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# Algebra I

## *Item Sampler* *2015–16*



QA115077



1. What is the product of the polynomials  $4 - a$  and  $a^2 + 7a - 18$ ?

Ⓐ  $a^3 - 3a^2 + 10a - 72$

Ⓑ  $a^3 + 3a^2 - 46a + 72$

Ⓒ  $-a^3 - 3a^2 + 46a - 14$

Ⓓ  $-a^3 - 3a^2 + 46a - 72$

2. A skydiver is 960 meters above the ground when she opens her parachute. After opening the parachute, she descends at a constant speed of 3.2 meters per second.

Write an equation to model the height of the skydiver above the ground, using  $h$  to represent her height above the ground and  $s$  to represent the number of seconds since she opened her parachute.

$$h = \boxed{\phantom{000000}}s + \boxed{\phantom{000000}}$$

3. Consider the system of linear inequalities  $\begin{cases} y < \frac{1}{2}x - 1 \\ y \geq 2x + 3 \end{cases}$ .

Which points are in the solution set?

- Ⓐ (-4,-3)
- Ⓑ (1,3)
- Ⓒ (-5,-7)
- Ⓓ (3,0)
- Ⓔ (-6,-5)
- Ⓕ (-7,-2)
- Ⓖ (-4,-4)
- Ⓗ (-3,-3)

- 4.** A lawn care company sells grass seed by the pound. There is one price per pound up to 5 pounds and a lower price per pound for each pound over 5 pounds. The expression  $3(x-5)+25$  gives the total cost in dollars of  $x$  pounds of seed when a customer buys more than 5 pounds.

What does the number 25 represent in the expression?

- Ⓐ the total cost in dollars of the amount over 5 pounds
  - Ⓑ the cost in dollars of each pound over 5 pounds
  - Ⓒ the cost in dollars of each of the first 5 pounds
  - Ⓓ the total cost in dollars of the first 5 pounds
- 5.** When Hector found a rare coin a few years ago, it was worth \$190. Since then, it has been increasing in value by the same percentage each year. One year after Hector found the coin, it was worth \$209.

If  $c(n)$  represents the value in dollars of the coin  $n$  years after Hector found it, which expression is equal to  $c(n)$ ?

- Ⓐ  $190(0.01^n)$
- Ⓑ  $190(0.1^n)$
- Ⓒ  $190(1.01^n)$
- Ⓓ  $190(1.1^n)$

6. Three new websites launched at the same time. The table shows the number of visits they received each month since they came online.

**Visits to Three Websites**

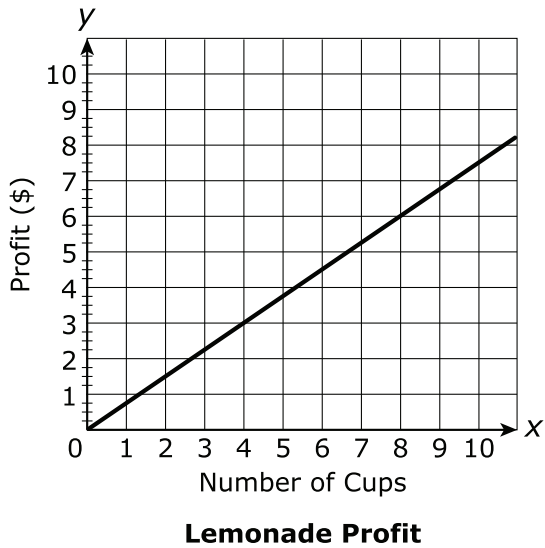
Month	Visits to Website A	Visits to Website B	Visits to Website C
1	8	8	2
2	38	11	4
3	68	16	8
4	98	23	16
5	128	32	32
6	158	43	64

Suppose the numbers of monthly visits to each website continues to increase at the same rate. What will be true about the number of visits to each website in Month 12?

Select the bubble to match the website to the correct description of the website's number of visitors in Month 12.

