Student Name:

Benchmark Assessments

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Algebra I

Final Comprehensive—Part 1

(Selected Response)

Pearl Public School District
Mississippi

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PART 1—SELECTED RESPONSE

The items in this test are based on the Mississippi College- and Career-Ready Standards for Mathematics.

DIRECTIONS FOR PART 1:

- **Calculators <u>may</u> be used during this test.**
- **Read each problem carefully.**
- **Choose the best answer from the choices given.**
- **Fractions in some answer choices may have been simplified. Check each answer choice to see if this has been done.**
- **Diagrams used in the test may not be drawn to scale.**
- **Stop when you see the words "STOP. END OF PART 1."**

1. Seth is in charge of buying bagels and apples for a school function. He has $45 to spend. Bagels cost $1.50 each, and apples cost $0.80 each. Seth decides to buy 15 apples and spend the rest of the money on bagels.

How many bagels can Seth buy if he spends all $45?

A 30 bagels

B 28 bagels

C 22 bagels

D 20 bagels

Use the information given to answer questions 2-3.

For a holiday celebration, Andre's neighborhood is planning a fireworks display. Andre is trying to estimate the length of time the fireworks display will take.

Part A

2. What is a valid estimate?

A 20 hours

B 20 minutes

C 20 nanoseconds

D 20 seconds

Part B

3. A firework is launched into the air before exploding. Which measurement is *best* used to estimate the height of the firework, in whole numbers, when it explodes?

A mm

B cm

C m

D km

4. Callie rides the train from home to work every morning. The table shows the times it takes the train to travel various distances.

Time (minutes)	Distance (miles)
10	16
15	24
20	32
25	40
30	48

What is the average rate at which the train travels between the 10-minute mark and the 30-minute mark, in miles per minute?

A 0.6 mile per minute

B 1.6 miles per minute

C 2.4 miles per minute

D 6.4 miles per minute

5. Consider the expression.

$$2x^2 + 4x - 3(x - x^2) + (x + 2)(x - 2)$$

Which is a simplification of this expression?

A $x - 4$

B $5x + 4$

C $6x^2 + x - 4$

D $6x^2 + 5x + 4$

6. Lyla lives about a half-hour walk from her friend Jeremy's house. If Lyla rides her bike to Jeremy's house, *about* how long should it take to arrive?

A 0.5 minute

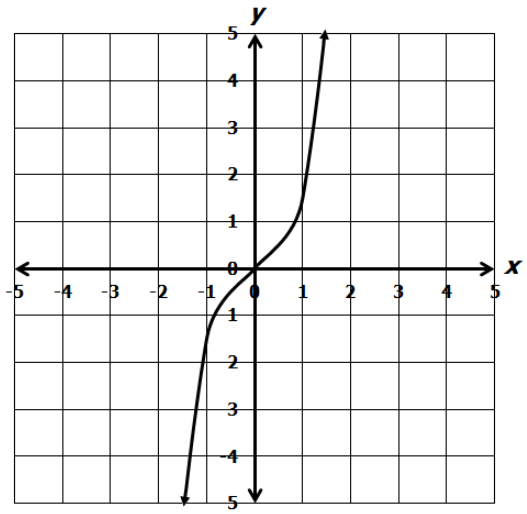
B 10 minutes

C 0.5 hour

D 1 hour

7. Which graph is an example of an odd function?

A



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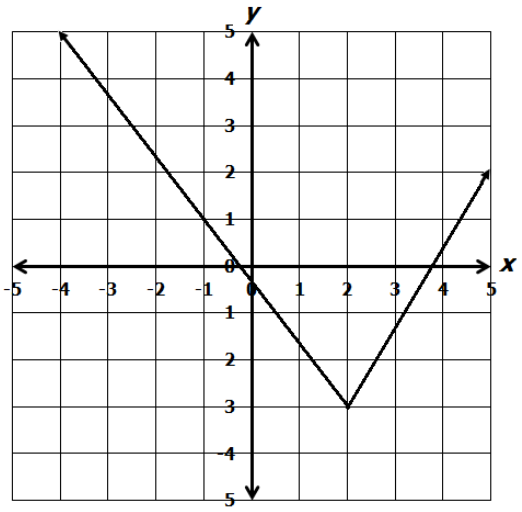

