TEST NAME: **REI. 11**
TEST ID: **439368**
GRADE: **09**
SUBJECT: **Mathematics**
TEST CATEGORY: **My Classroom**

Student:

Class:

Date:

Read the passage - 'The Mathematics of Beanbag Toss' - and answer the question below:

The Mathematics of Beanbag Toss

The Mathematics of Beanbag Toss

What Is Beanbag Toss?

In the past few years, a lawn game commonly called beanbag toss has seen a growth in popularity and recognition across the United States. In beanbag toss, players throw beanbags at an inclined platform in an attempt to get the beanbags to land on the platform or go through a hole in the platform. The game is typically played by four players at a time, with two teams of two players each, and continues until one of the teams reaches a certain score.

The rules of the game are easy to learn, but tossing a beanbag so that it lands in the right spot can be challenging. The beanbag often slides off the slanted platform, so players practice tossing the beanbag into a high parabola. If the beanbag is thrown with too much velocity, it can land on the platform but then continue moving and slide off the top.

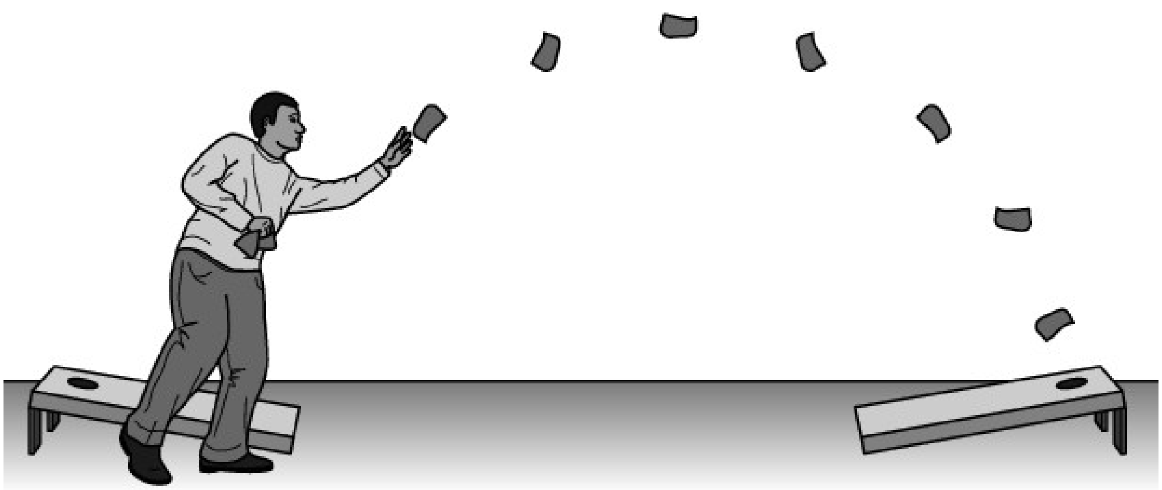


Figure 1

Beanbag Toss Setup

To play beanbag toss, two platforms and two different-colored sets of beanbags are needed. Many companies sell pre-made game sets that include all necessary materials. Instead of buying a set, a lot of people make their own platforms out of wood and paint them in their favorite colors or add logos representing their college or favorite sports team.

Beanbag toss platforms are 2 feet (ft) wide by 4 feet long and are angled so that the top is higher than the base. Each platform has a hole that is 6 inches (in.) in diameter. The center of the hole is 9 inches from the top of the platform and 12 inches from each edge. The platforms are typically 2 inches thick and have legs that fold out to make the top of the platform 12 inches tall.

There are four beanbags in each set, and two sets are needed for each game. The beanbags are filled with beans, corn kernels, or other similar materials. Each is a square that is 5 to 6 inches wide and weighs between 12 and 16 ounces.

BEANBAG TOSS PLATFORM

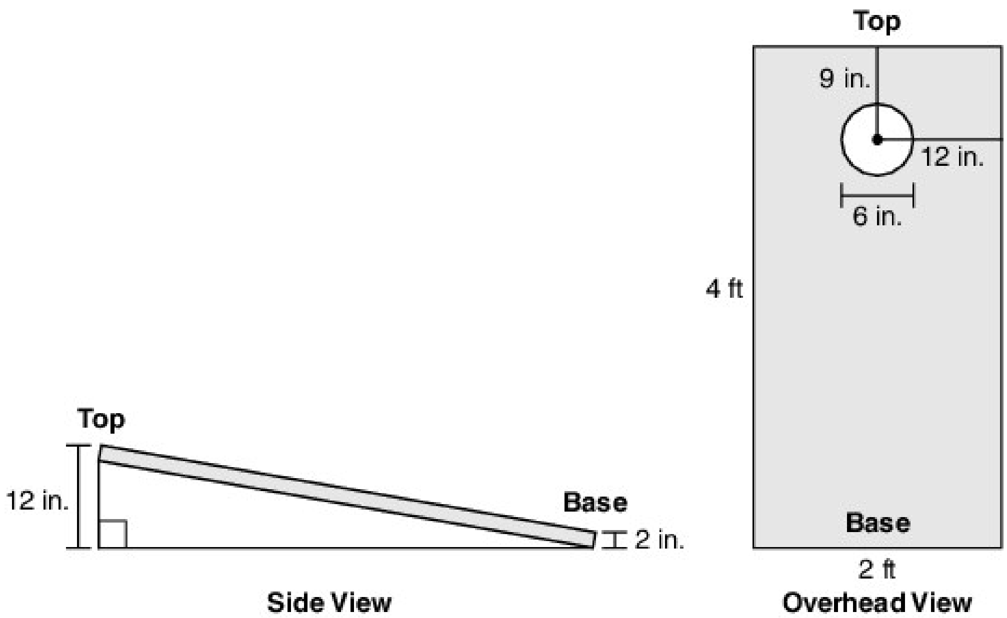


Figure 2

A typical beanbag toss court is set up so that the bases of the platforms are 27 feet apart and the holes are 33 feet apart at their closest point. The pitcher's boxes are the areas next to each platform; the players stand in their pitcher's box area when it is their turn to toss a beanbag, or pitch, onto the opposite platform. When pitching, players must stay behind the foul line formed by the base of the platform.

