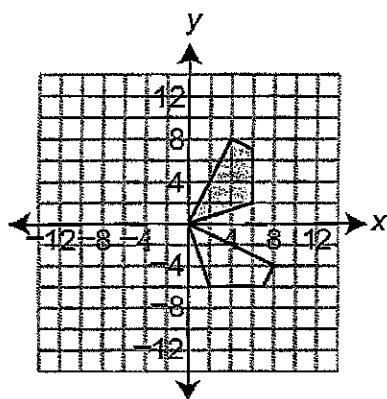


Which statement correctly describes the relationship shown in the graph?

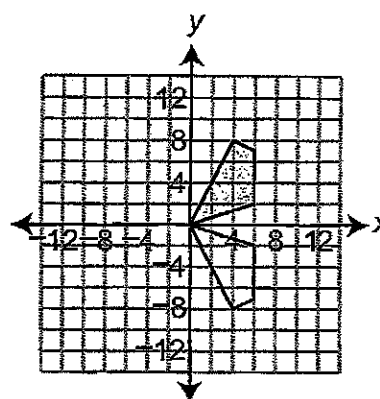
- A. The car's initial value is \$2,000, and the car's value increases \$30,000 each year.
- B. The car's initial value is \$18,000, and the car's value increases \$2,000 each year.
- C. The car's initial value is \$30,000, and the car's value decreases \$2,000 each year.
- D. The car's initial value is \$30,000, and the car's value decreases \$12,000 each year.

10. Which coordinate plane shows that the shaded polygon is the image of the unshaded polygon after a  $90^\circ$  counterclockwise rotation about the origin?

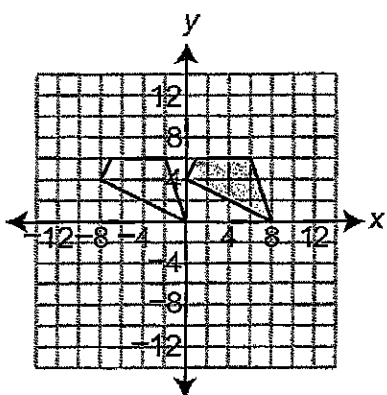
A



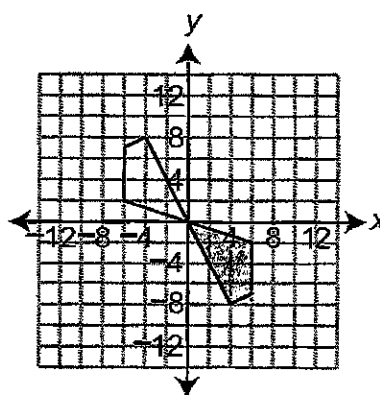
B.



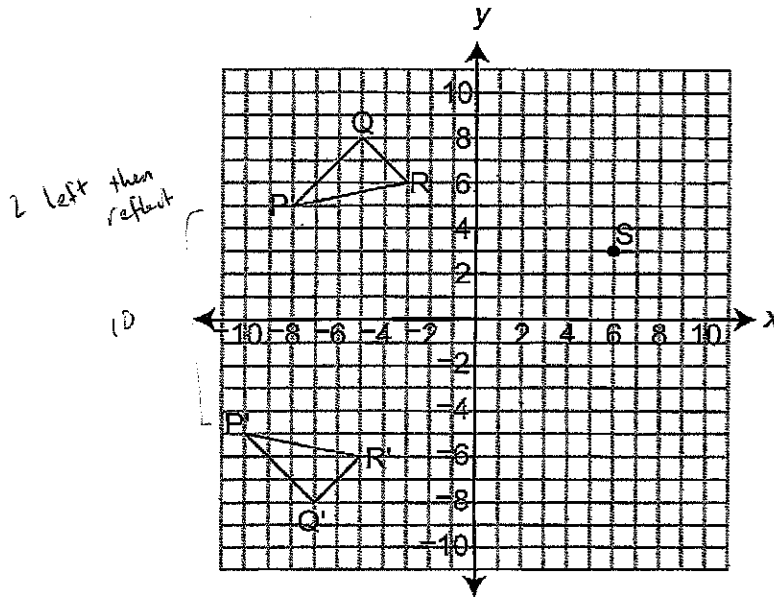
C.



D.