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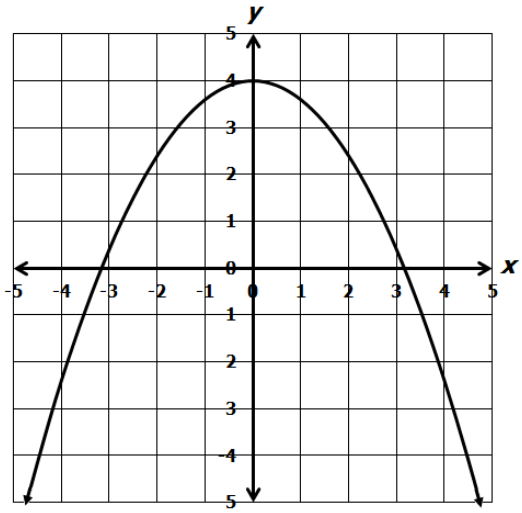

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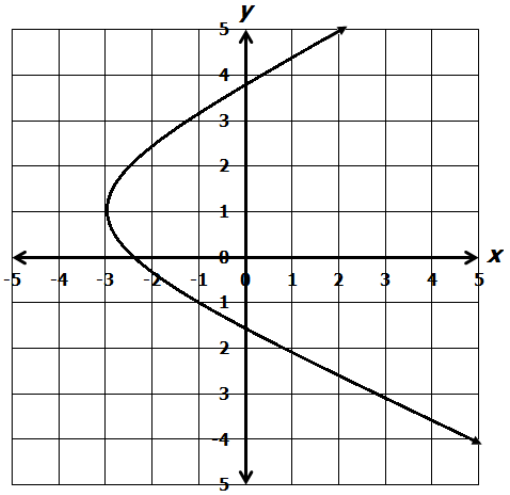


8. Tiberius wants to make T-shirts for his class and asks each student what color she or he prefers. The results are shown in the table.

	Red	Blue	Yellow	Green
Girls	1	5	3	8
Boys	4	6	2	7

What percent of students, to the *nearest* whole percent, prefer yellow T-shirts?

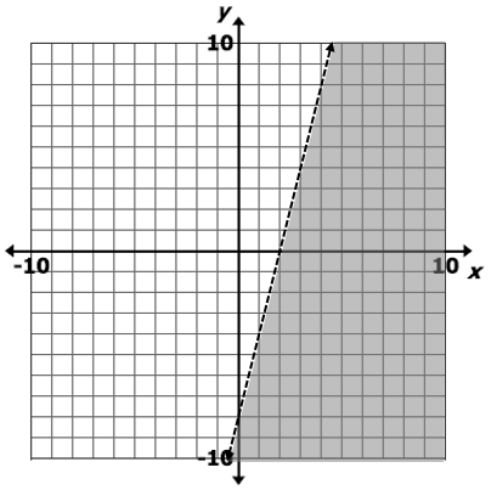
A 14%

B 18%

C 26%

D 32%

9. Consider the graph of the inequality.



Which inequality *best* represents the graph?

A $4x + y > 8$

B $4x + y < 8$

C $4x - y > 8$

D $4x - y < 8$

10. What are the key features of the function $y = -\frac{1}{2}x - 3$?

A $m = -3$; y-intercept $(0, -\frac{1}{2})$; x-intercept $(-\frac{3}{2}, 0)$

B $m = -3$; y-intercept $(0, -\frac{1}{2})$; x-intercept $(-6, 0)$

C $m = -\frac{1}{2}$; y-intercept $(0, -3)$; x-intercept $(-\frac{3}{2}, 0)$

D $m = -\frac{1}{2}$; y-intercept $(0, -3)$; x-intercept $(-6, 0)$

11. The dimensions of a rectangle are given.

Length: $2x^2 + 3x - 1$

Width: $x - 2$

What is the area of the rectangle?

A $2x^3 - x^2 - 7x + 2$

B $2x^3 + 7x^2 + 5x - 2$

C $2x^2 + 4x + 1$

D $4x^2 + 8x + 2$

12. Which situations can be modeled using an exponential function? Select *ALL* that apply.

A A tree grows 15 centimeters per year.

B A bacteria population decreases by 100 bacteria every hour.

C The money in a bank account grows by 1% per year.