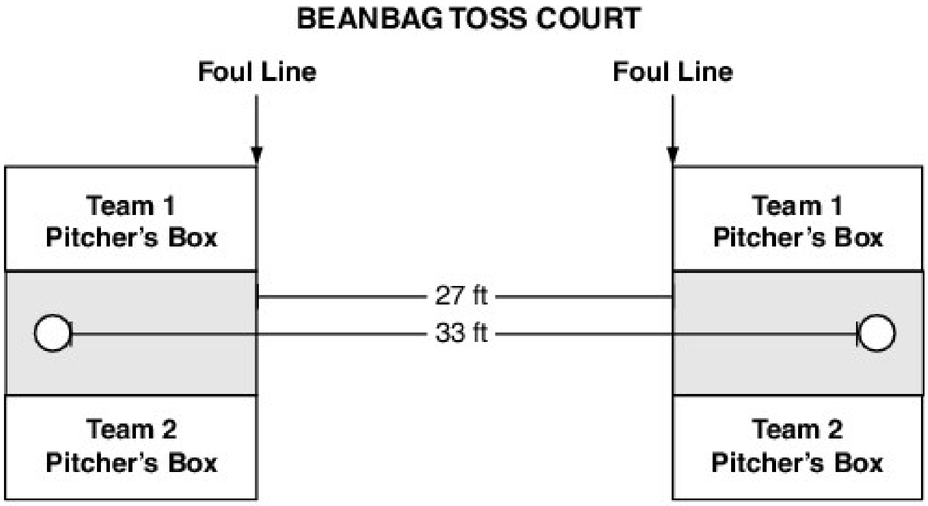


Figure 3

Rules and Scoring

Each team has two players who stand across from each other instead of next to each other. Members of opposing teams stand next to the same platform. In each round, the first player tosses a beanbag at the opposite platform; the opposing team's member then tosses a beanbag at that same platform. These two players alternate until they have each tossed all four of their beanbags. The score for the round is totaled; the next round begins when the other two players pick up the beanbags and toss them in the same alternating fashion.

Depending on where it lands, each beanbag can earn 3, 1, or 0 points. Every beanbag that goes through the hole by the end of the round is worth 3 points. These points are awarded no matter how the beanbag falls into the hole; it can be tossed directly into the hole, land on the platform and slide into the hole, or land on the platform and be pushed into the hole by another beanbag that lands on the platform. If a beanbag lands on the platform but does not fall through the hole or slide off the platform by the end of the round, it is worth 1 point. No points are awarded for any beanbag that touches the ground before reaching the platform, that never reaches the platform, or that is thrown from closer than the foul line.

To play a faster game, the point values can be added together until one team reaches 21 points. A longer and more common version of the game involves using cancellation scoring until one team reaches 21 points. In this version of the game, only one team can earn points in each round, and the team with the higher score is awarded the difference in the scores for that round. For example, if Team 1 had two beanbags on the platform and one in the hole and Team 2 had one beanbag on the platform and none in the hole, Team 1 would earn 4 points. In that same round in the faster version of the game, Team 1 would earn 5 points and Team 2 would earn 1 point.

There are many other scoring variations that can be used, such as playing to 25 points, requiring that a team wins by at least 2 points, or requiring a winning score of exactly 21 points and being penalized for going over 21 points.

Beanbag toss can be played anywhere and by people of all ages. The combination of outdoor fun, competition with friends, and versatility is what attracts people to the game. Start a game of beanbag toss with your friends or family this weekend and find out which variation of the game you prefer.

1. Read "The Mathematics of Beanbag Toss" and answer the question.

If $f(x)$ is a quadratic function that represents the vertical location of a beanbag based on its horizontal location, x, and $g(x)$ represents the equation of the line formed by the slanted platform at which the the beanbag is thrown, what does the solution to the system of equations containing $f(x)$ and $g(x)$ represent?

A. the maximum height of the beanbag in the air

B. the path of the beanbag as it slides on the board

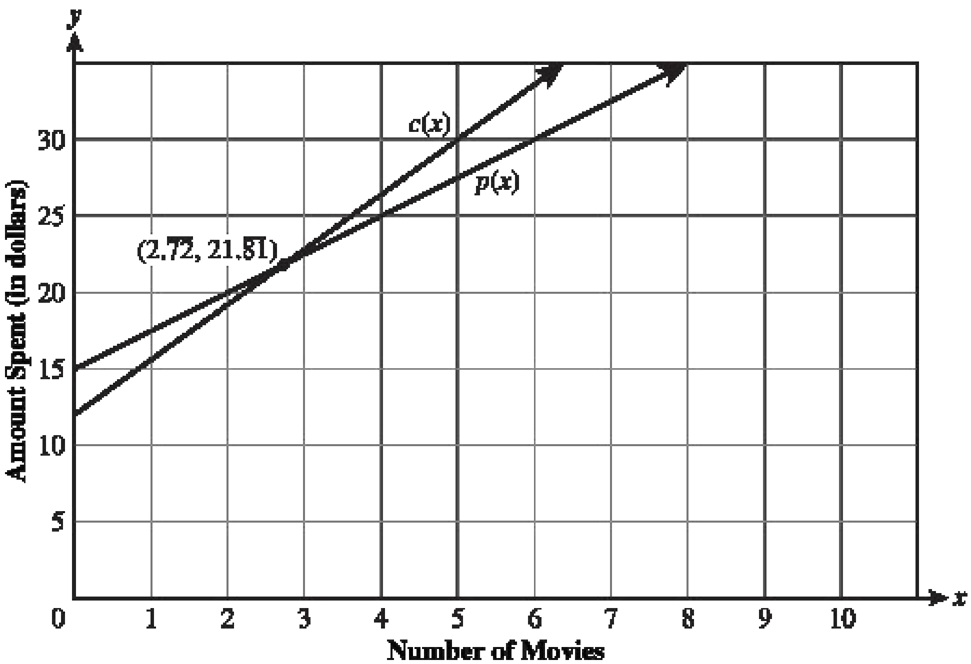
C. the location of the beanbag when it hits the ground

D. the location of the beanbag when it hits the platform

2. Paul and Cecilia spent the same amount of money renting movies online. Paul joined Site A to rent movies. Site A costs $15.00 to join and $2.50 per movie rental. Cecilia joined Site B to rent movies. Site B costs $12.00 to join and $3.60 per movie rental. Paul and Cecilia each rented fewer than 40 movies.

