

Summative Assessment

1. Solve: $x + 21 = 7$
 - A. $x = -28$
 - B. $x = -14$
 - C. $x = 14$
 - D. $x = 28$
2. Assume $f(x) = g(x)$. Which of the following two functions may be used to represent the function $3x = x - 4$?
 - A. $f(x) = 3x, g(x) = x - 4$
 - B. $f(x) = x - 7, g(x) = x - \frac{4}{3}$
 - C. $f(x) = 3x, g(x) = 3x$
 - D. $f(x) = 7, g(x) = 3x$
3. Which of the following is equivalent to $3\sqrt{20} + 2\sqrt{72}$?
 - A. $18\sqrt{7}$
 - B. $6\sqrt{2} + 2\sqrt{5}$
 - C. $6\sqrt{5} + 12\sqrt{2}$
 - D. $12\sqrt{5} + 72\sqrt{2}$

4. The president of a community college hopes to increase the school's enrollment each year. The number of students enrolled at the school during the year when the president began this initiative was 4,000. She listed the approximate number of students she hopes to have enrolled each year in the table below.

Year	Number of Students
0	4,000
1	4,040
2	4,080
3	4,121
4	4,162

What is the constant percent rate increase that the president of the school hopes to have each year?

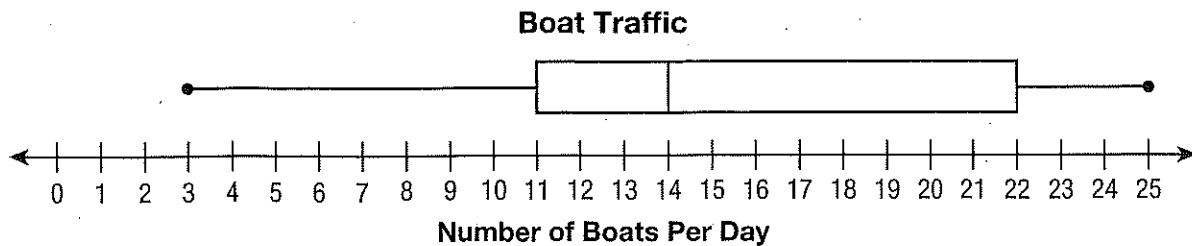
- A. 0.01%
 - B. 0.1%
 - C. 1%
 - D. 10%
5. Which of the following polynomials is written in standard form?
 - A. $-14x + x^2 + 7x^3$
 - B. $3x^3 - 90x + 2x^5$
 - C. $\frac{1}{2}x^4 + \frac{3}{8}x^3 + 10$
 - D. $3x^2 + 7x - 8 - 2x^2 + 11$

6. The Fish and Wildlife Department kept track of the number of boats that passed a point on the river each day for two weeks. The data are listed below.

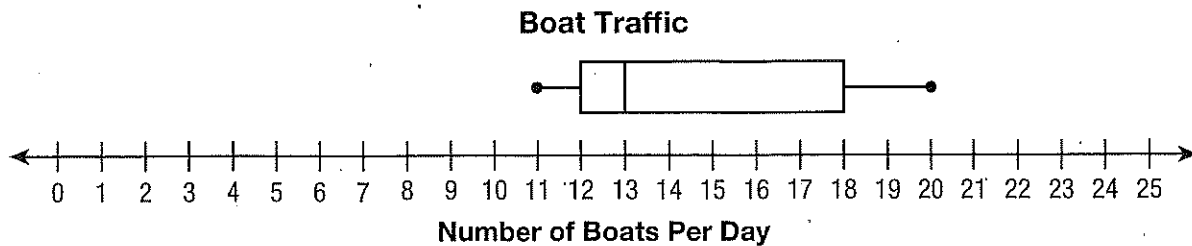
12, 24, 9, 3, 11, 18, 14, 18, 22, 25, 12, 12, 5, 16

In order to compile the data into a box plot, the staff determined the lower quartile to be 11, the median to be 13, and the upper quartile to be 18. Which box plot best represents the collected data?

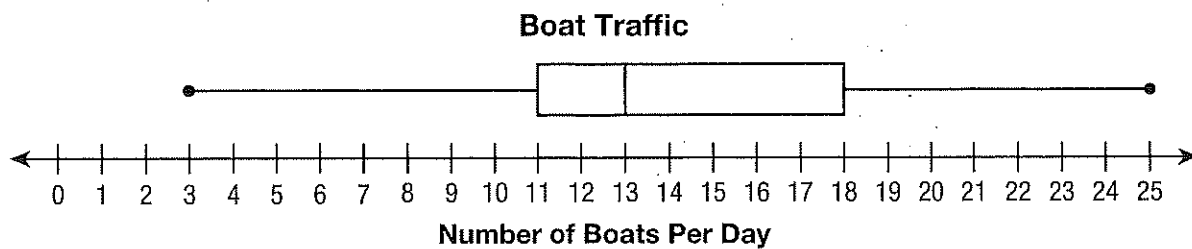
A.



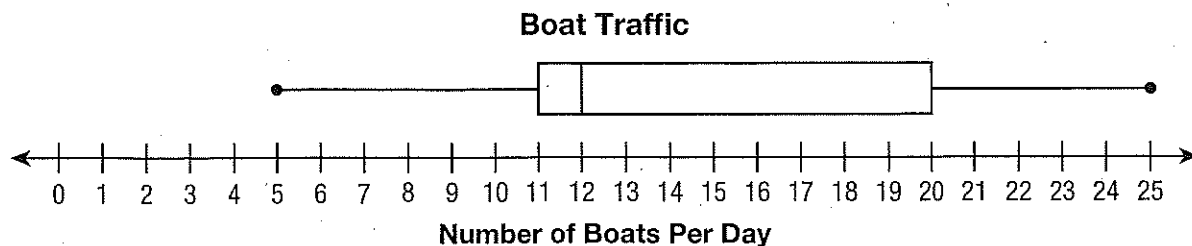
B.



C.



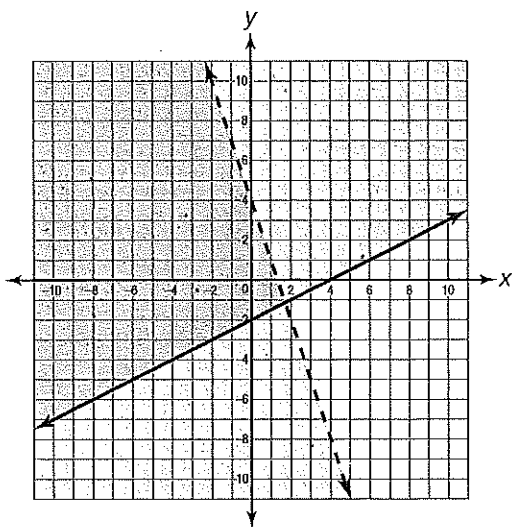
D.