D The population of an ant colony triples every 4 months.

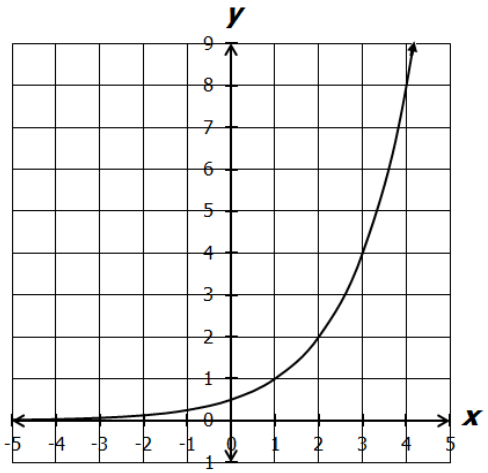
E The rate a taxi driver charges is a fixed fee plus $0.30 per mile.

13. Consider the equation of the exponential function.

$$y = 0.5(2)^x$$

Which graph represents the solutions of the equation?

A



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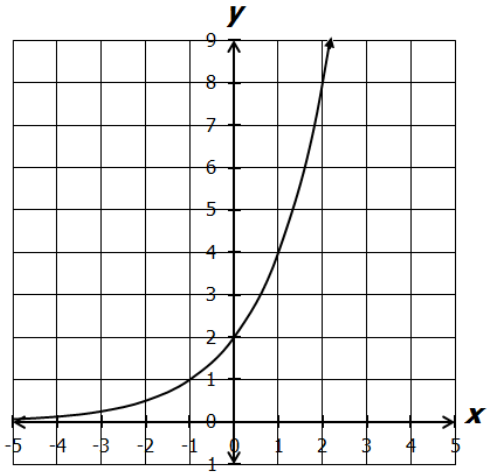

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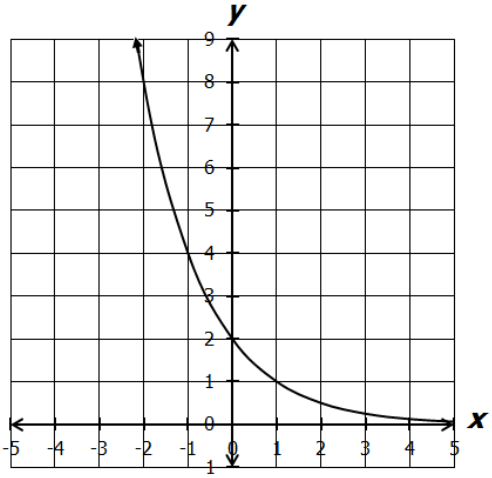

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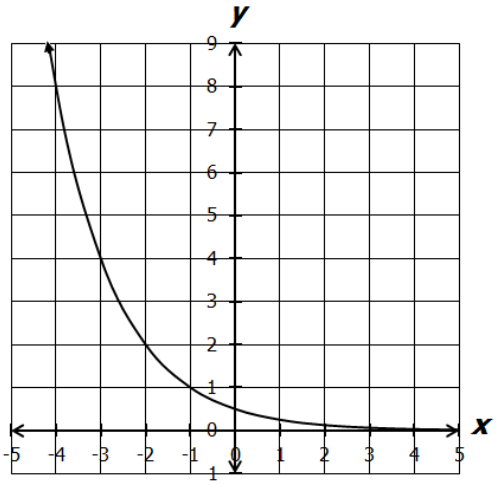
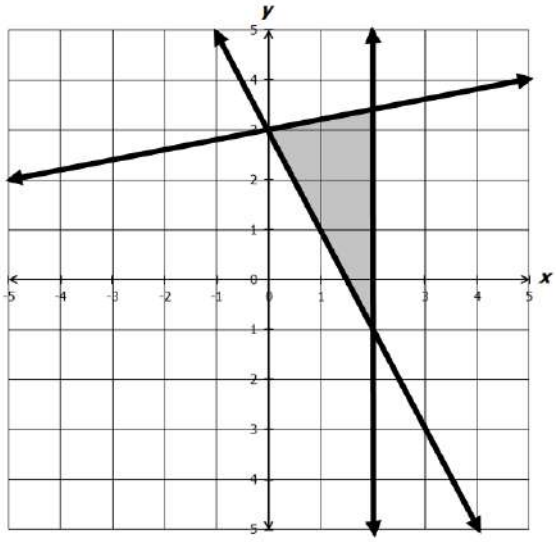


14. A system of linear inequalities is graphed on the coordinate grid.



Which is the graphed system?