Consider the following question: How many movies did Paul rent?

The graph below shows the functions $p(x) = 15 + 2.5x$ and $c(x) = 12 + 3.6x$ and their point of intersection.



Part A.

Explain why the x-coordinate of the point where the graphs of the equations and $y = p(x)$ and $y = c(x)$ intersect is not the solution to the problem.

Part B.

How many movies did Paul rent?

3. Ms. Williams listed two functions, *f(x)* and *m(x)*.

$$f(x) = \frac{x-4}{2}$$

$$m(x) = -\left|\frac{3x+12}{2}\right|$$

She asked four of her students to list the solutions for the equation *f(x) = m(x)*. Their solutions are shown in the table below.

Name	Conclusion
Mariah	It has $^-8$ and $^-2$ as its two solutions.
Riley	It has $^-6$ and $^-3$ as its two solutions.
Crystal	It has $^-14$ and $^-5$ as its two solutions.
Eva	It has $^-10$ and $^-9$ as its two solutions.

Which student's solution was correct?

A. Mariah

B. Riley

C. Crystal

D. Eva

4. The functions $f(x)$ and $g(x)$ are defined below.

$$f(x) = \frac{3}{4}(2)^x$$
$$g(x) = 18x - 60$$

What is the difference in the x values for the two points where $f(x) = g(x)$?

A. 48

B. 36

C. 4

D. 2

5. The table below provides the values of the functions $f(x)$ and $g(x)$ for several values of x.

x	$f(x)$	$g(x)$
−3	−1	12
−2	0	3
−1	1	1
0	5	0
1	9	−1
2	2	−3
3	0	−12

Which of the following is a solution to the equation $f(x) = g(x)$?

A. $x = -1$

B. $x = 0$

C. $x = 1$

D. $x = 2$

6. Two functions are listed below.

$$f(x) = 2^{(x-4)}$$
$$g(x) = 2x + 3$$

What is the smaller x-value such that $f(x)$ is ***approximately*** equal to $g(x)$?

A. $^{-}3.45$

B. $^{-}1.49$

C. 8.29

D. 19.58

7. When does the value of $f(x) = \left(\frac{1}{2}\right)^x$ equal the value of $g(x) = 2x + 8$?

A. $x = {}^{-}2$

B. $x = {}^{-}1$

C. $x = 2$

D. $x = 4$

8. Given:

$$f(x) = 3^x$$
$$g(x) = {}^{-}2x + 13$$

For which x-value does $f(x) = g(x)$?

A. $\frac{5}{13}$

B. 0

C. 2

D. 9

9. If $f(x) = {}^{-}2x + 5$ and $g(x) = 3^x$, what is the x-coordinate of the point where $f(x) = g(x)$?

A. 9

B. 5

C. 3

D. 1

10. A company is selling two new products. Weekly sales of product one can be modeled by the function $f(x) = 100(1.108)^x$ after x weeks. Weekly sales of product two can be modeled by the function $g(x) = 10x + 200$ after x weeks. After ***approximately*** how many weeks will the weekly sales of the two products be the same?

A. 9 weeks

B. 11 weeks

C. 15 weeks

D. 19 weeks

11. If $y = 6x + 8$ and $y = {}^{-}4x - 2$, what is the value of $x + y$ when the two equations are equal?

A. $^{-}2$

B. $^{-}1$

C. 1

D. 2

12. Carl bought a car for $5,000. The value of the car is decreasing by 9% each year. Janet bought a car for $3,000. The value of her car is decreasing by 3% per year. How long does it take for the value of the cars to be ***approximately*** the same?

A. 8 years

B. 9 years

C. 11 years

D. 13 years

13. Two functions are shown below.

$$f(x) = {}^{-}18x - 14$$
$$g(x) = 4^x - 1$$

What is the ***approximate*** value of x when $f(x)$ equals $g(x)$?