	Smallest Number of Visitors	Second Most Visitors	Largest Number of Visitors
Website A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Website B	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Website C	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. The graph below represents the profit Calvin makes at his lemonade stand. How much profit does he earn for each cup of lemonade that he sells?



- Ⓐ 1 cup of lemonade earns \$4.00 profit.
- Ⓑ 1 cup of lemonade earns \$3.00 profit.
- Ⓒ 1 cup of lemonade earns \$0.75 profit.
- Ⓓ 1 cup of lemonade earns \$0.25 profit.

8. A car is traveling along a highway. Its elevation,  $h$ , in feet above sea level can be modeled by the function  $h = 0.1t^2 - 1.2t + 7.6$ , where  $t$  is the time in minutes that the car has been traveling. Select the correct option from each table.

The car reached a 

<input type="radio"/> maximum
<input type="radio"/> minimum

 elevation

of 

<input type="radio"/> 4
<input type="radio"/> 6
<input type="radio"/> 7.6
<input type="radio"/> 12
<input type="radio"/> 36

 feet above sea level.



9. The kinetic energy,  $K$ , of an object in joules is given by the formula  $K = \frac{1}{2}mv^2$ , where  $m$  is the object's mass in kilograms, and  $v$  is the object's velocity in meters per second. If the kinetic energy of an object is known, which formula could be used to find the velocity  $v$ ?

Ⓐ  $v = \sqrt{\frac{K}{2m}}$

Ⓑ  $v = \sqrt{\frac{2K}{m}}$

Ⓒ  $v = \sqrt{\frac{m}{2K}}$

Ⓓ  $v = \sqrt{\frac{2}{Km}}$

- 10.** The domain of the function  $f(x) = -3x$  is restricted to the negative integers.

Which values are elements of the range?

- Ⓐ -12
- Ⓑ -3
- Ⓒ 0
- Ⓓ 7
- Ⓔ 9
- Ⓕ 12
- Ⓖ 21

11. Select one option from each table.

The process of rewriting an expression such as  $x^2 - 6x - 24$  in the form  $(x + a)^2 - b$  is known as \_\_\_\_\_.

<input type="radio"/> completing the square
<input type="radio"/> evaluating the expression
<input type="radio"/> factoring the expression

This method can be used to find that the minimum value of  $y = x^2 - 6x - 24$  is \_\_\_\_\_.

<input type="radio"/> -33
<input type="radio"/> -24
<input type="radio"/> 24
<input type="radio"/> 33

- 12.** Two landmarks are 65 miles apart. The distance between them on a map is 2 feet 5 inches. What is the distance between two other landmarks on the same map if the actual distance between them is 52 miles? Round your answer to the nearest inch.
- Ⓐ 1 foot 4 inches
  - Ⓑ 1 foot 11 inches
  - Ⓒ 2 feet 0 inches
  - Ⓓ 3 feet 0 inches
- 13.** Which of the following shows the expression  $3x(2x+2) - 2x^2 + 2$  in simplest form?
- Ⓐ  $4x^2 + 8$
  - Ⓑ  $10x^2 + 2$
  - Ⓒ  $4x^2 + 6x + 2$
  - Ⓓ  $4x^2 + 6x - 2$

**14.** Given the general form of a linear equation:  $ax + by = c$

Solve for  $b$  in terms of  $a$ ,  $c$ ,  $x$ , and  $y$ .

Ⓐ  $b = \frac{c}{y} - ax$

Ⓑ  $b = \frac{ax + c}{y}$

Ⓒ  $b = c - a\frac{x}{y}$

Ⓓ  $b = \frac{c}{y} - \frac{a}{y}x$

**15.** Which expressions are equivalent to  $m^4 - 5m^2 + 4$ ? Select all that apply.

Ⓐ  $(m^2 - 1)(m^2 - 4)$

Ⓑ  $(m - 1)(m + 1)(m^2 - 4)$

Ⓒ  $(m^2 - 1)(m - 2)(m + 2)$

Ⓓ  $(m - 1)(m - 1)(m + 2)(m + 2)$

Ⓔ  $(m - 1)(m + 1)(m - 2)(m + 2)$

Ⓕ  $(m + 1)(m + 1)(m - 2)(m - 2)$

- 16.** A coffee shop invited its customers to fill out a survey. The results showed that the relationship between the number of minutes a customer spends waiting in line,  $m$ , and the numerical rating the customer gave the coffee shop,  $s$ , could be modeled by the equation  $s = -0.10m + 5$ .

