Math

2019

Algebra I

Released Items

1. **VH031549**

The table shown gives values of the function $y = g(x)$ for selected values of x.

x	0	1	2	3
$g(x)$	3	6	12	24

Which represents $g(x)$?

A. $g(x) = 3 + 2x$

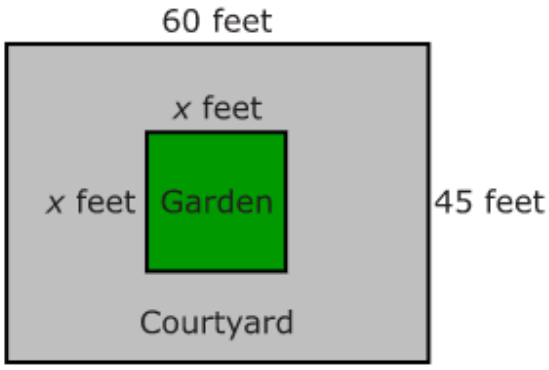
B. $g(x) = 3 \cdot 2x$

C. $g(x) = 3 \cdot x^2$

D. $g(x) = 3 \cdot 2^x$

2. **M40433**

The drawing shows the plan for a rectangular courtyard with a square garden at its center.



The expression $2{,}700 - x^2$ gives the area of the courtyard, in square feet, not including the garden. Which expression represents the area of the courtyard if the length of each side of the square garden is increased by n feet?

A. $(2{,}700 + n) - x^2$

B. $2{,}700 - x^2 + n^2$

C. $2{,}700 - (x + n)^2$

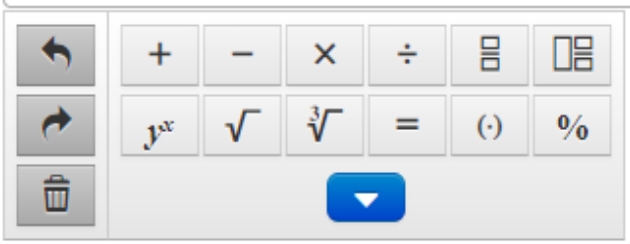
D. $2{,}700 - (x - n)^2$

3. **VH225229**

A rectangular box has a width equal to twice the height. The formula $V = 2h^2l$ can be used to find the volume, *V*, of the box if the height, *h*, and length, *l*, are known. What is an equation for the height of the box in terms of the volume and length?

Enter your answer in the space provided. Enter **only** your answer.

$h =$ ☐



4. **VH026435**

$f(x) = x^2$ for all real numbers *x*. $g(x) = (x-1)^2 + 2$ for all real numbers *x*.

Part A

Which statement is true about *f* and *g*?

- A. The graph of $g(x)$ can be drawn by translating the graph of $f(x)$ 1 unit left and 2 units up.
- B. The graph of $g(x)$ can be drawn by translating the graph of $f(x)$ 1 unit right and 2 units up.
- C. The graph of $g(x)$ can be drawn by translating the graph of $f(x)$ 1 unit left and 2 units down.
- D. The graph of $g(x)$ can be drawn by translating the graph of $f(x)$ 1 unit right and 2 units down.

Part B

The graph of the function *h*(*x*) is the result of reflecting the graph of *f*(*x*) over the *x*-axis and then translating 1 unit up. Which equation defines *h*(*x*) ?

- A. $h(x) = (-x)^2 + 1$
- B. $h(x) = -x^2 + 1$
- C. $h(x) = -(x^2 + 1)$
- D. $h(x) = (-x + 1)^2$

5. **VH018490**

Melissa will participate in a charity walkathon. Her mother will donate $10 for Melissa's participation plus an additional $2 for each mile that Melissa walks.

Part A

If Melissa walks 15 miles, what will be the amount of her mother's donation?

Enter your answer in the box.

Part B

What equation expresses P, the amount in dollars, of Melissa's mother's donation as a function of M, the number of miles that Melissa walks?

- A. $P = M + 10$
- B. $P = 2M + 10$
- C. $P = 10M + 2$
- D. $P = 2(M + 10)$

Part C

If the donation is $44, how many miles did Melissa walk?

- A. 15
- B. 17
- C. 22
- D. 98

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Part D

Melissa wants her mother to donate at least $65. Which of the listed numbers of miles would make the donation at least $65?