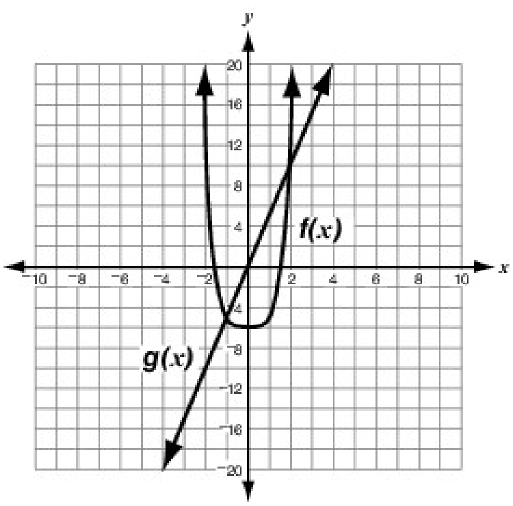
A. ⁻1.40

B. ⁻0.75

C. ⁻0.65

D. ⁻0.10

14. The figure below shows the graph of the functions $f(x)$ and $g(x)$. For which value(s) of x does $f(x) = g(x)$?



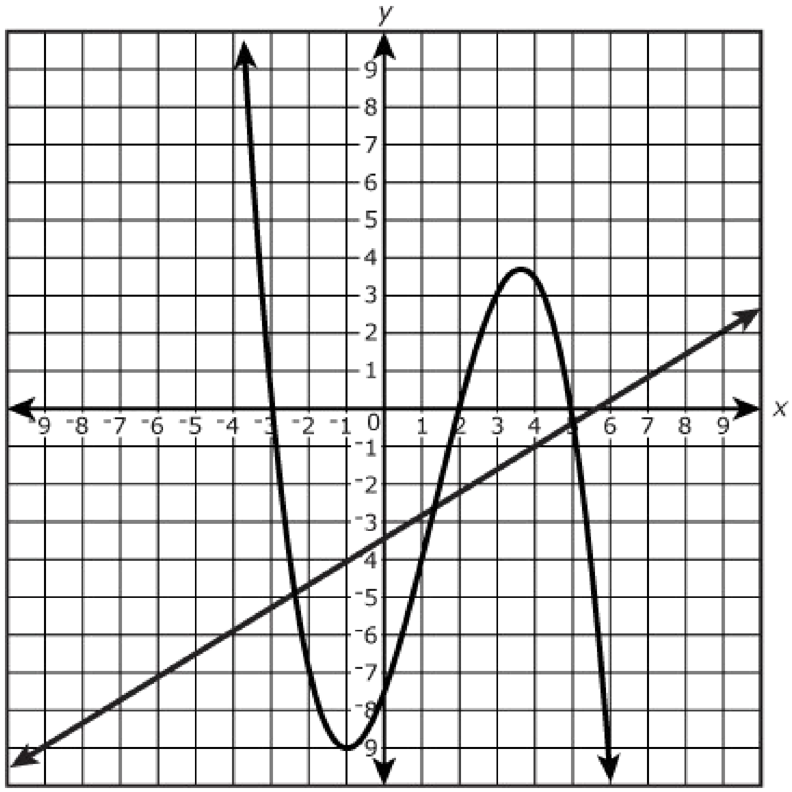
A. 2

B. 10

C. −1 and 2

D. −5 and 10

15. On the coordinate plane, $f(x)$ and $g(x)$ are graphed.



Between which 2 consecutive integers is there a solution to $f(x) = g(x)$?

A. -4 and -3

B. -2 and -1

C. 0 and 1

D. 1 and 2

16. Two types of bacteria are in a sample. There were originally 7 bacteria of the first type of bacteria and 815 of the second type of bacteria. The first type of bacteria doubles in size every day. The second type of bacteria increases by 25 every day. After how many days will the amounts of the two types of bacteria be ***about*** the same?

A. 4 days

B. 5 days

C. 6 days

D. 7 days

17. **Who Will Catch Up When?**

Three friends are packing gift boxes to be handed out at the high school dance. Each box has ten sections to be filled. They each pack the boxes at different rates.

Part A. The tables below show Kelsey's and Andrew's progress. The variable t stands for the time that has passed since their starting time at 10:00 a.m. $(t = 0)$. Andrew had already packed 4 boxes the day before.

Fill in the tables, assuming that each person packs the boxes at a constant rate.

KELSEY

Time t (in hours)	0	0.25	0.5	0.75	1.0	1.25	1.5
Number of boxes	0	3					

ANDREW

Time t (in hours)	0	0.25	0.5	0.75	1.0	1.25	1.5
Number of boxes	4	6.5					

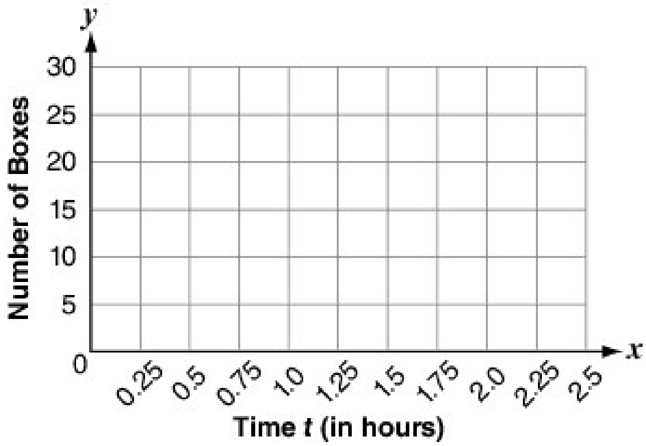
Part B. Let the number of boxes Kelsey packs be represented by $k(t)$ and the number Andrew packs by $a(t)$. Using the information from the tables, write the functions for $k(t)$ and $a(t)$. Interpret each function in terms of the context it represents.

Kelsey:

Andrew:

In terms of $k(t)$ and $a(t)$, what equation can be solved to find the time at which both Kelsey and Andrew have packed the same number of boxes? Explain.

Part C. Graph and label the functions $k(t)$ and $a(t)$ on the same coordinate grid below.



What is the solution of the equation that was written in part B that could be used to find the time at which Kelsey and Andrew have packed the same number of boxes? Explain how you can find the solution on the graph and then verify your answer by solving the equation algebraically.

Part D. The third friend, James, starts out packing the boxes very quickly but then slows down. His approximate progress can be modeled by the square root equation below, where *t* stands for the time that has passed since their starting time at 10:00 a.m.

$$j(t) = 10\sqrt{2t}$$

Fill in the table to show James's progress. Round the values to the nearest 0.1 box.

JAMES

Time *t* (in hours)	0	0.25	0.5	0.75	1.0	1.25	1.5
Number of boxes	0						

Part E. Sketch a graph of the function *j*(*t*) on the coordinate grid above, where *k*(*t*) and *a*(*t*) are already graphed.

- Write the equation that could be used to find the time at which Kelsey and James have packed the same number of boxes. Approximate the solution or solutions to this equation using the graph.
- Write the equation that could be used to find the time at which Andrew and James have packed the same number of boxes. Approximate the solution or solutions to this equation using the graph.

18. A system of equations is shown below.

$$y = 7x - 5$$
$$y = 3^x$$

Which is a y-value of a solution to the system?