A $y \leq -3x + 3;\ y \leq 3x + 5;\ x \leq 2$

B $y \leq 3x + 3;\ y \leq -\frac{1}{5}x + 3;\ x \geq 2$

C $y \geq -2x + 3;\ y \leq \frac{1}{5}x + 3;\ x \leq 2$

D $y \geq 2x - 3;\ y \leq 3x + 5;\ x \geq 2$

15. Alyssa *correctly* solves the inequality shown in the box, where d and g are positive real number constants, and $g < d$.

$$dx - 3 > gx$$

Which inequality represents Alyssa's solution?

A $x < \frac{3d}{g}$

B $x < \frac{d-3}{g}$

C $x > \frac{3}{dg}$

D $x > \frac{3}{d-g}$

16. Several values of a quadratic function are given in the table.

x	-5	-2	-1	2	6	8	9
y	-7	8	9	0	-40	-72	-91

Between which two input values is there a maximum?

A -5 and -2

B -2 and 2

C 2 and 8

D 8 and 9

17. The number of butterflies in a butterfly sanctuary is modeled by the function, where x represents the number of months.

$$f(x) = 4(1.5)^{x-1}$$

What is the value of $f(3)$, the number of butterflies in the population after 3 months?

A 9

B 18

C 36

D 216

18. A population can be modeled by the function shown in the box, where t is time, in years.

$$P(t) = 1{,}200(1 - 0.05)^t$$

What is the meaning of 0.05 in this context?

A It is the rate of decrease of the population each year.

B It is the rate of increase of the population each year.

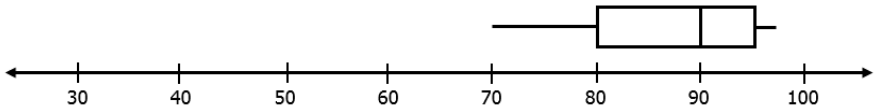
C It is the fraction of time needed for the population to decrease by 1.

D It is the fraction of time needed for the population to increase by 1.

19. Four different English classes take the same test on a novel. Which box plot represents the class with the *highest* median test score?

A

B



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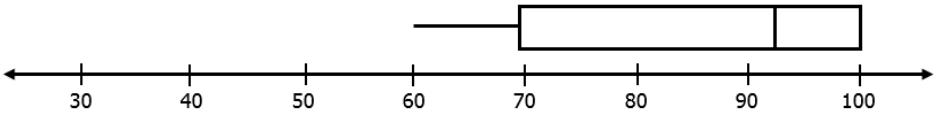

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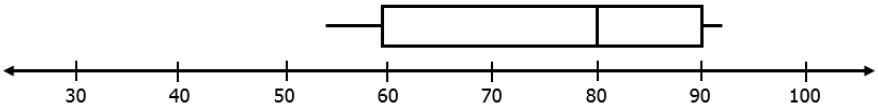


20. The Vasquez family had its first baby a few months ago and is ordering photos to give to extended family members. Standard sizes of photos are 5 in. by 7 in., which cost $0.90 each, and 8 in. by 10 in., which cost $1.90 each. The family wants to spend less than $30 on pictures and needs to order *at least* 14 prints.

If x represents the number of 5 in. by 7 in. photos and y represents the number of 8 in. by 10 in. photos, which inequalities give the possible numbers of each size that the Vasquez family can order and stay within budget? Select *ALL* that apply.

A $x + y \geq 14$

B $x + y \leq 14$

C $0.9x + 1.9y > 30$

D $0.9x + 1.9y < 30$

E $0.9x + 1.9y \geq 14(30)$

F $0.9x + 1.9y \leq 14(30)$

21. Santos needs to find the length of a rectangle with a perimeter of 72 ft. Which equation represents the perimeter solved for the length?

