

F.BF.1a*

SELECTED RESPONSE

Select the correct answer.

- A small swimming pool initially contains 400 gallons of water, and water is being added at a rate of 10 gallons per minute. Which expression represents the volume of the pool after t minutes?

Ⓐ $-10t + 400$
 Ⓑ $10t + 400$
 Ⓒ $400t + 10$
 Ⓓ $400(1.10)^t$
- A diver jumps off a 10-meter-high diving board with an initial vertical velocity of 3 meters per second. The function $h(t) = -4.9t^2 + v_0t + h_0$ models the height of a falling object, where v_0 is the initial vertical velocity and h_0 is the initial height. Which function models the divers height h , in meters, above the water at time t , in seconds?

Ⓐ $h(t) = -4.9t^2 - 3t + 10$
 Ⓑ $h(t) = -4.9t^2 - 3t - 10$
 Ⓒ $h(t) = -4.9t^2 + 3t + 10$
 Ⓓ $h(t) = -4.9t^2 + 3t - 10$
- Andrea buys a car for \$16,000. The car loses value at a rate of 8% each year. Which recursive rule below describes the value of Andrea's car V , in dollars, after t years?

Ⓐ $V(0) = \$16,000$ and $V(t) = 0.08 \cdot V(t - 1)$ for $t \geq 1$
 Ⓑ $V(0) = \$16,000$ and $V(t) = 0.2 \cdot V(t - 1)$ for $t \geq 1$
 Ⓒ $V(0) = \$16,000$ and $V(t) = 0.92 \cdot V(t - 1)$ for $t \geq 1$
 Ⓓ $V(0) = \$16,000$ and $V(t) = 1.08 \cdot V(t - 1)$ for $t \geq 1$

Select all correct answers.

- Miguel has \$250 dollars saved, and he adds \$5 to his savings every week. Which functions describe the amount A , in dollars, that Miguel has saved after t weeks?

Ⓐ $A(t) = 5t + 250$
 Ⓑ $A(t) = -5t + 250$
 Ⓒ $A(t) = 250t + 5$
 Ⓓ $A(0) = 250$ and $A(t) = A(t - 1) + 5$ for $t \geq 1$
 Ⓔ $A(0) = 250$ and $A(t + 1) = A(t) + 5$ for $t \geq 0$
 Ⓕ $A(0) = 250$ and $A(t + 1) = 5A(t)$ for $t \geq 0$

CONSTRUCTED RESPONSE

- When a piece of paper is folded in half, the total thickness doubles and the total area is halved. Suppose you have a sheet of paper that is 0.1 mm thick and has an area of 10,000 mm².

 - Write an equation that models the thickness T , in millimeters, of the sheet of paper after it has been folded n times.

- Write an equation that models the area A , in square millimeters, of the sheet of paper after it has been folded n times.

6. The people at a conference use the following exercise to get to know each other. The leader of the conference chooses 4 people, greets each of them with a handshake, and they chat. After one minute, those 4 people each choose 4 people, greet each with a handshake, and chat. This continues until each person at the conference has shaken someone's hand. Write an exponential function that models the number of handshakes H in the n th minute.

7. A population of 300 sea turtles grows by 5% each year.

a. Describe the steps needed to calculate the population each year.

b. Write a recursive function for the population P after t years.

8. Simon wants to use 500 feet of fencing to enclose a rectangular area in his backyard.

a. Write a function for the enclosed area A , in square feet, in terms of the width w , in feet. Show your work.

b. What are the dimensions of the largest rectangle Simon can enclose with 500 feet of fencing? Explain.

F.BF.1b*

SELECTED RESPONSE

Select the correct answer.

- A rectangle has side lengths $(x + 4)$ feet and $(2x + 1)$ feet for $x > 0$. Write a function that describes the area A , in square feet, in terms of x .

(A) $A(x) = 3x + 5$
 (B) $A(x) = 6x + 10$
 (C) $A(x) = 2x^2 + 9x + 4$
 (D) $A(x) = 2x^2 + 7x - 4$
- In a factory, the cost of producing n items is $C(n) = 25n + 150$. Which function describes the average cost of producing one item when n items are produced?

(A) $A(n) = 25n + 150$
 (B) $A(n) = 25 + \frac{150}{n}$
 (C) $A(n) = 25n^2 + 150n$
 (D) $A(n) = \frac{25}{n} + \frac{150}{n^2}$

Select all correct answers.

- Two identical water tanks each hold 10,000 liters. Tank A starts full, but water is leaking out at a rate of 10 liters per minute. Tank B starts empty and is filled at a rate of 13 liters per minute. Which functions correctly describe the combined volume V of both tanks after t minutes?