A. 2

B. 3

C. 9

D. 16

19. A system of equations is shown below.

$$y = 9x + 5$$
$$y = 2x^2$$

Which is an x-value of a solution to the system?

A. -5

B. $-\frac{1}{2}$

C. $\frac{3}{2}$

D. 10

20. Which of these is **true** about the solution of the equation $f(x) = g(x)$ if $f(x) = 2|x|$ and $g(x) = 2x$?

A. The solution of the equation $f(x) = g(x)$ is $x = 0$ because both functions intersect the *x*-axis at $x = 0$.

B. The solution of the equation $f(x) = g(x)$ is $y = 0$ because both functions intersect the *y*-axis at $y = 0$.

C. The solution of the equation $f(x) = g(x)$ is $x \geq 0$ because both functions intersect for $x \geq 0$.

D. The solution of the equation $f(x) = g(x)$ is $y \geq 0$ because both functions intersect for $y \geq 0$.

21. Given the functions $f(x) = 3x + 6$ and $g(x) = (x + 3)^2 - 1$:

- Complete the table shown below.

x	$f(x)$	$g(x)$
−3		
−2		
−1		
0		
1		

- Identify the solutions of the equation $f(x) = g(x)$.
- The *y*-intercept of the function *f*(*x*) is decreased by 8 units to form a new function, *h*(*x*). Use a calculator to graph *h*(*x*) and *g*(*x*), and identify the solutions of the equation $h(x) = g(x)$. Explain your answer.

Write your answer(s) on the paper provided.

22. Two functions are shown below.

$$f(x) = 2(3)^x$$
$$g(x) = 4x + 2$$

What is the difference in the *y*-values of the two unique points where $f(x) = g(x)$?

A. 0

B. 2

C. 4

D. 6

23. A system of equations is shown below.

$$7x + 3y = 10$$
$$y - 3 = 5(3)^x$$

What is the ***approximate*** value of $x + y$when the two equations are equal?

A. 2.79

B. 3.98

C. 4.37

D. 5.91

24. What is the maximum number of intersections an exponential function can have with a linear function?

A. 0

B. 1

C. 2

D. 3

25. Let $f(x)=\frac{x+2}{x^2+5x+6}$ and $g(x)=\frac{1}{6}x^2+\frac{1}{3}$ over the interval $[-3,2]$. How many solutions for the equation $f(x)=g(x)$ exist over that interval?

A. 1

B. 2

C. 3

D. 4

26. Two functions are shown below.

$$f(x) = 2x - 7$$

$$g(x) = \left(\frac{1}{2}\right)^x$$

What is the ***approximate*** value of x when $f(x) = g(x)$?

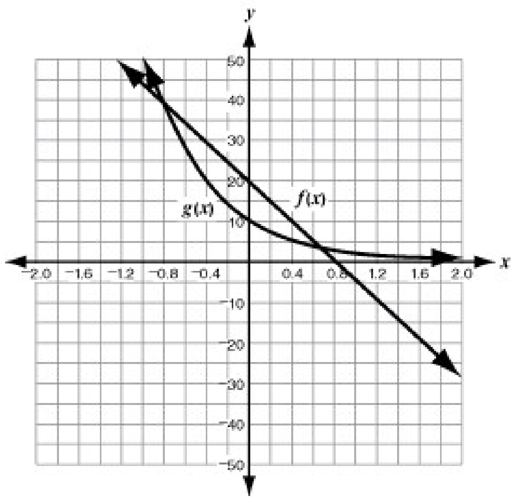
A. 2.98

B. 3.54

C. 4.12

D. 5.38

27. The functions $f(x)$ and $g(x)$ are shown on the graph below.



Which approximate values best represent the solutions of the equation $f(x) = g(x)$?

A. −0.8 and 0.7

B. 0.8 and 20

C. 3 and 39

D. 10 and 20

28. The function $f(x) = 0.85x + 3.99$ models the total cost of purchasing x key chains from an Internet company that charges shipping. The function $g(x) = 1.10x$ models the total cost of purchasing x number of the same key chains from an Internet company that does not charge shipping. What is the ***best approximation*** of the number of key chains for which the two companies charge the same amount?

A. 14

B. 15

C. 16

D. 17

29. The table below shows values for two functions, $f(x)$ and $g(x)$.

x	$f(x)$	$g(x)$
$^{-}3$	$^{-}5$	16
$^{-}2$	$^{-}2$	8
$^{-}1$	1	4
0	4	2
1	7	1
2	10	0.5
3	13	0.25

For what value of x does $f(x)$ ***approximately*** equal $g(x)$?

A. 2.7

B. 0.6

C. $^{-}0.2$

D. $^{-}0.4$

30. The table below shows the values of $f(x)$ and $g(x)$ for different values of x.

x	$f(x)$	$g(x)$
−2	$\frac{12}{5}$	0
−1	$\frac{5}{2}$	1
0	$\frac{8}{3}$	2
1	3	3
2	4	4

What is/are the solution(s) of the equation $f(x) = g(x)$?

31. Which ordered pair represents a solution to $f(x) = g(x)$?

$$f(x) = x^2 - 19$$
$$g(x) = {}^{-}2x + 5$$

A. $(^{-}6, 7)$

B. $(^{-}4, 3)$

C. $(4, {}^{-}3)$

D. $(6, {}^{-}7)$

32. The graphs of the functions described below have at least one point of intersection.

$$f(x) = \frac{5(x+2)}{x-6}$$

$$g(x) = 20 \cdot \log(x-5)$$

To the nearest 0.01, what is the *x*-coordinate of the leftmost intersection?

A. 5.02

B. 6.00

C. 10.25

D. 14.41

33. If $f(x) = 2(3)^x$ and $g(x) = 6x + 6$, for what positive value of x does $f(x) = g(x)$?

A. 0

B. 1

C. 2

D. 3

34. Samantha is ordering bracelets for the Spirit Club to distribute to students at a pep rally. She has received price quotes from two companies. Company A charges $0.40 per bracelet, with a minimum charge of $40. Company B charges $0.25 per bracelet plus an initial set-up fee of $45.