7. A baker wants to know if she has enough flour to make 50 loaves of bread. Which of the following units does she need to consider?

A. cups of flour per loaf of bread
 B. cups of flour per minute
 C. minutes per cup of flour
 D. customers per loaf of bread

8. The solution to a system of linear inequalities is graphed below.



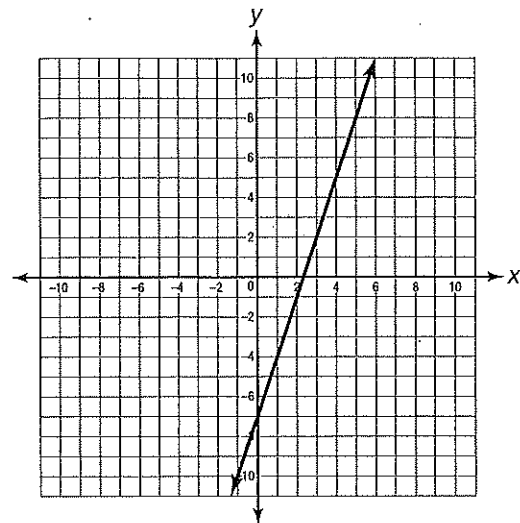
Does the point $(-2, -3)$ represent a solution to the system of inequalities?

- A. The point is on a solid line bordering the darker shaded region, so it is a solution to the system of inequalities.
 B. The point is on a solid line bordering the darker shaded region, so it is not a solution to the system of inequalities.
 C. The point is on a dotted line bordering the darker shaded region, so it is a solution to the system of inequalities.
 D. The point is on a dotted line bordering the darker shaded region, so it is not a solution to the system of inequalities.

9. A marine biologist tracked the growth of a population of sea stars along a coast. She noted an exponential growth pattern of the population. In modeling the total population, $p = f(t)$, over time, t , which of the following should she use as a practical domain?

A. all real numbers
 B. $p > 0$
 C. $t < 0$
 D. $t > 0$

10. The function $f(x) = 3x - 7$ is graphed below.

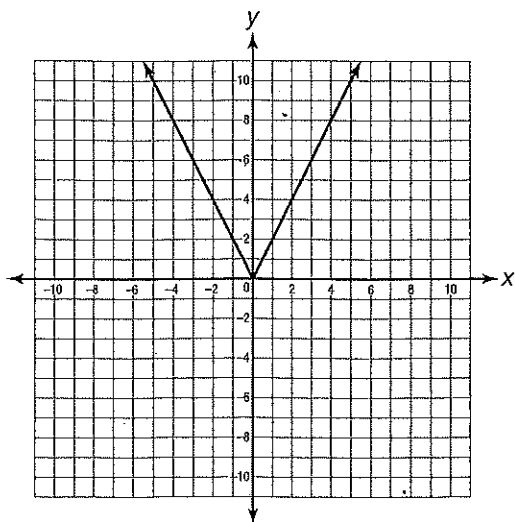


What change would be seen if $f(x) + 2$ were graphed?

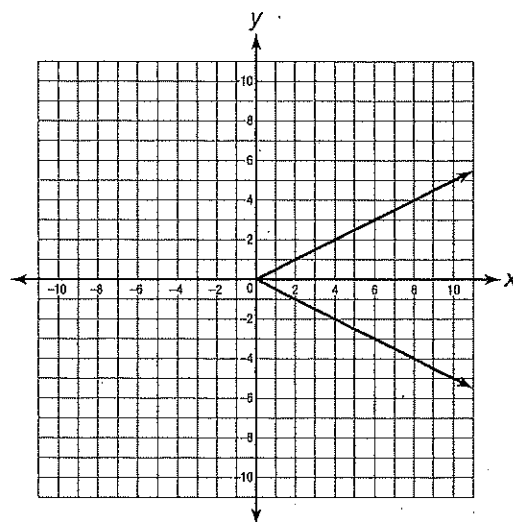
- A. The line would shift to the right 2 units.
 B. The line would shift to the left 2 units.
 C. The line would shift up 2 units.
 D. The line would shift down 2 units.

11. Which of the following is the graph of $f(x) = |2x|$?

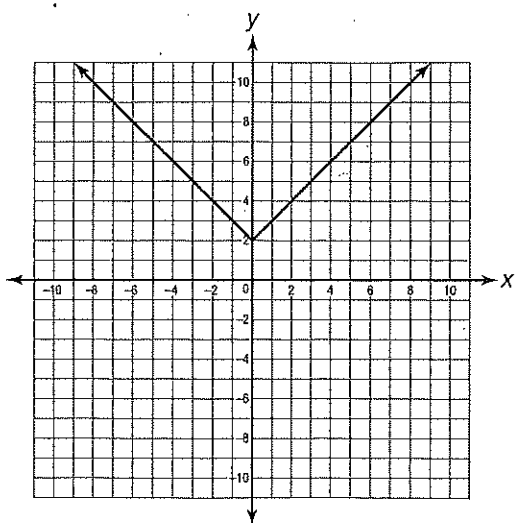
A.



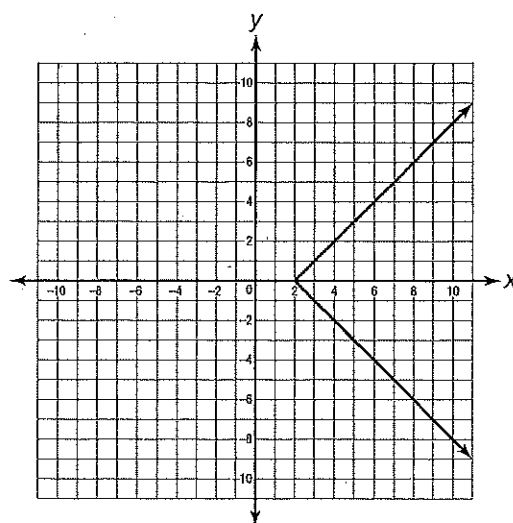
C.



B.