A $l = 72 - w$

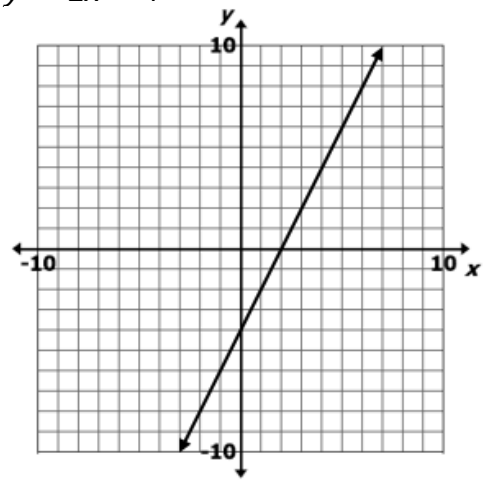
B $l = 72 + w$

C $l = \frac{72 - w}{2}$

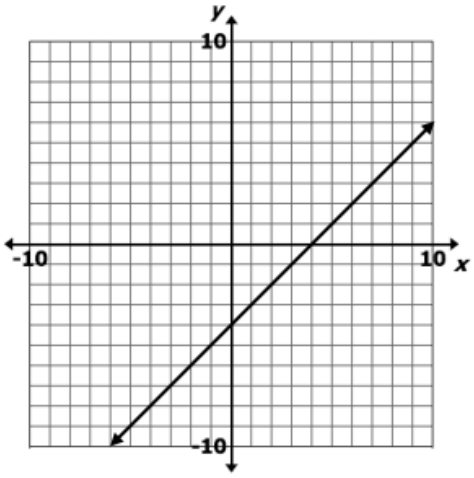
D $l = \frac{72 - 2w}{2}$

22. Raven is four years younger than her brother, Eddie (x). Which equation and graph represent the total (y) of Raven's and Eddie's ages?

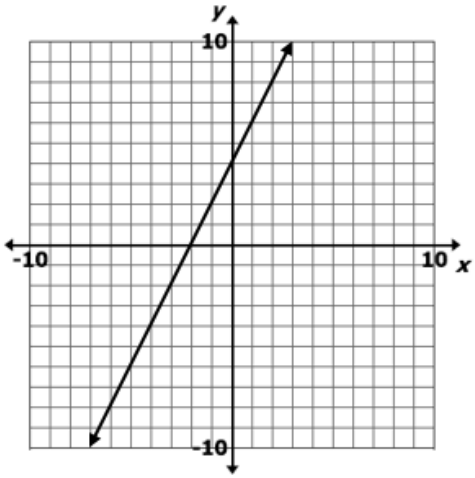
A $y = 2x - 4$



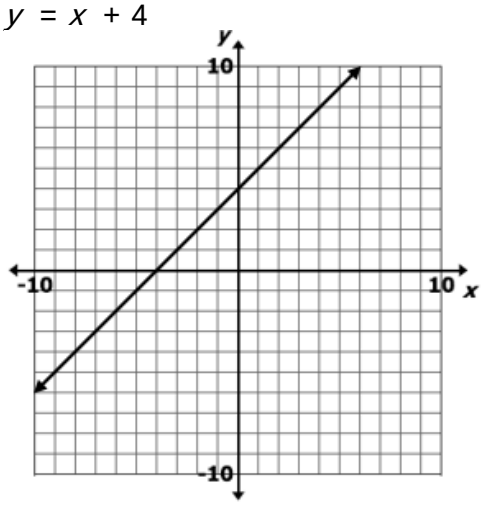
C $y = x - 4$



B $y = 2x + 4$



D $y = x + 4$



23. The equation $y = -2x^2 + 6x + 36$ represents the height of a projectile over time. After how many seconds will the projectile hit the ground?

A 3 seconds

B 6 seconds

C 12 seconds

D 18 seconds

24. Consider the polynomial function.

$$f(x) = 4x^2 + 4x - 24$$

Which x-values are the zeros of this function? Select *ALL* that apply.

A -24	**B** -4	**C** -3	**D** -2	**E** 2	**F** 3

25. Julianne pays $3.50 for 4 cookies and 2 milk cartons at Deli Corner. Jamal buys 3 cookies and 1 milk carton from the same deli for $2.25. Layla has $3 and wants 3 cookies and 3 milk cartons.

How much more money does Layla need?