Select all that apply.

- A. 23 miles
- B. 25 miles
- C. 27 miles
- D. 29 miles
- E. 31 miles

6. **VH150250**

A university organizes an event in which all tenth-grade students from three school districts are invited to visit the university campus. Each school district serves students from kindergarten through twelfth grade. The organizers expect 10% of the invited students to attend.

Part A

Write an equation that can be used to predict the total number of tenth-grade students expected to attend. Describe the assumptions you used to determine your equation.

Enter your equation and your work in the space provided.

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

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Part B

This table shows information about the districts from which students will be invited.

Number of Students in a District

District Name	Number of Students in the District
Allegany County	9,022
Anne Arundel County	75,481
Baltimore City	83,800

Estimate the total number of tenth-grade students expected to visit the university.

Enter your answer and your work in the space provided.

- Math symbols
- Relations
- Geometry
- Groups
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- Greek

7. **VH068614**

The staff at an advertising company took a survey of 350 people, each of whom had visited one of two branches, East and West, of a store. Each person surveyed was asked whether he or she had purchased a certain product within the past month. The results of the survey, by location, are shown in the table.

	East	West	Total
Had purchased the product	49	70	119
Had not purchased the product	133	98	231
Total	182	168	350

Of the people who visited the West branch of the store, what fraction indicated that they had not purchased the product?

Give your answer as a fraction. Enter your answer in the boxes.

8. **VH018281**

Line k contains the points $(-9, 4)$ and $(9, -8)$ in the *xy*-coordinate plane. What are two other points that lie on line k?

A. $(-3, -4)$ and $(3, 0)$

B. $(-3, 0)$ and $(3, 4)$

C. $(-3, 4)$ and $(3, 0)$

D. $(-3, 0)$ and $(3, -4)$

9. **VH210488**

While Sam was at work, his house lost electrical power. By the time the electrical power came back on, the temperature inside the house was 88°F. The air conditioner immediately started to cool the house.

Let $f(x)$ represent the temperature, in degrees Fahrenheit, of Sam's house x minutes after the air conditioner started to cool the house.

Part A

What is the meaning of the statement $f(30) = 76$?

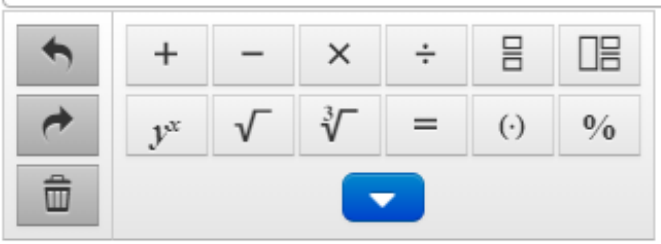
- A. After 30 minutes, the house has cooled to 76°F.
- B. After 30 minutes, the house is 76°F cooler than it was when the air conditioner started to cool the house.
- C. After 76 minutes, the house has cooled to 30°F.
- D. After 76 minutes, the house is 30°F cooler than it was when the air conditioner started to cool the house.

Part B

Use function notation to represent the temperature of the house when the air conditioner started to cool the house.

Enter your answer in the space provided. Enter **only** your answer.

$f(\square) = \square$



10. **VH018061**

The function $h(t) = -16t^2 + 48t + 160$ can be used to model the height, in feet, of an object t seconds after it is launched from the top of a building that is 160 feet tall.

Two other forms of the function are:

$h(t) = -16(t - 5)(t + 2)$

$h(t) = -16(t - 1.5)^2 + 196$

Which value of the function represents the maximum height of the object?

- A. $h(0)$
- B. $h(1.5)$
- C. $h(2)$
- D. $h(5)$

11. **VH011918**

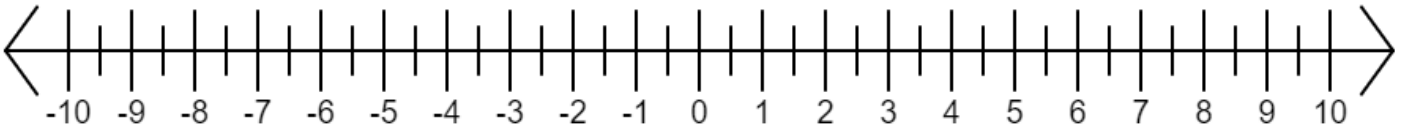
Which expression is equivalent to $3 + 2(x + 4)(x - 4)$?