According to the model, how many additional minutes waiting in line would cause a customer to lower his or her rating by 1?

- Ⓐ 0.1
- Ⓑ 5
- Ⓒ 10
- Ⓓ 40

17. Select a word from each table that makes each sentence true.

The graph of  $y=f(x)+2$  is the graph of  $y=f(x)$  translated  
2 units \_\_\_\_\_.

<input type="radio"/> up
<input type="radio"/> down
<input type="radio"/> left
<input type="radio"/> right

The graph of  $y=f(x-3)$  is the graph of  $y=f(x)$  translated  
3 units \_\_\_\_\_.

<input type="radio"/> up
<input type="radio"/> down
<input type="radio"/> left
<input type="radio"/> right

18. Consider the function  $f(x) = 3x - 1$ . What is  $f(4)$ ?

Ⓐ 9

Ⓑ 11

Ⓒ 33

Ⓓ 80

19. Select the expression in each row that matches the equivalent expression in each column.

	$(x + y)^2$	$(x - y)^2$	$y(x - 1)$	$(x + y)(x - y)$	$(x + y)(x - y)y$
$x^2 + 2xy + y^2$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
$\frac{(x^2y - xy^2)}{x}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
$x^2y - y^3$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



**20.** Identify the vertex of the function  $f(x) = (x + 12)^2 + 4$ .

- Ⓐ (0, 4)
- Ⓑ (0, -4)
- Ⓒ (-12, 4)
- Ⓓ (-12, 0)

**21.** Given the function:

$$f(x) = -\frac{3}{4}x + 5$$

As the value of  $x$  increases by 4, how will the value of  $y$  change?

- Ⓐ  $y$  will decrease by 3
- Ⓑ  $y$  will increase by 3
- Ⓒ  $y$  will decrease by 4
- Ⓓ  $y$  will increase by 4

- 22.** A fitness club charges new members a one-time initiation fee and then a monthly fee of \$35. The equation  $y = 35x + b$  describes this situation. What do the variables  $b$ ,  $x$ , and  $y$  represent in the formula? Select the correct description of each variable.

	one-time initiation fee	number of months as a member	total amount charged
$y$ represents the	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
$x$ represents the	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
$b$ represents the	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**23.** A mountain climber found that the relationship between his altitude and the surrounding air temperature is linear. The function  $f(a) = -\frac{1}{100}a + 75$  represents this relationship, where  $a$  is the altitude in meters and  $f(a)$  is the temperature in degrees Fahrenheit. According to this function, by how much is the temperature decreasing for every meter that the mountain climber's altitude increases?

Ⓐ  $-75^{\circ}\text{F}$

Ⓑ  $-\frac{1}{100}^{\circ}\text{F}$

Ⓒ  $\frac{1}{100}^{\circ}\text{F}$

Ⓓ  $75^{\circ}\text{F}$

- 24.** A program to restore an endangered frog species began 8 months ago. The table shows the population of the species at various times since the program began.

<b>Month</b>	<b>Number of Frogs</b>
0	11
2	69
4	195
6	547
8	1,231

On average, what has been the monthly change in the frog population over the last 4 months?