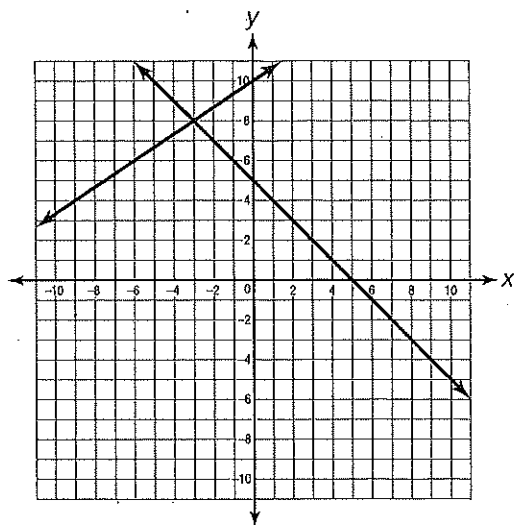


D.



12. A system of linear equations and its graph are shown below.

$$\begin{cases} y = -x + 5 \\ y = \frac{2}{3}x + 10 \end{cases}$$



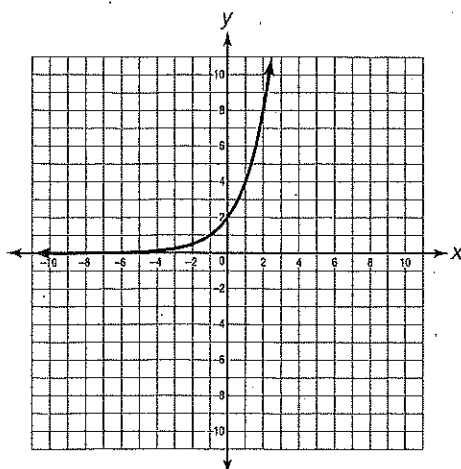
What is the solution to the system of linear equations?

- A. $(7, -2)$
- B. $(8, -3)$
- C. $(-2, 7)$
- D. $(-3, 8)$

13. Pablo planted a tomato plant for his neighbor. The tomato plant has 2 tomatoes. Pablo said that he expects the number of tomatoes to triple each month. After a certain number of months, he expects there to be 54 tomatoes. If m represents the number of months, which equation could Pablo's neighbor use to determine when Pablo expects there to be 54 tomatoes?

- A. $3 \cdot 2^m = 54$
- B. $3 \cdot m^2 = 54$
- C. $2 \cdot 3^m = 54$
- D. $2 \cdot m^3 = 54$

14. An exponential function is graphed below.



Which ordered pair below represents a solution to the function?

- A. (2, 0)
B. (2, 8)
C. (1, 2)
D. (0, 1)
15. A sandwich shop owner counted the number and type of sandwiches sold over the course of a weekend and compiled the data into the relative frequency table below.

Sandwiches	Saturday	Sunday	Total
Ham and Swiss	0.05	0.07	0.12
Turkey and Cheddar	0.20	0.11	0.31
Roast Beef and Cheddar	0.16	0.07	0.23
Veggie	0.12	0.22	0.34
Total	0.53	0.47	1.00

Using the data, which interpretation is most likely true if the sandwich shop sold 150 sandwiches during the weekend?

- A. About 47 of the sandwiches were turkey and cheddar.
B. About 80 of the sandwiches were sold on Sunday.
C. About 51 of the sandwiches were roast beef and cheddar sandwiches.
D. About 71 of the sandwiches were sold on Saturday.

16. A fundraiser is being held to support a local nonprofit organization. Admission costs \$10, and each raffle ticket costs \$3. There are no other possible costs. If an event-goer pays the admission fee and buys x number of tickets, what type of function should be used to model the total amount spent by the event-goer at the event?

A. exponential
B. linear
C. neither
D. cannot be determined

17. A researcher studied the effect of changes in air temperature on home electricity usage around the country. The researcher made a scatter plot with her data and determined a line of best fit. The correlation coefficient was found to be 0.683. Which of the following conclusions could the researcher make from her data?

A. As the air temperature increases, home electricity usage increases.
B. As the air temperature increases, home electricity usage does not change.
C. As the air temperature increases, home electricity usage increases and then decreases.
D. As the air temperature increases, home electricity usage decreases.

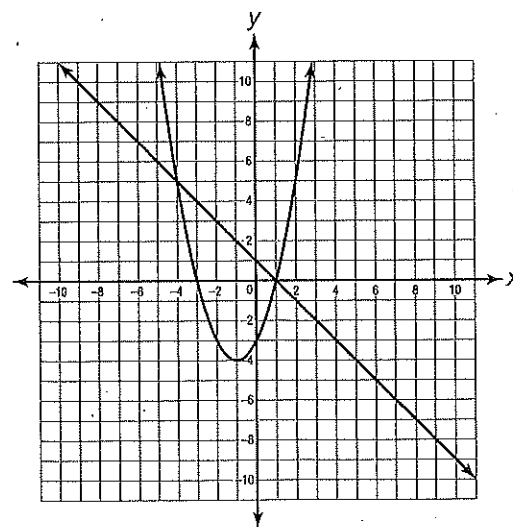
18. A reservoir collects rainwater that is eventually filtered and used as the drinking water for a local town. A town official determined that the reservoir is currently holding 500,000 gallons of water. If the town uses 10,000 gallons of water each day and there is no rain to replenish the water, how much water will be in the reservoir after 20 days?

A. 200,000 gallons
B. 250,000 gallons
C. 280,000 gallons
D. 300,000 gallons

19. The following system of equations is graphed below.

$$y = x^2 + 2x - 3$$

$$y = 1 - x$$



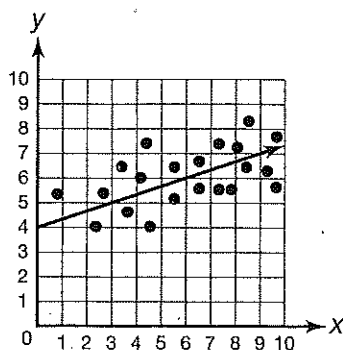
What is the solution set for this system of equations?

A. $(-5, 4)$
B. $(1, 0)$
C. $(-5, 4)$ and $(0, 1)$
D. $(-4, 5)$ and $(1, 0)$

20. Andrea has taken enough courses at her college to have 100 credits toward her graduation. She needs at least 160 credits to graduate. She receives 4 credits per course. Which number of courses will give her exactly enough credits to graduate at the end of this year?

A. 12 courses
B. 15 courses
C. 30 courses
D. 60 courses

21. The graph below shows a scatter plot and its line of best fit.



Which represents the equation of the line of best fit and the best prediction of the value of y when $x = 15$?

- A. $y = \frac{1}{3}x + 4$; $y = 49$
B. $y = \frac{1}{3}x + 4$; $y = 9$
C. $y = 3x + 4$; $y = 49$
D. $y = 3x + 4$; $y = 9$

22. A teacher is correcting a student's homework assignment, but she cannot read one line of the student's work. The student's work is shown below, with a blank space representing the missing line.