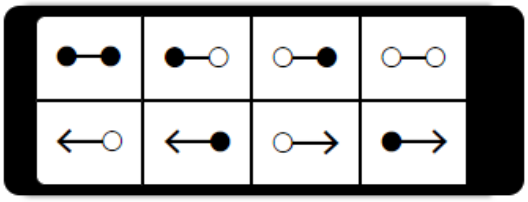
- A. $2x^2 - 13$
- B. $2x^2 - 29$
- C. $2x^2 - 35$
- D. $5x^2 - 80$

12. **VH223193**

Solve the inequality $5x - 3 < 2x$ and graph the solution on the number line.

Select a solution set indicator. Drag the points on the indicator to the appropriate locations on the number line.





13. **VH231478**

An object is launched upward from a platform that is 10 meters above ground level. It reaches a maximum height of 88.4 meters above ground level in 4 seconds. The object hits the ground after a total of 8.25 seconds.

Let the function $h\,(t)$ represent the height, in meters, of the object above ground level *t* seconds after launch. Which inequality describes the domain of this relationship?

- A. $0 \leq t \leq 8.25$
- B. $0 \leq t \leq 88.4$
- C. $4 \leq t \leq 8.25$
- D. $10 \leq t \leq 88.4$

14. **VH024229**

Adam ran for 30 minutes. He kept a record of his running speed, in miles per hour (mph), for each 5-minute interval. The table shows the changes in the running speed for different time intervals.

Interval of Time	Running Speed
First 5 minutes	Went from 0 mph to 7 mph
5 minutes to 15 minutes	Remained at 7 mph
15 minutes to 20 minutes	Went from 7 mph to 4 mph
20 minutes to 25 minutes	Went from 4 mph to 6 mph
25 minutes to 30 minutes	Went from 6 mph to 0 mph

Consider a graph in the *xy*-coordinate plane of Adam's running speeds as a function of time, in minutes. Assume that the increases and decreases in the running speed were constant.

Part A

In which time interval is the graph of the function increasing?

Select **all** that apply.

- ☐ A. 0 to 5 minutes
- ☐ B. 5 to 10 minutes
- ☐ C. 10 to 15 minutes
- ☐ D. 15 to 20 minutes
- ☐ E. 20 to 25 minutes
- ☐ F. 25 to 30 minutes

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14. (continued from previous page) **VH024229**

Part B

In which time interval is the graph of the function decreasing?

Select **all** that apply.

- A. 0 to 5 minutes
- B. 5 to 10 minutes
- C. 10 to 15 minutes
- D. 15 to 20 minutes
- E. 20 to 25 minutes
- F. 25 to 30 minutes

15. **M40002**

Today (Week 0), a certain flower is 0.75 foot tall. Each week, the flower will grow 25% taller than it was the week before. In the function below, *t* is the number of weeks from today and *h*(*t*) is the predicted height after *t* weeks.

$$h(t) = \frac{3}{4} \times 1.25^t$$

What will the average rate of change be from Week 0 to Week 5?

- A. 0.27 foot per week
- B. 0.31 foot per week
- C. 1.54 feet per week
- D. 3.25 feet per week