A $0.25

B $0.50

C $0.75

D $1.25

26. If an eco-friendly tour company sells more than 5 tickets for a particular outing, the cost per ticket decreases by a certain fixed percent. A group of x friends decide to take the tour, where $x > 5$. The total cost for the x friends is modeled by the expression.

$$x(1 - 0.2)18$$

What is the meaning of the number 18 in the expression?

A It is the total number of tickets purchased.

B It is the price of a ticket if fewer than 5 tickets are purchased.

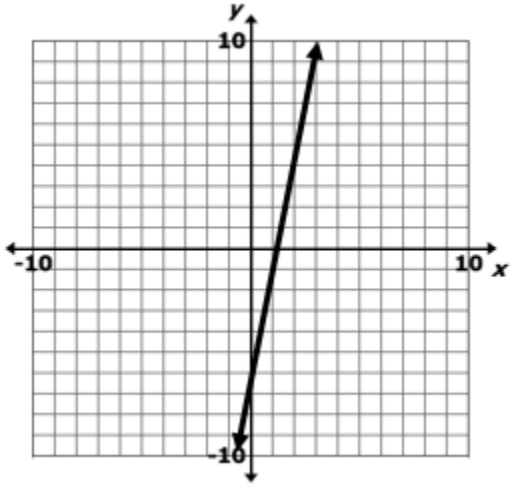
C It is the percent discount for more than 5 tickets purchased.

D It is the discounted price of a ticket.

27. Denzel works for a toy company. The amount of profit per toy sold (x), in dollars, is given by the function $f(x) = 5x - 6$.

If the company decreases the initial cost of making x toys by \$2, which graph *best* displays the function for the new profit from selling x toys, $f(x) + 2$?

A



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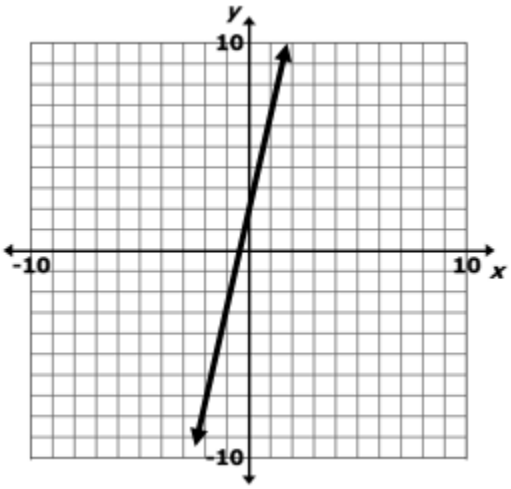

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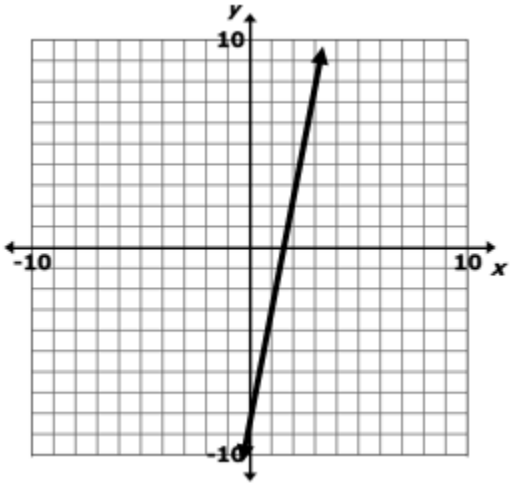

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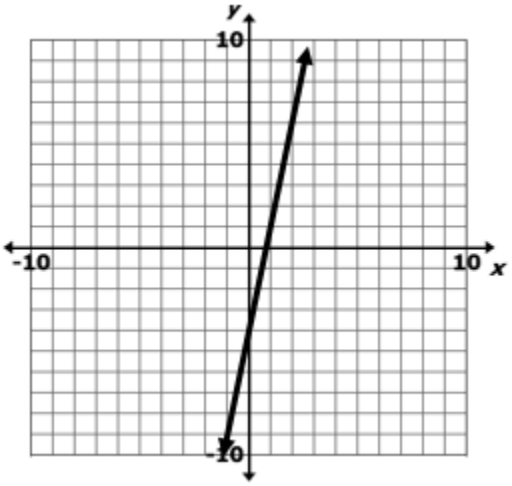


28. A pineapple plant produces offshoots that can be used to cultivate more plants. Each pineapple plant produces an average of 5 offshoots. Each of these offshoots grows to be another plant with an average of 5 offshoots.