Part I: Complete a table of values for each company. Determine the number of bracelets for which the cost is the same for both companies.

Comparison Pricing		
Number of Bracelets	Company A's Price Quote	Company B's Price Quote

Number of Bracelets: _____________

Part II: Explain why your answer from Part I is the only order for which the two companies quote the same price.

35. Two functions are shown below.

$$f(x) = 3x + 6$$

$$g(x) = 3(^{-}2)^x$$

For which value of *x* does *f*(*x*) = *g*(*x*)?

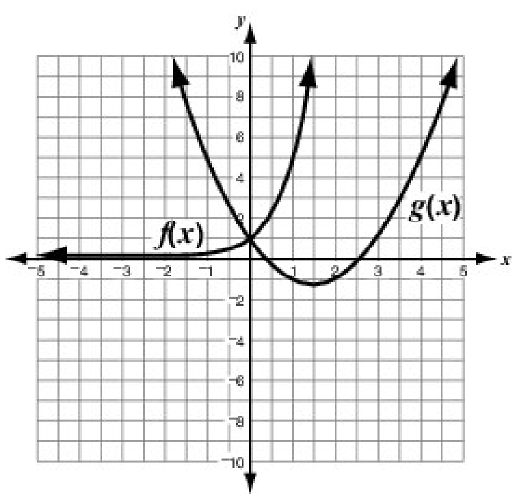
A. $^{-}2$

B. 0

C. $\frac{1}{2}$

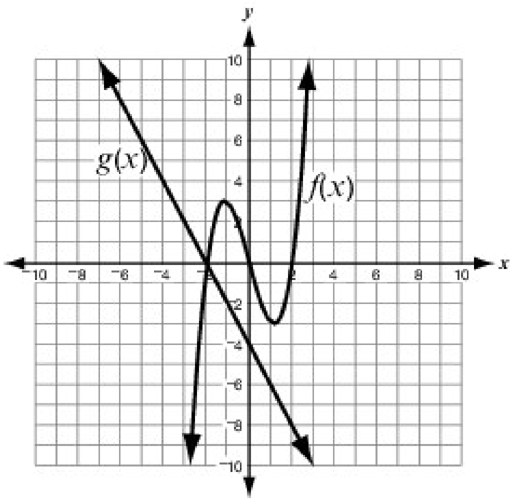
D. 2

36. Functions $f(x)$ and $g(x)$ are shown on the graph below.



What is/are the solution(s) of the equation $f(x) = g(x)$?

37. The graphs of functions $f(x) = x^3 - 4x$ and $g(x) = -2x - 4$ are shown below.



Which statement is **true** about the real solutions of the equation $f(x) = g(x)$?

A. It has only one real solution, -2.

B. It has two real solutions, -4 and 0.

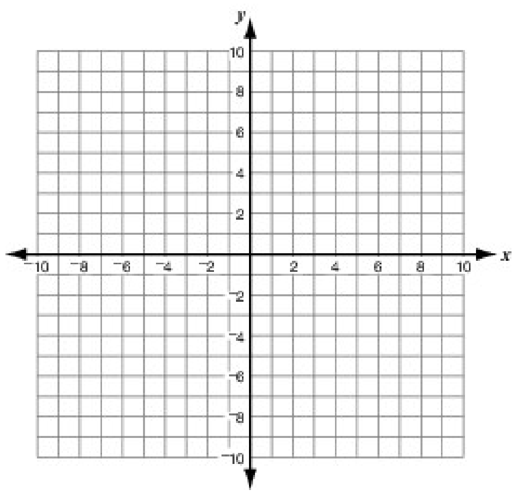
C. It has two real solutions, -2 and 0.

D. It has three real solutions, -2, 0 and 2.

38. Consider the functions shown below.

$f(x) = |x+4|$ and $g(x) = |x|$

Part A. Graph the functions $f(x)$ and $g(x)$ on the grid below.



Part B. What is the solution of the equation $f(x) = g(x)$? Explain.

Use words, numbers, and/or pictures to show your work.

39. Two functions are shown below.

$$f(x) = 2^x + 2$$
$$g(x) = {}^{-}2x + 6$$

For what value of x does $f(x) = g(x)$?

A. 1

B. 2

C. 4

D. 6

40. Given:

$$f(x) = {}^{-}x + 6$$
$$g(x) = 2^x - 4$$

What is the ***approximate*** value of x when $f(x) = g(x)$?

A. 2.8

B. 3.2

C. 4

D. 6

41. If $f(x) = 5(2)^x$ and $g(x) = {}^{-}2x + 46$, for what positive value of x does $f(x) = g(x)$?

A. 3

B. 5

C. 40

D. 46

42. Two functions are defined as $f(x) = \frac{-2}{x-4} + 2$ and $g(x) = x + 2$. To the nearest tenth, what are the approximate solutions of the equation $f(x) = g(x)$?

43. Two functions are shown below.

$$f(x) = 2^x$$
$$g(x) = x + 16$$

Between what two positive values of x does $f(x) = g(x)$?

A. 3 and 4

B. 4 and 5

C. 19 and 20

D. 20 and 21

44. Since January 2010, a grape farmer has been growing red and green grapes. The number of red grape vines can be modeled by the function $f(x) = 1{,}000(1.03)^x$, where x is the number of years since January 2010. The number of green grape vines can be modeled by the function $g(x) = 20x + 1{,}125$, where x is the number of years since January 2010. In what year will the number of each type of grape vine be ***approximately*** equal?

A. 2013

B. 2015

C. 2017

D. 2019

45. Two functions are shown below.

$$f(x) = {}^{-}3(x - 4)$$

$$g(x) = 5(4)^x$$

For ***approximately*** what value of x does $f(x) = g(x)$?

A. 0.29

B. 0.53

C. 5.22

D. 10.41

46. The tables below contain ordered pairs that satisfy functions $f(x)$ and $g(x)$. According to the tables, where do the functions intersect?