Step 1: $-2x + 11 = -5$

Step 2: $-2x + 11 - 11 = -5 - 11$

Step 3: $-2x = -16$

Step 4: _____

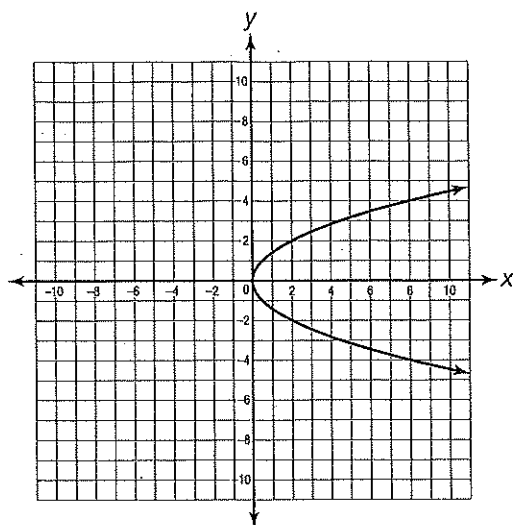
Step 5: $1x = 8$

Step 6: $x = 8$

Which of the following represents the correct Step 4 and the property that would be used to justify the step?

- A. $2x = 16$; multiplicative identity property
B. $\frac{-2x}{-2} = \frac{-16}{-2}$; division property of equality
C. $-2x + 2x = -16 + 2x$; addition property of equality
D. $\frac{2x}{2} = \frac{16}{2}$; addition property of equality

23. Which of the following is true of the graph below?

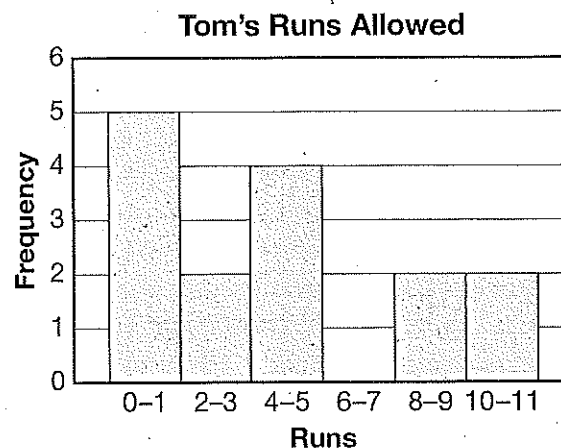
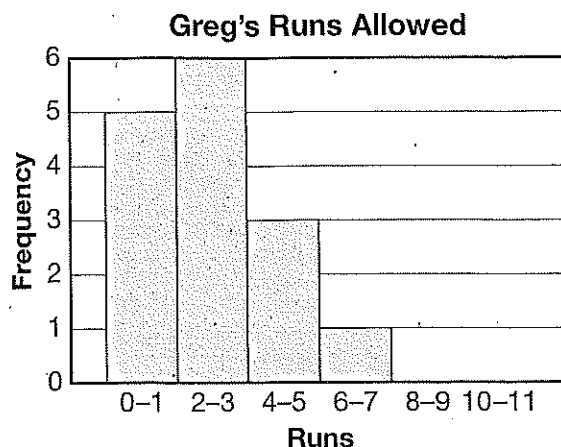


- A. The graph represents a function because it passes the vertical line test. Its inverse is also a function because the graph passes the horizontal line test.
- B. The graph does not represent a function because it does not pass the horizontal line test. Its inverse is a function because the graph passes the vertical line test.
- C. The graph represents a function because it passes the vertical line test. Its inverse is not a function because the graph does not pass the horizontal line test.
- D. The graph does not represent a function because it does not pass the vertical line test. Its inverse is a function because the graph passes the horizontal line test.

24. What is the value of the function $f(x) = 2 \cdot 4^x - 5$ when $x = 2$?

- A. 11
B. 27
C. 32
D. 59

25. Statistics were kept for two baseball pitchers, Tom and Greg, over the season. The histograms below show the number of runs allowed per game by each pitcher.



Which statement below is true about the performance of the two pitchers?

- A. The mean of Greg's runs allowed is a better indicator of the pitcher's typical performance than the mean of Tom's runs allowed.
- B. The range of runs allowed by Greg is greater than that allowed by Tom.
- C. The median of Greg's runs allowed is greater than the median of Tom's runs allowed.
- D. The mean of Greg's runs allowed is greater than the median of Tom's runs allowed.

26. The table below represents ordered pairs of a function.

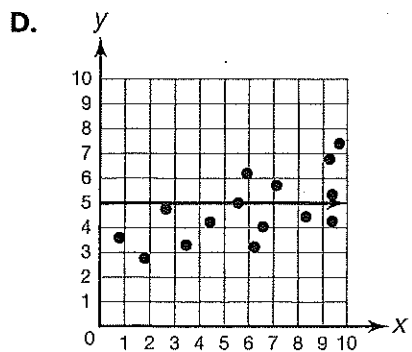
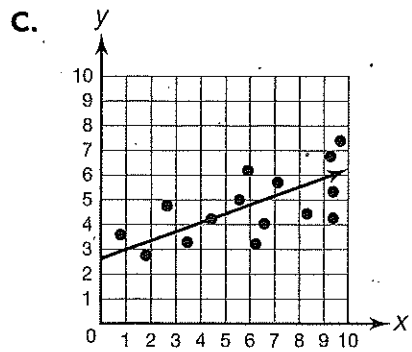
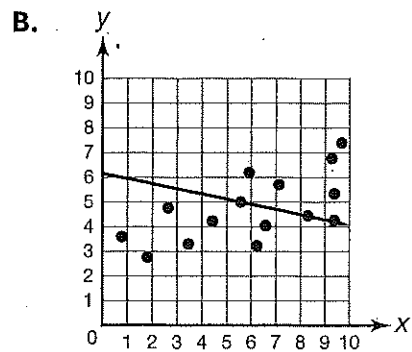
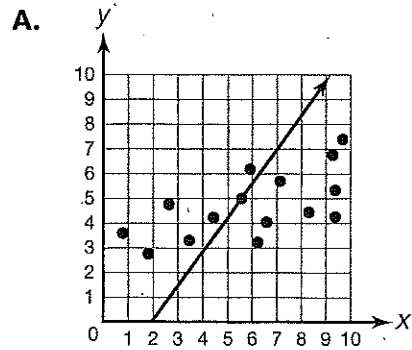
x	y
-2	3
0	-2
2	1
4	3
6	4

Which change could be made so that the relation in the table is no longer a function?