16. **VF884598**

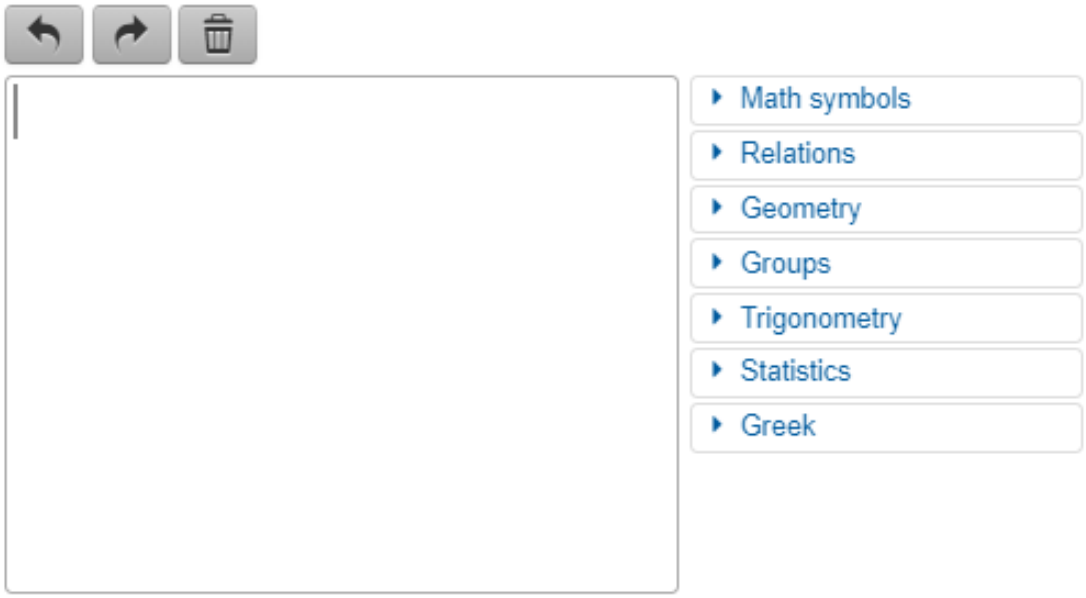
Consider the function $f(x) = x^2$.

Functions *g* and *h* are defined as $g(x) = f(x + k)$ and $h(x) = f(x) + k$, where *k* is a nonzero real number.

Part A

Show algebraically that $g(x)$ and $h(x)$ are different functions.

Enter your work in the space provided.



- Math symbols
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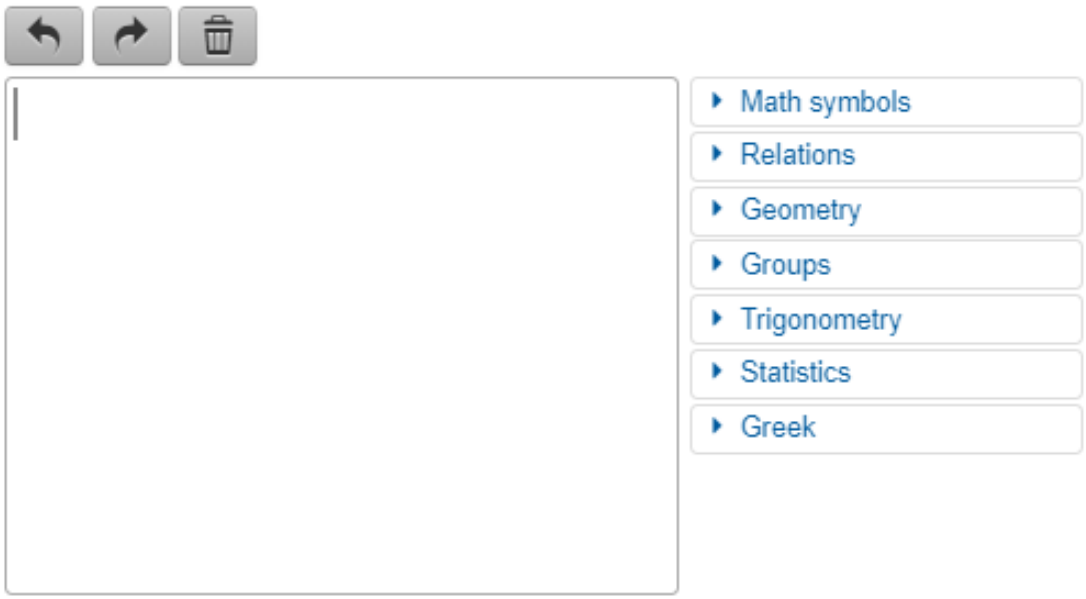
Part B

Explain the graphical difference between $g(x)$ and $h(x)$.

Enter your explanation in the space provided.



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17. **VH018306**

The number of bacteria initially present in a culture was 1,000. Each hour, the number of bacteria in the culture was eight times the number that was present at the start of the preceding hour, as shown in the table.

Time (hours)	Number of Bacteria in the Culture
0	1,000
1	8,000
2	64,000
3	512,000

Which equation could be used to determine *n*, the number of bacteria in the culture at hour *t*?

A. $n = 1,000(8,000)^t$

B. $n = 1,000(2)^t$

C. $n = 1,000(8)^t$

D. $n = 1,000(2t)$