(A) $V(t) = 10,000 - 10t + 13t$
 (B) $V(t) = 10,000 - 10t - 13t$
 (C) $V(t) = 10,000 + 10t - 13t$
 (D) $V(t) = 10,000 - 3t$
 (E) $V(t) = 10,000 + 3t$
 (F) $V(t) = 10,000 - 23t$

Select the correct answer for each lettered part.

- Let $f(x) = x^2 - x - 2$ and $g(x) = x^2 + x - 6$. Classify each function below as linear, quadratic, or neither.

a. $f(x) + g(x)$	<input type="radio"/> Linear	<input type="radio"/> Quadratic	<input type="radio"/> Neither
b. $f(x) - g(x)$	<input type="radio"/> Linear	<input type="radio"/> Quadratic	<input type="radio"/> Neither
c. $\frac{f(x)}{g(x)}$	<input type="radio"/> Linear	<input type="radio"/> Quadratic	<input type="radio"/> Neither
d. $f(x) \cdot g(x)$	<input type="radio"/> Linear	<input type="radio"/> Quadratic	<input type="radio"/> Neither

CONSTRUCTED RESPONSE

- Let $f(x) = x^2 + x - 6$ and $g(x) = x^2 - 4$. Find $f(x) + g(x)$ and $f(x) - g(x)$. Simplify your answers.

6. Esther exercises for 45 minutes. She rides her bike at 880 feet per minute for t minutes and then jogs at 400 feet per minute for the rest of the time.

a. Write a function that describes the distance d_1 , in feet, that Esther travels while riding her bike for t minutes.

b. Write a function that describes the distance d_2 , in feet, that Esther travels while jogging.

c. Use your answers from parts a and b to write a function that describes the distance d , in feet, that Esther travels while exercising.

8. Town A and town B both had a population of 15,000 people in the year 2000. The population of town A increased by 2.5% each year. The population of town B decreased by 3.5% each year.

a. Write a function $A(t)$, the population of town A t years after 2000.

b. Write a function for $B(t)$, the population of town B t years after 2000.

c. Find $A(t) + B(t)$ and $\frac{A(t)}{B(t)}$. Simplify your answers and interpret each function in terms of the situation. If necessary, round decimals to the nearest thousandth.

F.BF.2*

SELECTED RESPONSE

Select the correct answer.

1. A theater has 18 rows of seats. There are 22 seats in the first row, 26 seats in the second row, 30 seats in the third row, and so on. Which of the following is a recursive formula for the arithmetic sequence that represents this situation?

(A) $f(0) = 18, f(n) = f(n - 1) + 4$
for $1 \leq n \leq 18$

(B) $f(1) = 22, f(n) = f(n - 1) + 4$
for $2 \leq n \leq 18$

(C) $f(n) = 18 + 4n$

(D) $f(n) = 22 + 4(n - 1)$

2. The table below shows the balance b , in dollars, of Daryl's savings account t years after he made an initial deposit. What is an explicit formula for the geometric sequence that represents this situation?

Time, t (years)	Balance, b (dollars)
1	\$1218
2	\$1236.27
3	\$1254.81
4	\$1273.64

(A) $b(t) = 1.015(1218)^{t-1}$

(B) $b(t) = 1218(1.015)^t$

(C) $b(t) = 1218 + 1.015(t - 1)$

(D) $b(t) = 1218(1.015)^{t-1}$

Select all correct answers.

3. Amelia earns \$36,000 in the first year from her new job and earns a 6% raise each year. Which of the following models Amelia's pay p , in dollars, in year t of her job?

(A) $p(0) = 36,000, p(t) = 1.06 \cdot p(t - 1)$
for $t \geq 1$

(B) $p(1) = 36,000, p(t) = 1.06 \cdot p(t - 1)$
for $t \geq 2$

(C) $p(t) = 36,000 \cdot 1.06^{t-1}$ for $t \geq 1$

(D) $p(t) = 1.06 \cdot 36,000^{t-1}$ for $t \geq 1$

(E) $p(t) = 1.06(t - 1) + 36,000$ for $t \geq 1$

(F) $p(t) = 38,160 \cdot 1.06^{t-2}$ for $t \geq 1$

CONSTRUCTED RESPONSE

4. Calvin is practicing the trumpet for an audition to play in a band. He starts practicing the trumpet 40 minutes the first day and then increases his practice time by 5 minutes per day. The audition is on the 10th day.

a. Write a recursive rule that represents the time t , in minutes, Calvin practices on day d .

b. Write an explicit rule that represents the time t , in minutes, Calvin practices on day d .

c. Use the result from part b to find how long Calvin practices on the 8th day. Show your work.

5. The table displays the speed of a car s , in feet per second, t seconds after it starts coasting.

Time, t (seconds)	Speed, s (ft/sec)
1	57
2	54.15
3	51.44
4	48.87

a. Explain why this sequence is geometric.

b. Write an explicit rule for this sequence using the values from the table.

c. Use the result from part b to write a recursive rule for this sequence.

d. What is the speed of the car when it begins to coast? Show your work.