- A. Replace (4, 3) with (4, 5).
 B. Replace (-2, 3) with (-2, -5).
 C. Replace (6, 4) with (7, 3).
 D. Replace (6, 4) with (2, 5).
27. At the store, 2 pounds of brussels sprouts and 4 pounds of carrots cost a total of \$8. If b represents the cost of one pound of brussels sprouts and c represents the cost of one pound of carrots, this situation can be represented by the equation $2b + 4c = 8$. Which of the following shows this equation solved for the variable b ?

- A. $b = 4c + 4$
 B. $b = -2c + 4$
 C. $c = 2b + 4$
 D. $b = -4c + 8$

28. Which of the following best represents a scatter plot and its line of best fit?



29. Monica folded a piece of paper in half to form two rectangles. Then she folded the piece of paper in half a second time to form four rectangles. She continued to fold the piece of paper in half to form greater numbers of rectangles. She determined that she could use the function $f(x) = 2^x$ to model what she was doing. Which is the best interpretation of the parameters in this equation?

- A. $f(x)$ represents the number of times the paper was folded, and x represents the total number of people folding the paper.
- B. $f(x)$ represents the number of pieces of paper, and x represents the number of rectangles formed with those pieces of paper.
- C. $f(x)$ represents the total number of rectangles formed with the paper, and x represents the number of times the paper was folded.
- D. $f(x)$ represents the number of times the paper was folded, and x represents the total number of rectangles formed with the paper.

30. The rates of change of two functions are being compared. One function, $f(x)$, is represented by the equation $f(x) = -2x - 1$, while the other function, $g(x)$, is represented in the function table below.

x	$g(x)$
-4	8
-2	5
0	2
2	-1

Which of the following is true?

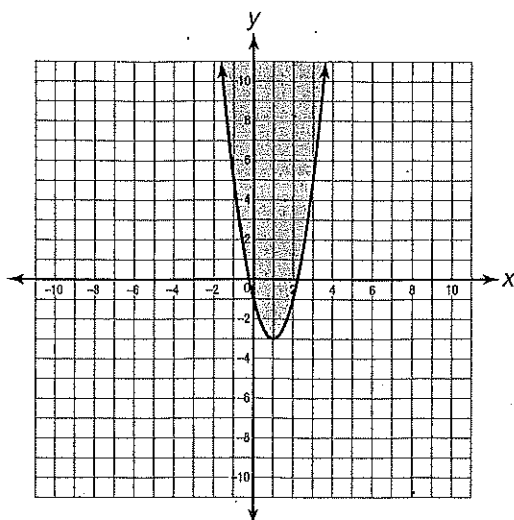
- A. The rate of change for $f(x)$ is less than the rate of change for $g(x)$.
- B. The rate of change for $g(x)$ is less than the rate of change for $f(x)$.
- C. The rates of change for $f(x)$ and $g(x)$ are equal.
- D. The rates of change cannot be compared because $f(x)$ is a linear function and $g(x)$ is an exponential function.

31. Which question below would best be answered with an approximation?

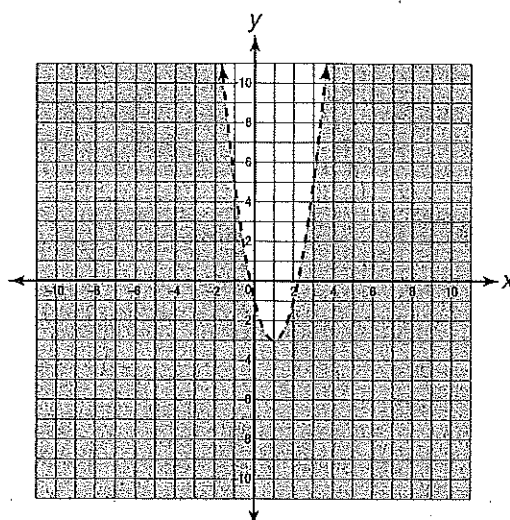
- A. How many beans are in this jar?
- B. Without using a calculator, what does $2 \cdot \sqrt{2}$ equal?
- C. How many apple slices do you have in your lunch?
- D. How many days will it rain this winter?

32. Which of the following is the graph of $y \leq 2x^2 - 4x - 1$?

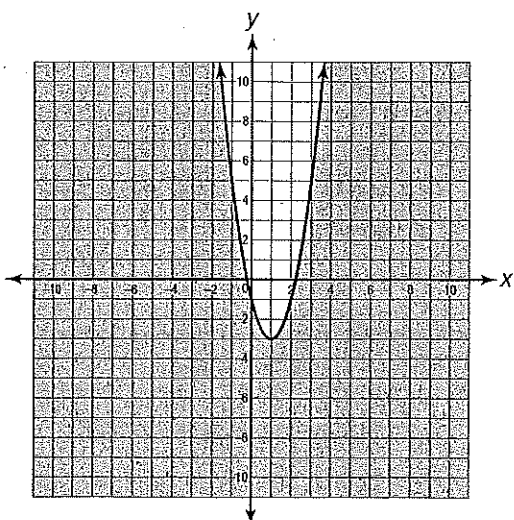
A.



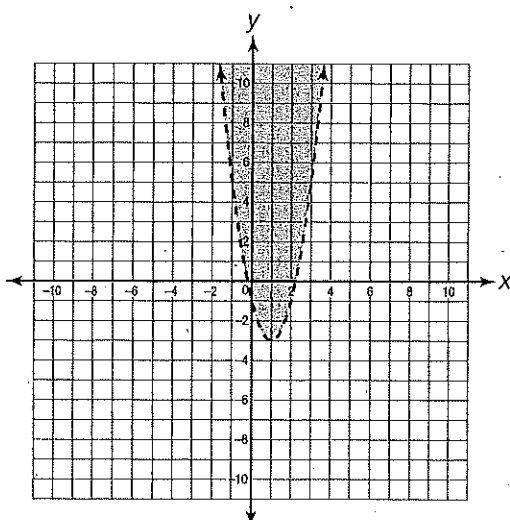
C.



B.



D.



33. The daily high air temperature was recorded in two cities for two weeks. The temperatures, in degrees Fahrenheit, are shown below.