Which expression models the average number of pineapple plant offshoots a farmer can cultivate, where n is the number of generations of offshoots from one plant?

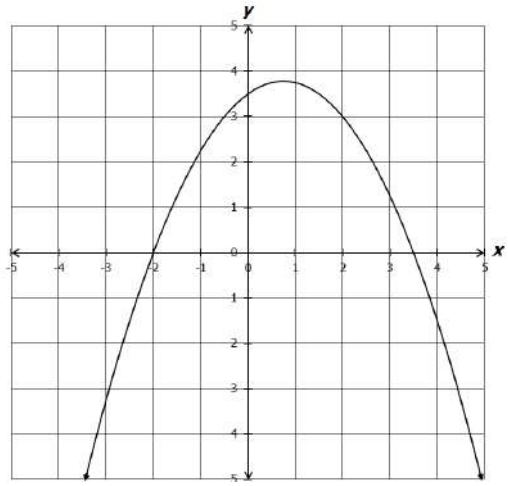
A 5^n

B n^5

C $5 \times n$

D $5 \div n$

29. Consider the quadratic function.



Which function has a y-intercept greater than the quadratic function shown in the graph?

A $f(x) = x^2 + 4$

B $f(x) = 2x^2 + x - 1$

C $f(x) = 4x^2 + 5x$

D $f(x) = 5x^2 + 3x + 3$

30. Two polynomials are given, where m, n, p, and q are real numbers.

Polynomial 1: $mx - nx^2 + p$

Polynomial 2: $px^2 - m$

Polynomial 2 is subtracted from Polynomial 1. Which expression represents the result?