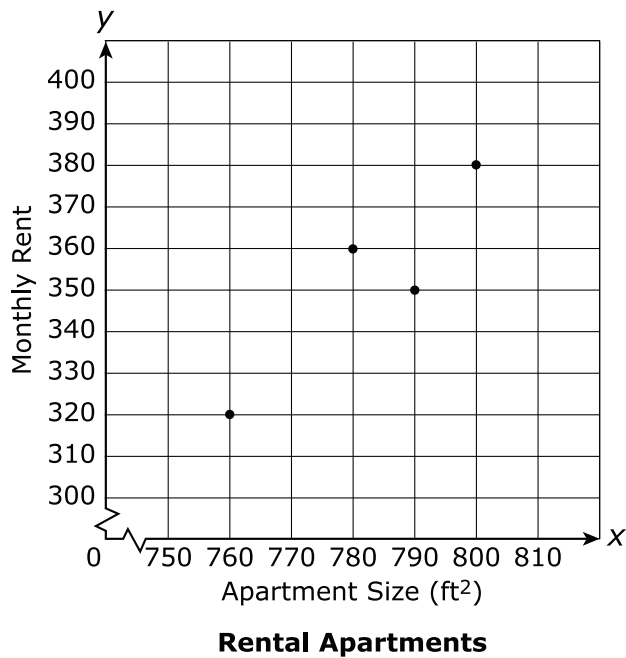
- Ⓐ 46
- Ⓑ 195
- Ⓒ 259
- Ⓓ 1,036

**DIRECTIONS:** Use the information provided in the passage to answer questions 1–8 that follow.

Chris and Jason are moving to Jackson, MS, for college and need to find an apartment to rent. They are interested in renting a 775-square-foot apartment that is listed for \$360 a month. They want to pay a fair price for the apartment, so they found information on apartment size (in ft<sup>2</sup>) and monthly rent for 5 apartments that were rented within the past week near campus.

<b>Apartment</b>	<b>Apartment Size (ft<sup>2</sup>)</b>	<b>Monthly Rent</b>	<b>Amenities</b>
1	760	\$320	elevator
2	770	\$330	covered parking
3	790	\$350	laundry facilities
4	800	\$380	elevator, gym, covered parking
5	780	\$360	elevator, indoor pool, laundry facilities

1. The data for four of five apartments is plotted on the graph below. Use the graph to determine the coordinates of the missing data point.



Write the coordinates of the missing data point.

(  ,  )

2. The regression equation  $y = A + Bx$  can be used to model the data in the table. What do the variables  $B$ ,  $x$ , and  $y$  represent in the equation? Select the correct description of each variable.

	monthly rent	slope of the regression line	size of the apartment
$B$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
$x$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
$y$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Using the model  $y = A + Bx$ , compute the regression equation for the data in the table.

Then, write the values for  $A$  and  $B$  into the text boxes in the equation below.

$$y = \boxed{\phantom{000}} + \boxed{\phantom{000}} x$$

- 4.** What does the slope of the line in the regression equation represent? Select all that apply.
- Ⓐ There is no relationship between apartment size and rent.
  - Ⓑ There is a positive relationship between apartment size and rent.
  - Ⓒ There is a negative relationship between apartment size and rent.
  - Ⓓ As the area of the apartment increases, rent increases.
  - Ⓔ As the area of the apartment increases, rent decreases.

- 5.** Compute the correlation coefficient for apartment size and monthly rent.

Write your answer in the box below. Round to the nearest hundredth.



6. Select the words in the tables that correctly describe the correlation coefficient between apartment size and monthly rent.

The monthly rent has a

<input type="radio"/> weak
<input type="radio"/> moderate
<input type="radio"/> strong

<input type="radio"/> positive
<input type="radio"/> negative

linear association with apartment size.

7. Using the original data, Chris and Jason concluded that the monthly rent that is listed for the 775-square-foot apartment was higher than the estimated monthly rent based on apartment size.

What is the estimated monthly rent for a 775-square-foot apartment?

Write your answer in the box below. Round to the nearest whole number.

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- 8.** What should Chris and Jason conclude regarding the relationship between apartment size and monthly rent?
- Ⓐ Apartment size is the only factor that influences the monthly rent.
  - Ⓑ A smaller apartment would definitely be less expensive per month.
  - Ⓒ Other factors, such as a gym, laundry facilities, elevator, and parking, may also influence monthly rent.
  - Ⓓ There does not appear to be an association between monthly rent and the size of the apartment, so the size of the apartment does not matter.