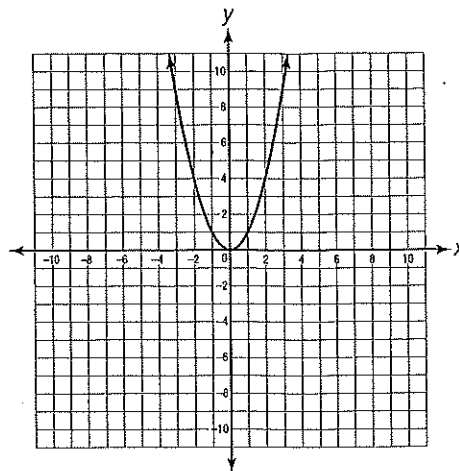
Kepler: 76, 79, 85, 88, 93, 94, 90, 84, 82, 86, 90, 94, 96, 91

Newton: 72, 73, 68, 75, 80, 85, 94, 99, 102, 90, 84, 77, 70, 65

Which city had the greater mean temperature over the two weeks?

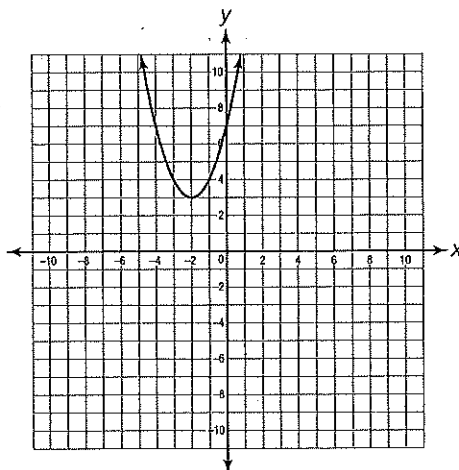
- A. Kepler
- B. Newton
- C. The mean temperatures were equal.
- D. There is not enough information to determine the means.

34. The parent function for quadratic functions, $f(x) = x^2$, is graphed below.

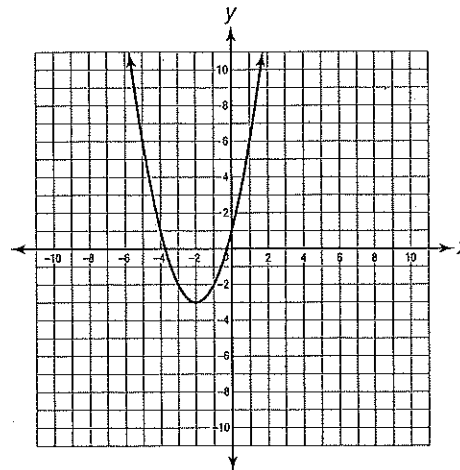


Which of the following is the graph of $g(x) = (x - 2)^2 + 3$?

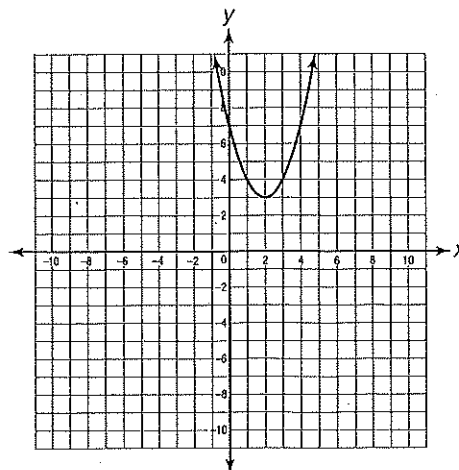
A.



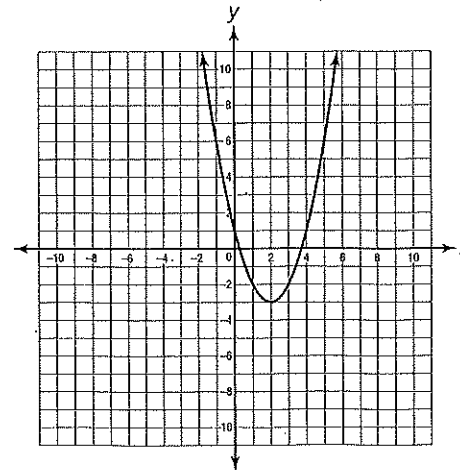
C.



B.



D.



Go On ►

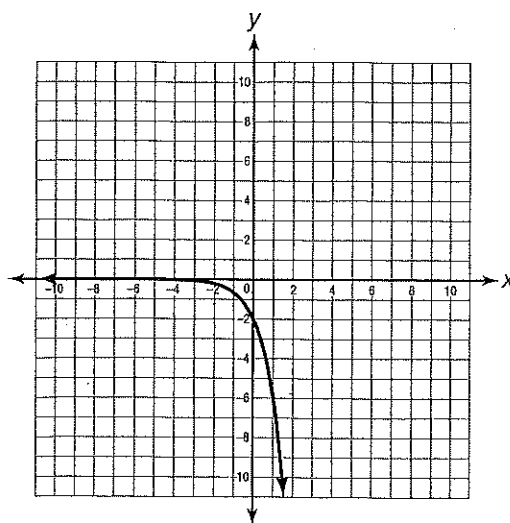
35. A volunteer organization is planning to double the number of volunteers it uses each year. The organization started with 5 volunteers this year. Which function could be used to determine the number of volunteers it expects to have each year?

A. $f(x) = 5^{2x}$
 B. $f(x) = 5 \cdot 2^x$
 C. $f(x) = 2 \cdot 5^x$
 D. $f(x) = 5x^2$

36. Which of the following shows the equation $x^2 - 8 = 4x$ after applying the method of completing the square and the equation's solution set?

A. $(x - 2)^2 = 8$; $x = 2 \pm 2\sqrt{2}$
 B. $(x - 4)^2 = 8$; $x = 4 \pm 2\sqrt{2}$
 C. $(x - 2)^2 = 12$; $x = 2 \pm 2\sqrt{3}$
 D. $(x - 4)^2 = 12$; $x = 4 \pm 2\sqrt{3}$

37. The function $f(x)$ is graphed below.



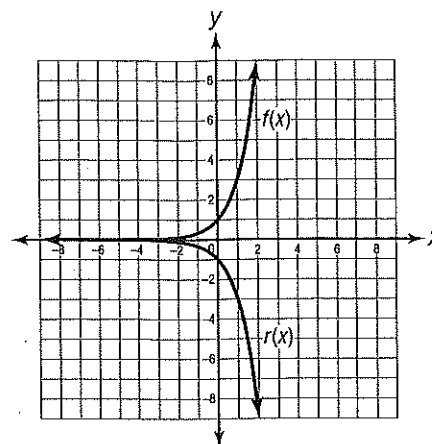
What is the end behavior of $f(x)$ as x increases?

- A. The function converges toward the value $f(x) = 0$.
 B. The function converges toward a value of $f(x)$ other than 0.
 C. The function increases toward infinity.
 D. The function decreases toward negative infinity.