A.

x	$f(x)$	$g(x)$
-2	$-\frac{8}{9}$	9
-1	$-\frac{2}{3}$	6
0	0	5
1	2	6
2	8	9

The functions intersect at $(0, 0)$.

B.

x	$f(x)$	$g(x)$
-2	18	2
-1	11	-1
0	6	0
1	3	-1
2	2	2

The functions intersect at $(-1, -1)$, $(0, 0)$, and $(2, 2)$.

C.

x	$f(x)$	$g(x)$
-2	-3	$-\frac{3}{4}$
-1	-1	$-\frac{1}{2}$
0	1	0
1	3	1
2	5	3

The functions intersect at $(-1, -1)$, $(0, 0)$, and $(1, 1)$.

D.

x	$f(x)$	$g(x)$
-2	4	-10
-1	2	-2
0	0	0
1	2	2
2	4	10

The functions intersect at $(0, 0)$ and $(1, 2)$.

47. Which statement is true about the equation $f(x) = g(x)$ given $f(x) = 2x + 3$ and $g(x) = x^2$?

A. It has two solutions at -1 and 3.

B. It has two solutions at -1.5 and 0.

C. It has four solutions at -1, 1, 3, and 9.

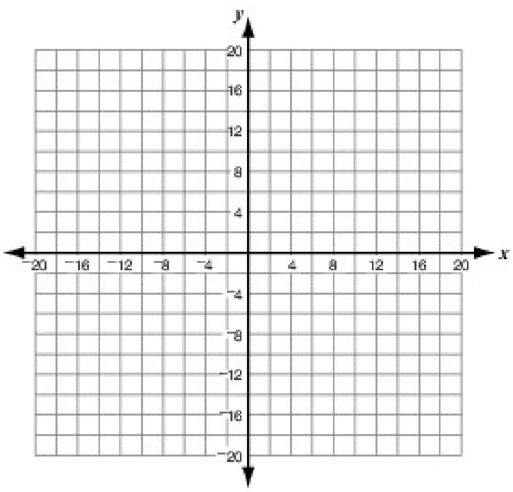
D. It has four solutions at -1.5, -1, 0, and 3.

48. Use the functions $f(x) = |x + 5| + 2$ and $g(x) = 2x - 3$ to answer the questions below.

Part A. Complete the table given below.

x	$f(x)$	$g(x)$
–5		
0		
5		
10		

Part B. Graph the functions *f*(*x*) and *g*(*x*) on the grid below.



Part C. How do the table of values and graph of the solution describe the solution of the equation $f(x) = g(x)$?

Part D. Algebraically, find the solution of the equation $f(x) = g(x)$.

Use words, numbers, and/or pictures to show your work.

49. Two functions are shown in the table below.

x	$f(x)$	$g(x)$
5	14	0
10	19	$^-5$
15	24	$^-10$
20	29	$^-15$

For what value of x does $f(x) = g(x)$?

A. $^-19$

B. $^-2$

C. 7

D. 28

50. Two functions are shown below.

$$y = {}^-2x + 3$$
$$y = 4x - 9$$

What is the value of $x + y$ when the two functions are equal?

A. $^-3$

B. $^-1$

C. 1

D. 3

51. Two functions are shown below.

$$f(x) = \frac{1}{5}x + 3$$

$$g(x) = 2^x$$

What is the ***approximate*** value of *x*when the two functions are equivalent?

A. 1.67

B. 1.74

C. 3.35

D. 3.42

52. **Bikes and Banks**

Functions are useful for solving all kinds of problems because you can give them one piece of information and they will give you back another. There are different ways to show the information, including equations, tables, and graphs, and each way has its advantages, depending on what you want to know.

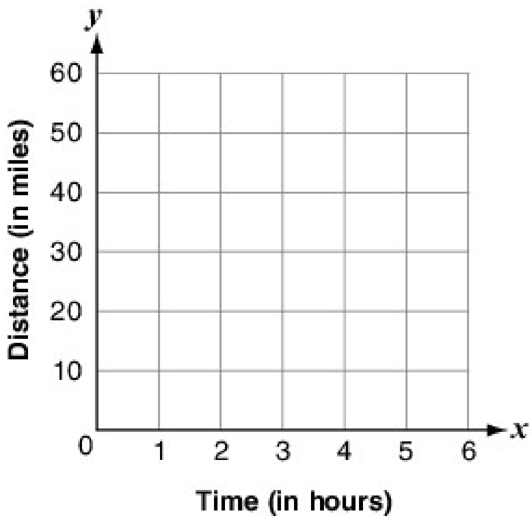
Part A. Suppose Jesse starts riding his bike at time $t = 0$ and travels at a pace of 12 miles per hour. Crystal starts riding 1 hour later from the same place in the same direction but at a speed of 16 miles per hour. She is riding faster, but she has 1 hour fewer on the road than Jesse does. Make a table of values to show each person's distance from the starting point for the first 3 hours.

Time (in hours)	Jesse's Distance	Crystal's Distance
0	0	
1		
2		
3		

Part B. Write a function, $f(t)$, that tells how many miles Jesse will be from the starting place at time t. Write a function, $g(t)$, that tells how many miles Crystal will be from the starting place at time t. Make sure that the values given by your functions match the values in the table.

Part C. Explain how you could use your functions in part B to figure out at what time t Crystal will catch up with Jesse. Solve to find the answer.

Part D. Now, plot both your functions on the graph, or use a graphing program or graphing calculator. Where do the two lines intersect? Explain the significance of the point of intersection.



Part E. The functions in parts A–D are linear; the variables change at a steady rate, and the graphs of the functions form straight lines. Now, compare a linear function with an exponential function. In exponential functions, the variables grow (or shrink) faster and faster.

Compare two savings accounts, each with a beginning deposit (principal) of $100. The first one earns 8% simple interest, which means that it adds 8% of $100 every year. How much interest is added to the principal each year? Write a function, $f(t)$, to give the value of the account after t years.