6. The table below shows the cost c , in dollars, of a private party on a boat based on the number of people p attending.

People, p	Cost, c (dollars)
2	306
3	334
4	362
5	390

a. Does an arithmetic sequence or a geometric sequence model this situation? Justify your answer by using the values in the table.

b. Write an explicit formula and a recursive formula for the sequence. Show your work.

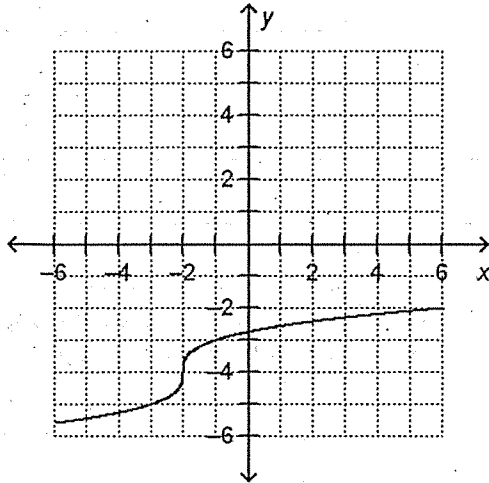
c. How much would it cost for 44 people to attend the private party? Show your work.

F.BF.3

SELECTED RESPONSE

Select the correct answer.

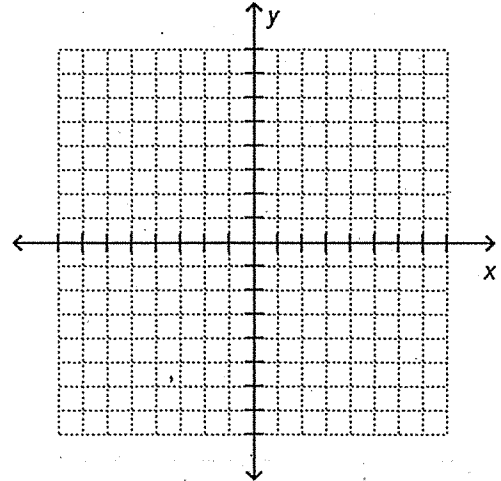
1. The graph of $g(x)$ is shown below. The graph of $g(x)$ can be obtained by applying horizontal and vertical shifts to the parent function $f(x) = \sqrt[3]{x}$. What is $g(x)$?



- (A) $g(x) = \sqrt[3]{x-2} + 4$
 - (B) $g(x) = \sqrt[3]{x+2} - 4$
 - (C) $g(x) = \sqrt[3]{x+4} - 2$
 - (D) $g(x) = \sqrt[3]{x-4} + 2$
2. What must be done to the graph of $f(x) = |x|$ to obtain the graph of the function $g(x) = 0.5|x + 4| - 10$?
- (A) The graph of $f(x)$ is shifted left 4 units, horizontally shrunk by a factor of 0.5, and shifted down 10 units.
 - (B) The graph of $f(x)$ is shifted right 4 units, vertically shrunk by a factor of 0.5, and shifted down 10 units.
 - (C) The graph of $f(x)$ is shifted left 4 units, vertically shrunk by a factor of 0.5, and shifted down 10 units.
 - (D) The graph of $f(x)$ is shifted left 4 units, vertically shrunk by a factor of 0.5, and shifted up 10 units.

CONSTRUCTED RESPONSE

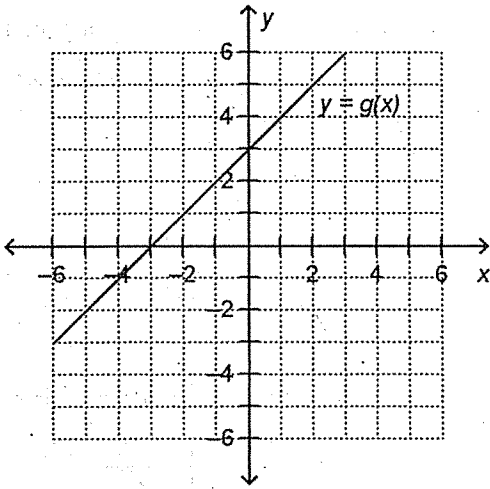
3. Describe the transformations applied to the graph of the parent function $f(x) = \sqrt{x}$ used to graph $g(x) = -2\sqrt{1-x} + 3$. Graph $g(x)$.