38. A biologist measured the population of birds in a local forest each year over the course of ten years. He graphed his data and found that the data could be approximated by using an exponential curve of best fit. The curve had the equation $y = 54 \cdot 2.718^{0.124x}$, where y represents the bird population and x represents the number of months after the first population measurement. Which is the best interpretation of the base and the coefficient of this curve of best fit?

- A. The base suggests that there were 54 birds when the researcher initially measured, and the coefficient represents how quickly the population increases with time.
- B. The base suggests that there were 54 birds when the researcher made his last measurement, and the coefficient represents how quickly the population increases with time.
- C. The coefficient suggests that there were 54 birds when the researcher initially measured, and the base represents how quickly the population increases with time.
- D. The coefficient suggests that there were 54 birds when the researcher made his last measurement, and the base represents how quickly the population increases with time.

39. The function $f(x) = 3^x$ and its reflection over the x -axis, $r(x)$, are graphed below.

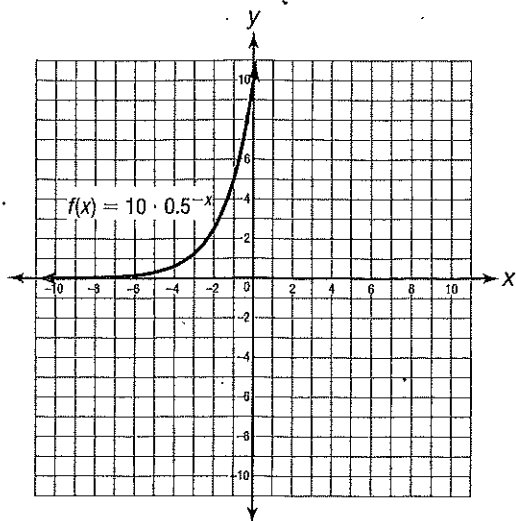


Which explicit algebraic function best describes the transformation that is shown?

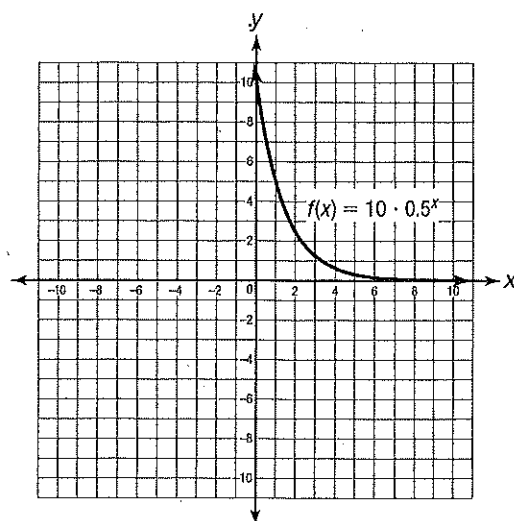
- A. $r(x) = -f(x)$
- B. $r(x) = -f(-x)$
- C. $r(x) = f(x) - 1$
- D. $r(x) = f(-x)$

40. A patient takes 10 milligrams of a medication that has a half-life. At the end of each half-life, the amount of the medication that is left in the body is half of the amount that was left at the end of the previous half-life. Let x represent the number of half-lives since the medication was taken, and let $f(x)$ represent the amount of medication in the patient's body. Which of the following graphs could model this situation?

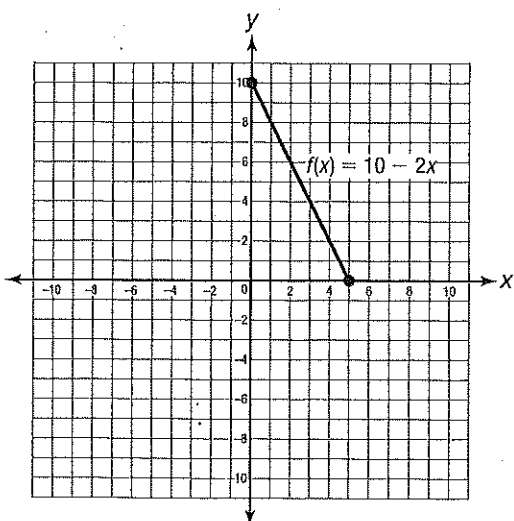
A.



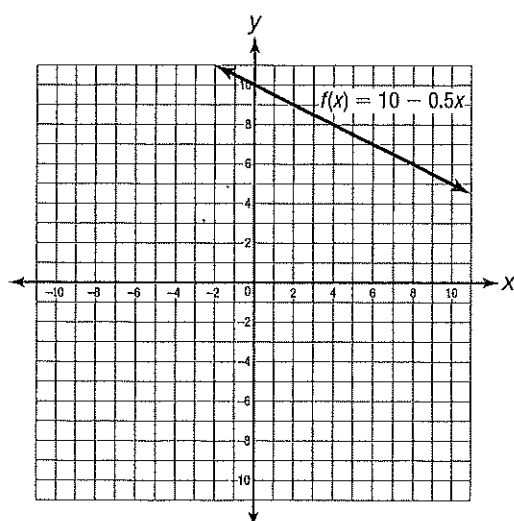
C.



B.



D.



41. Kaitlin has \$10,000 that she plans to invest either in a mutual fund or in a high-yield savings account. The value of the mutual fund after T years is given by the function $A(T) = 10,000(1.10)^T$. The value of the high-yield savings account over 3 months is given in the table below.

Time (in months)	Value in Savings (in dollars)
0	10,000.00
1	10,100.00
2	10,201.00
3	10,303.01

Which option will give her a higher annual return on her investment?

- A. The mutual fund has a higher annual return.
- B. The high-yield savings account has a higher annual return.
- C. Both investment options have the same annual return.
- D. More information is needed to compare the annual returns.

42. The average rate of change of the function $f(x) = 2^x + 1$ over the interval $1 < x < 3$ is 3. Which is the best interpretation of this value?

- A. This average rate of change is found by calculating $\frac{f(3) - f(1)}{3 - 1}$ and will not be constant across different intervals.
- B. This average rate of change is found by calculating $\frac{f(3) - f(1)}{3 - 1}$ and will remain constant across different intervals.
- C. This average rate of change is found by calculating $f(3) - f(1)$ and will not be constant across different intervals.
- D. This average rate of change is found by calculating $f(3) - f(1)$ and will remain constant across different intervals.

43. Which of the following explanations best describes the reasons that an arithmetic sequence can be written as a function?