Part F. The second account earns compound interest, which means that it earns a percentage of the principal and the interest. Every time interest is added, there is a greater amount to take a percentage of, so the interest grows faster and faster.

The interest on the second account is 6%, compounded every year.The first year it earns 6% of $100, for a total of 100(1.06), or $106, in the account. The second year it earns 6% of $106. The pattern continues this way:

1st year:

$100 + 6\% \text{ of } 100$

$(1)100 + 0.06(100) = 100(1 + 0.06) = 100(1.06)$

2nd year:

$100(1.06) + 6\% \text{ of } 100(1.06)$

$1(100)(1.06) + 0.06(100)(1.06) = 100(1.06)(1 + 0.06) = 100(1.06)(1.06)$

3rd year:

$100(1.06)(1.06) + 6\% \text{ of } 100(1.06)(1.06)$

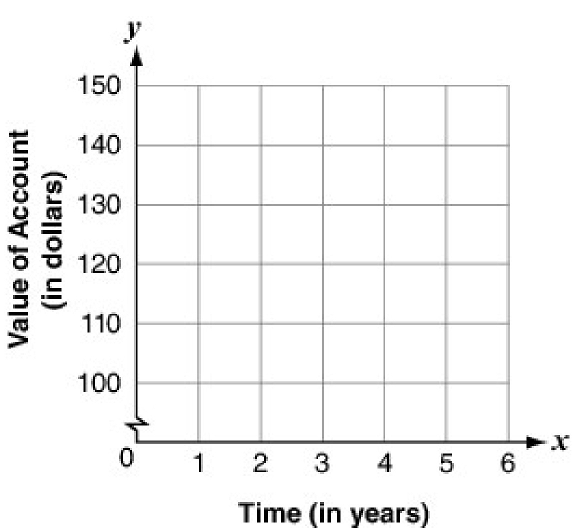
$(1)100(1.06)(1.06) + 0.06(100)(1.06)(1.06) = 100(1.06)(1.06)(1.06)$

Using a calculator, fill in the chart to show how much interest is earned by each account. The first column for each account shows how much interest is earned that year. The second column shows the total value of the account (principal plus interest) at the end of that many years.

Time (in years)	Yearly Interest in Account 1 (in dollars)	Total Value of Account 1 (in dollars) $f(t)$
1	8.00	
2	8.00	116.00
3		
4		
5		140.00
6		

Time (in years)	Yearly Interest in Account 2 (in dollars)	Total Value of Account 2 (in dollars) $g(t)$
1	6.00	106.00
2	6.36	112.36
3		
4	7.15	
5		
6		141.85

Part G. Draw the line for $f(t)$ (the total value of Account 1) on the graph. Then, plot the points from $g(t)$ (the total value of Account 2). (Notice that the y-axis starts at 100.)



Part H. Notice the pattern and the numbers you entered in the calculator to get the amount in the compound interest account. What function gives you the total value of Account 2 after t years? Check your function to see that it gives the same values as in your table. (You may have small rounding errors.) Using the function is **much** easier than figuring out the amounts by hand.

Part I. Now, use technology (a graphing calculator or graphing program) to graph $f(t)$ and $g(t)$. Let your x-axis go from 0 to 27 years. Make some observations about the graphs and the values they represent.

Part J. At approximately what point do $f(t)$ and $g(t)$ intersect? What does this point represent? To check your answer, put that value for t into both of your functions to see whether the functions are equal.

53. Two functions are shown below.

$$f(x) = 2x - 6$$
$$g(x) = {}^{-}x + 9$$

What is the value of x when $f(x) = g(x)$?

A. 3

B. 4

C. 5

D. 9

54. Two functions are shown below.

$$f(x) = 0.5(2)^x$$
$$g(x) = 5x - 12$$

Which is a point of intersection where $f(x) = g(x)$?

A. (8, 4)

B. (6, 44)

C. (4, 8)

D. (3, 3)

55. Two functions, $f(x)$ and $g(x)$, intersect each other at the points $(0, 2)$ and $(4, 32)$. What values are solutions of the equation $f(x) = g(x)$?

A. 0 and 2

B. 0 and 4

C. 2 and 32

D. 4 and 32

56. Two functions are shown below.

$$f(x) = 4(2)^x$$
$$g(x) = {}^-3x - 1$$

What is the value of x when $f(x) = g(x)$?

A. $^-1$

B. $^-\frac{3}{8}$

C. $^-\frac{1}{11}$

D. 2

57. The population of one type of algae can be modeled by the equation $P = 3(1.75)^t$, where t is time in days. A second type of algae has a population modeled by the equation $P = 500 + 100t$, where t is time in days. After ***approximately*** how many days are the populations equal?

A. 4

B. 5

C. 10

D. 11

58. Two functions are shown below.

$$f(x) = 5 - x$$
$$g(x) = 2x + 2$$

Which statement justifies that $f(x) = g(x)$ when $x = 1$?

A. $f(1) - g(1) = 4$

B. $f(1) - g(1) = 0$

C. $f(1) + g(1) = 4$

D. $f(1) + g(1) = 0$

59. Kim receives $200 from a contest. She invests half of the winnings at a 9% annual interest rate. She leaves the other half in a money jar at home and adds a $1 to the jar each month. After ***approximately*** how many years will Kim's investment and her money jar savings be worth the same amount of money?

A. 12 years

B. 9 years

C. 7 years

D. 4 years

60. Two functions are shown below.

$$f(x) = {}^{-}3x + 2$$

$$g(x) = 4(2)^x$$

For ***approximately*** what value of x does $f(x) = g(x)$?

A. $^{-}0.37$

B. $^{-}0.15$

C. 0.29

D. 0.51

61. Two functions are shown below.

$$f(x) = 500(1.05)^x$$
$$g(x) = 1,200(0.98)^x$$

At ***approximately*** what value of x does $f(x) = g(x)$?

A. 0.0

B. 12.7

C. 56.3

D. 928.6