11. In the figure shown below, triangle PQR is transformed to create triangle P'Q'R'.

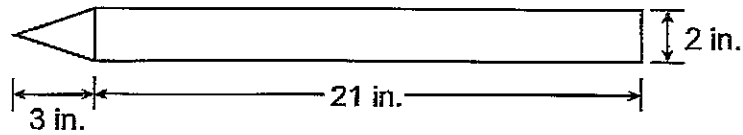


Point S will be transformed the same way as triangle PQR. Which sentence could describe how point S will be transformed?

- A. Point S will be translated to (6, 0) and then rotated to (0, 6).
- B. Point S will be translated to (6, 0) and then rotated to (0, -6).
- C. Point S will be translated to (4, 3) and then reflected to (-4, 3).
- D. Point S will be translated to (4, 3) and then reflected to (4, -3).

12. A balloon in the shape of a crayon is shown below.

Crayon Balloon



The crayon balloon is made up of a cone and a cylinder. What is the volume, in cubic inches, of the crayon balloon?

- A. 69.12
- B. 75.40
- C. 138.23
- D. 276.46

$$\begin{aligned}
 V_{\text{Crayon}} &= V_{\text{Cone}} + V_{\text{Cylinder}} \\
 &= \frac{1}{3}\pi R^2 h + \pi R^2 h \\
 &= \frac{1}{3}\pi(1)^2(3) + \pi(1)^2(21) \\
 &= 1\pi + 21\pi \\
 &= 22\pi \approx 69.12 \text{ in}^3
 \end{aligned}$$

13. Part of a sculpture is a stone sphere with a volume of  $36\pi$  cubic feet. What is the radius, in feet, of the stone sphere?

- (A) 3  
B. 6  
C. 9  
D. 12

$$V_{\text{sphere}} = \frac{4}{3}\pi R^3$$

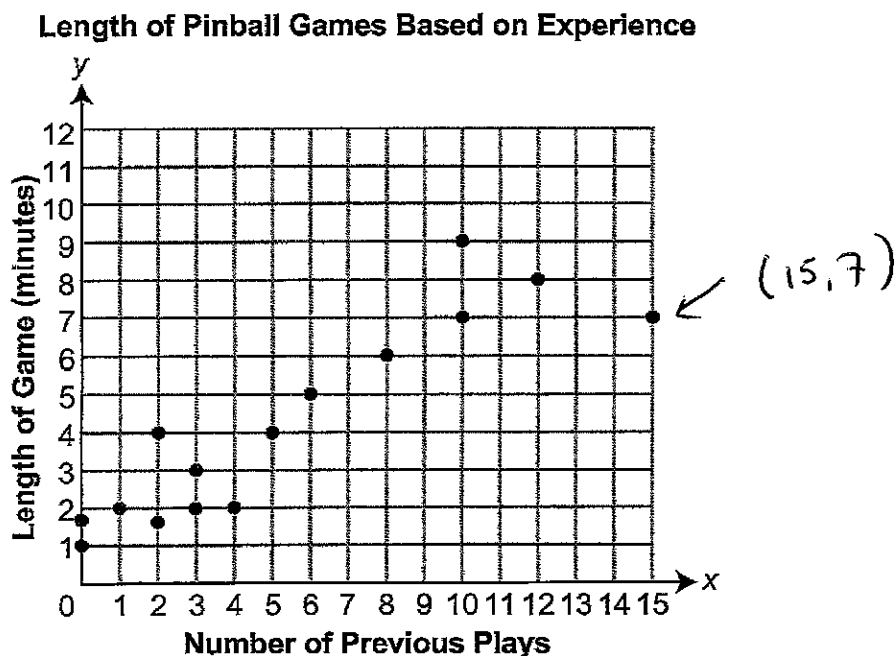
$$36\pi = \frac{4}{3}\pi R^3$$

$$\left(\frac{3}{4}\right) 36 = \frac{4}{3} R^3 \left(\frac{3}{4}\right)$$

$$27 = R^3$$

$$R = 3$$

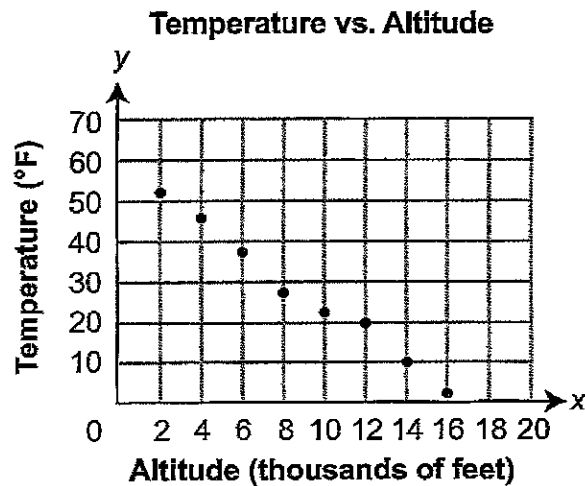
14. Christy created the scatter plot shown below.