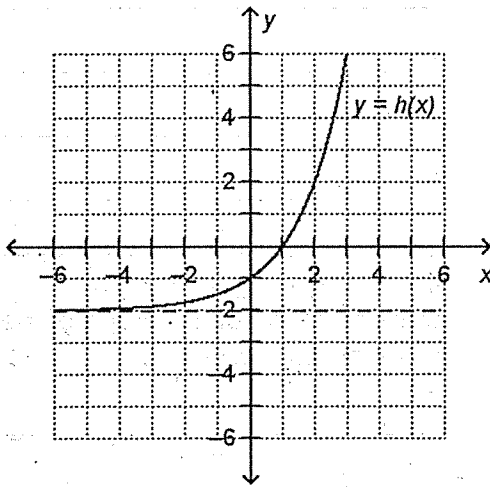
4. Describe how the nonzero slope m of a linear function $g(x) = mx$ is a transformation of the graph of the parent linear function $f(x) = x$.

5. For the following graphs of transformed functions, state the parent function $f(x)$, the type of transformation, and write a function rule.

a.



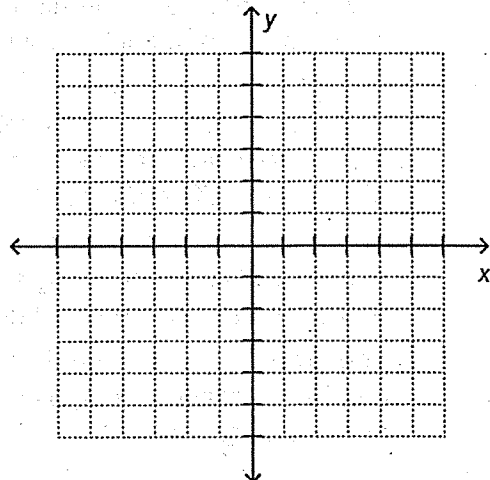
b.



6. a. Rewrite $g(x) = -\frac{1}{2}x^2 - 2x + 2$ in vertex form. Show your work.

b. Describe the transformations applied to the parent function $f(x) = x^2$.

c. Graph $g(x)$.



F.BF.4a

SELECTED RESPONSE

Select the correct answer.

1. What is the inverse of $f(x) = -2x + 6$?

(A) $g(x) = \frac{1}{2}x - 3$

(B) $g(x) = -\frac{1}{2}x + 3$

(C) $g(x) = 2x - 6$

(D) $g(x) = -\frac{1}{2}x + 6$

2. The point $(2, 12)$ is on the graph of $f(x)$. Which of the following points must be on the graph of $g(x)$, the inverse of $f(x)$?

(A) $(-2, 12)$

(B) $(2, -12)$

(C) $(2, 12)$

(D) $(12, 2)$

Select all correct answers.

3. If $f(x) = -\frac{1}{8}x + 5$, which of the following statements about $g(x)$, the inverse of $f(x)$, are true?

(A) $g(-2.125) = 57$

(B) $g(-0.5) = 44$

(C) $g(-0.375) = 37$

(D) $g(0.125) = 39$

(E) $g(0.625) = 45$

(F) $g(1.125) = 40$

CONSTRUCTED RESPONSE

4. Let $f(x) = -13x + 52$. Find the inverse of $f(x)$ and use it to find a value of x such that $f(x) = 182$. Show your work.

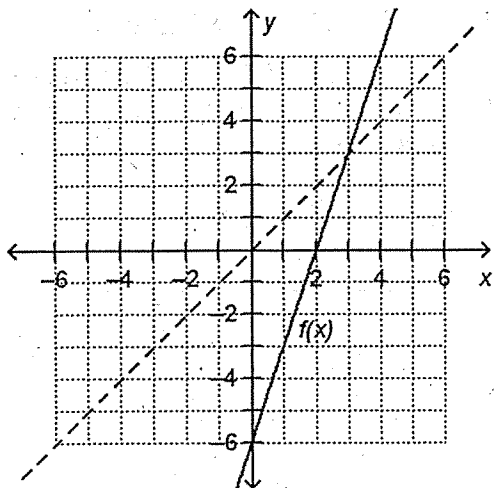
5. At a carnival, you pay \$15 for admission, plus \$3 for each ride you go on.

a. Write a function $A(r)$ that models the amount A , in dollars, you would spend to ride r rides at the carnival.

b. Find the inverse of $A(r)$. Show your work.

c. What does the inverse function found in part b represent in the context of the problem?

6. The graph of $f(x) = 3x - 6$ is shown, along with the dashed line $y = x$.



a. Find $g(x)$, the inverse of $f(x)$. Show your work.

b. Graph $g(x)$ on the coordinate grid above.

c. How are the graphs of $f(x)$ and $g(x)$ related to the line $y = x$?

7. a. Find $g(x)$, the inverse of $f(x) = mx + b$. Show your work.

b. Use the formula for $g(x)$ to find the inverse of $f(x) = 4x + 11$.

c. Does every linear function have an inverse? Use your result from part a to explain why or why not. If not, give the general forms of any linear functions that do not.