- A. The rate of change is constant and can be represented by the first value in the arithmetic sequence.
- B. The rate of change changes as the sequence progresses and can be modeled with an exponential function.
- C. An arithmetic sequence is comparable to a linear function where the common difference is equal to the slope and the first value in the sequence is the y-intercept.
- D. An arithmetic sequence can be modeled by an exponential function because each term is determined by multiplying the prior term by a common factor.

44. An arithmetic sequence is shown below.

23, 31, 39, 47, 55, 63, ...

What is the common difference?

- A. 8
 - B. 9
 - C. 11
 - D. 16
45. Henrietta took a summer road trip. She started in Carson and drove 100 miles on the first day. On the second day, she drove a total of t hours at an average speed of 60 miles per hour. Her trip can be modeled using the equation $d = 60t + 100$. What does each term in the equation represent?
- A. d is the distance traveled on the first day, t is the total amount of time that has passed, and 100 is the distance traveled on the second day.
 - B. $60t$ is the rate of speed, t is the amount of time traveled on the first day, and 100 is the distance traveled on the first day.
 - C. d is the distance traveled on the first day, $60t$ is the distance traveled on the second day, and 100 is the rate of speed.
 - D. d is the total distance traveled on both days, $60t$ is the distance traveled on the second day, and 100 is the distance traveled on the first day.

46. At a store, a pack of six turkey burgers costs \$5. A pack of six buns costs \$3. One pack of turkey burgers and one pack of buns serve one table of people at Tessa's barbecue. If $f(x) = 5x$ represents the total cost of x packs of turkey burgers and if $g(x) = 3x$ represents the total cost of x packs of buns, which function can Tessa use to determine the total cost of serving x tables of people at her barbecue?

- A. $h(x) = f(x) \cdot g(x)$
 - B. $h(x) = \frac{f(x)}{g(x)}$
 - C. $h(x) = f(x) + g(x)$
 - D. $h(x) = f(x) - g(x)$
47. Which of the following scenarios shows both correlation and causation?
- A. As the air temperature increases, Lee's amount of homework decreases.
 - B. As the dose of a medication is increased, the price of the medication decreases.
 - C. As the population of a city increases, the amount of rainfall in that city increases.
 - D. As the amount of physical activity increases, the amount of calories burned increases.

48. The function $f(x) = 7^x$ is an exponential function. Which of the following statements is true?

- A. The function's rate of change is linear and not constant.
- B. The function grows by an equal factor of 7 over equal intervals.
- C. The function grows by an equal factor of $\frac{1}{7}$ over equal intervals.
- D. The function's rate of change is exponential and not constant.

49. At an amusement park, Joey used a total of 12 tickets to ride the Ferris wheel 3 times and a roller coaster 2 times. Xavi used a total of 20 tickets to ride the Ferris wheel 1 time and a roller coaster 6 times.

What can be inferred from this information?

- A. The Ferris wheel costs 2 tickets, and the roller coaster costs 4 tickets.
- B. The Ferris wheel costs 3 tickets, and the roller coaster costs 2 tickets.
- C. The Ferris wheel costs 2 tickets, and the roller coaster costs 3 tickets.
- D. The Ferris wheel costs 4 tickets, and the roller coaster costs 2 tickets.

50. A geometric sequence is shown in the table below, where a_n represents the n th element of the sequence.

a_n	Value
a_1	1
a_2	3
a_3	9
a_4	27
a_5	81

Which recursive formula describes the geometric sequence?

- A. $a_{n+1} = a_n^3$
- B. $a_{n+1} = a_n + 3$
- C. $a_{n+1} = \frac{1}{3}a_n$
- D. $a_{n+1} = 3a_n$



Formula Sheet

Linear Equations

Standard Form: $Ax + By = C$
 Slope-Intercept Form: $y = mx + b$
 Point-Slope Form: $y - y_1 = m(x - x_1)$

Exponential Equations

Exponential Growth: $y = a \cdot b^x + c, b > 1$
 Exponential Decay: $y = a \cdot b^x + c, 0 < b < 1$
 Compound Interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

Quadratic Equations

Standard Form: $y = ax^2 + bx + c$
 Vertex Form: $y = a(x - h)^2 + k$

Polynomial Identities

Square of a Sum: $a^2 + 2ab + b^2 = (a + b)^2$
 Square of a Difference: $a^2 - 2ab + b^2 = (a - b)^2$
 Difference of Squares: $a^2 - b^2 = (a + b)(a - b)$
 Sum of Cubes: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
 Difference of Cubes: $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

Arithmetic Sequence

Recursive Process: $a_n = a_{n-1} + d$
 Explicit Formula: $a_n = a_1 + (n - 1)d$

Geometric Sequence

Recursive Process: $a_n = a_{n-1} \cdot r$
 Explicit Formula: $a_n = a_1 \cdot r^{n-1}$

Transformations of Functions

Horizontal Translation: $g(x) = f(x + k)$
 Vertical Translation: $g(x) = f(x) + k$
 Reflection across x-axis: $g(x) = -f(x)$
 Reflection across y-axis: $g(x) = f(-x)$
 Vertical Stretch: $g(x) = kf(x), |k| > 1$
 Vertical Shrink: $g(x) = kf(x), 0 < |k| < 1$
 Horizontal Stretch: $g(x) = f(kx), 0 < |k| < 1$
 Horizontal Shrink: $g(x) = f(kx), |k| > 1$

Properties of Exponents	
Product of Powers:	$a^n \cdot a^m = a^{n+m}$
Power of a Product:	$(ab)^m = a^m b^m$
Power of a Power:	$(a^n)^m = a^{n \cdot m}$
Power of Zero:	$a^0 = 1$ for all $a \neq 0$
Quotient of Powers:	$\frac{a^m}{a^n} = a^{m-n}$ for all $a \neq 0$
Power of a Quotient:	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ for all $b \neq 0$
Negative Powers:	$a^{-n} = \frac{1}{a^n}$ and $\frac{1}{a^{-n}} = a^n$ for all $a \neq 0$
Rational Powers:	$a^{\frac{m}{n}} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$

Standard Deviation
$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$

Interquartile Range
the difference of the third quartile, Q_3 , and the first quartile, Q_1 , of a data set

Common Conversions	
12 inches = 1 foot	100 centimeters = 1 meter
3 feet = 1 yard	1000 meters = 1 km
5,280 feet = 1 mile	2.54 centimeters = 1 inch
8 ounces = 1 cup	2 pints = 1 quart
2 cups = 1 pint	4 quarts = 1 gallon
60 seconds = 1 minute	7 days = 1 week
60 minutes = 1 hour	52 weeks \approx 1 year
24 hours = 1 day	365 days \approx 1 year