Christy finds that the line of best fit for the data has the equation  $y = 0.51x + 1.48$ . Which statement **best** explains how removing the point  $(15, 7)$  would affect the slope of the line of best fit?

- A. The slope of the line of best fit would decrease because the point lies below the original line of best fit.
- B. The slope of the line of best fit would decrease because the point lies above the original line of best fit.
- C. The slope of the line of best fit would increase because the point lies below the original line of best fit.
- D. The slope of the line of best fit would increase because the point lies above the original line of best fit.

15. The scatter plot below shows the temperatures ( $y$ ), in degrees Fahrenheit ( $^{\circ}\text{F}$ ), that were recorded at different altitudes ( $x$ ), in thousands of feet.



Which equation could represent the line of best fit for the temperatures, in degrees Fahrenheit, based on the altitudes, in thousands of feet?

A.  $y = -\frac{9}{4}x + 47$  too low

B.  $y = -\frac{7}{2}x + 59$

C.  $y = -5x + 69$

~~D.  $y = -5x + 80$  too high~~

16. Blake interviewed 24 students to see whether they collected sports cards and whether they participated in sports. The table below shows his data.

**Sports-Card Collecting and Sports Participation**

	Participates in Sports	Does Not Participate in Sports
Collects Sports Cards	6	3
Does Not Collect Sports Cards	x 8	7

Total  
9

How many of the students Blake interviewed participate in sports?

- A. 4
- B. 10
- C. 14
- D. 15

$$24 - 6 - 3 - 7 = x$$

$$x = 8$$



## OPEN-ENDED QUESTION

17. Bill used a rain gauge to measure how much rain fell, in centimeters (cm), during a rainfall.

The rain fell at the same rate throughout the first 180 minutes of the rainfall.

- A. Complete the table below with the number of minutes it took for 9 centimeters of rain to fall and the number of centimeters of rain that fell through 150 minutes.

Rainfall

Time (minutes)	30	45	60	90	<u>135</u>	150	180
Rain (cm)	2	3	4	6	9	<u>10</u>	12

$$15 \text{ min} = 1 \text{ cm}$$

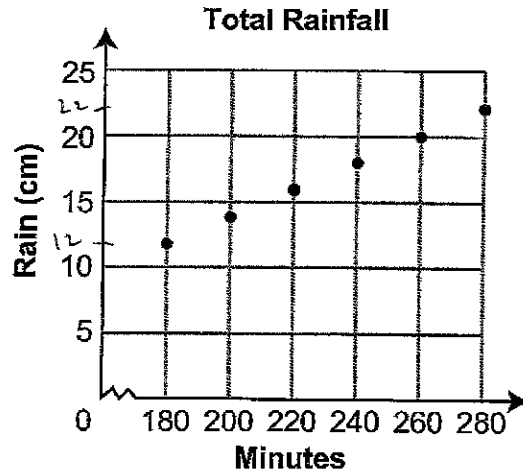
- B. Write an equation to describe the relationship between the time ( $t$ ), in minutes, and the amount of rain ( $r$ ), in centimeters.

$$15R = t \quad \text{or} \quad R = \frac{t}{15}$$

Go to the next page to finish question 17.

17. *Continued.* Please refer to the previous page for task explanation.

The total amount of rain that fell from 180 minutes through 280 minutes is shown in the scatter plot below.



$$\begin{aligned} \text{slope} &= \frac{22-12}{280-180} \\ &= \frac{10}{100} \\ &= \frac{1}{10} \end{aligned}$$

C. Describe the change in the slope between the first 180 minutes and the following 100 minutes, and explain what it means in terms of the total amount of rainfall.

The slope increases from  $\frac{1}{15}$  to  $\frac{1}{10}$ . This means that it is raining faster. The total rainfall is increasing.

After 280 minutes, the slope of the graph is 0.

D. Explain what a slope of 0 means in this situation.

it stops raining