A $-(n + p)x^2 - mx + (p - m)$

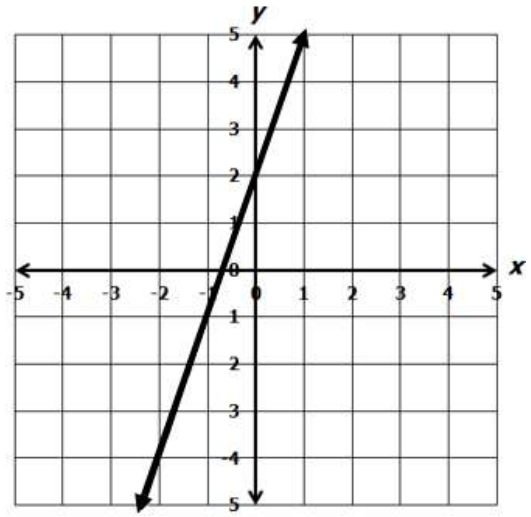
B $-(n + p)x^2 + mx + (p + m)$

C $(n + p)x^2 - mx - (p + m)$

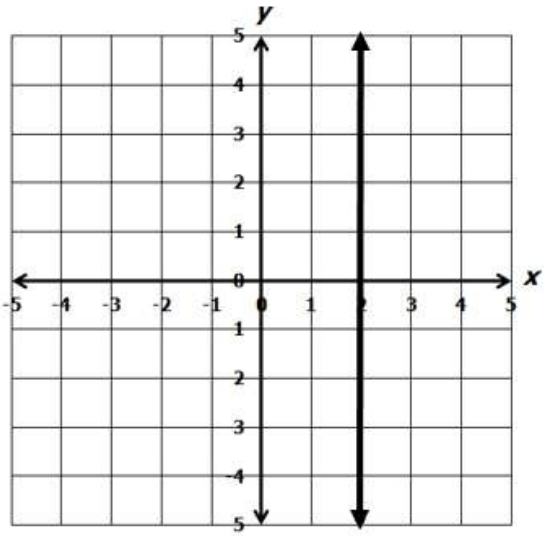
D $(n + p)x^2 + mx + (p - m)$

31. A polynomial of degree one has *exactly* one zero, which is 2. Which *could* be the graph of this polynomial?

A



C



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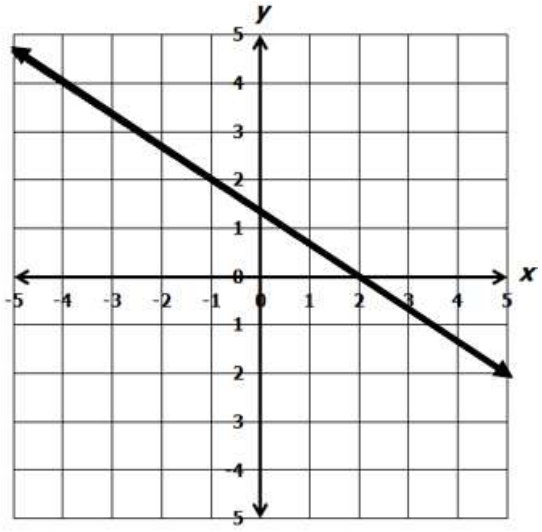

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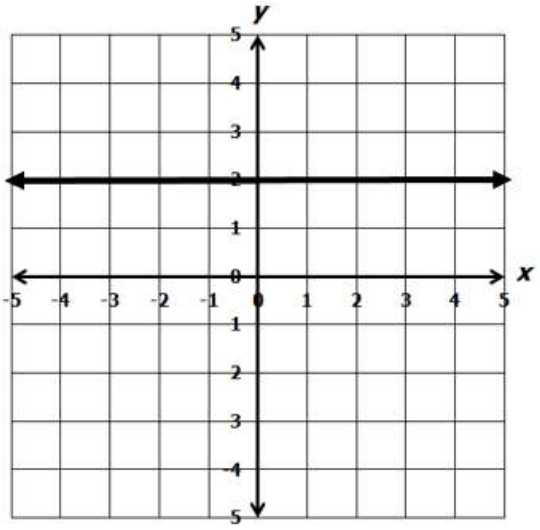


32. A bacteria population, P, grows by 36 % every hour for h hours. The initial population is 150.

Which equation represents this bacteria population after h hours?

A $P = 150(0.36)^h$

B $P = 150(1.36)^h$

C $P = 150 + (0.36)^h$

D $P = 150 + (1.36)^h$

33. Consider the sequence shown.

5, 15, 45, 135, 405, ...

Which equation represents the sequence if n is the number of the term in the sequence, and what is the 10th value in the sequence?

A $a_n = 5(3)^n$; 32,805

B $a_n = 5(3)^{n-1}$; 32,805

C $a_n = 5(3)^n$; 98,415

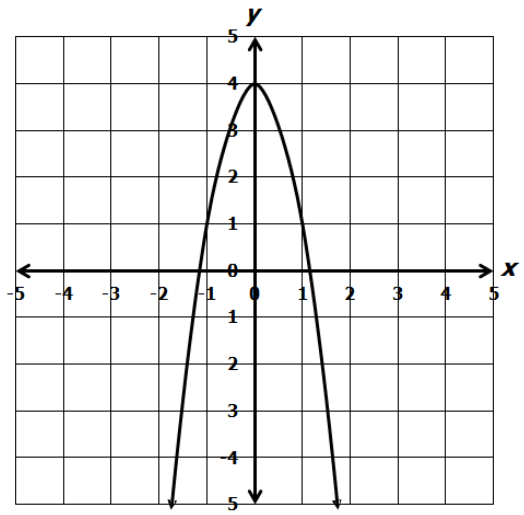
D $a_n = 5(3)^{n-1}$; 98,415

34. A quadratic equation is shown.

$$3x^2 + 2y = 4$$

Which graph represents the solutions to this equation?

A



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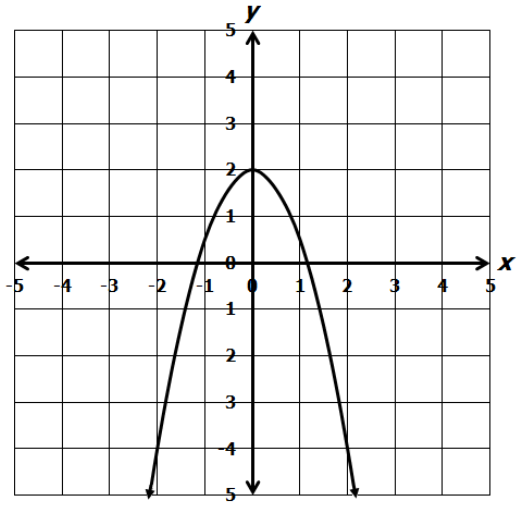

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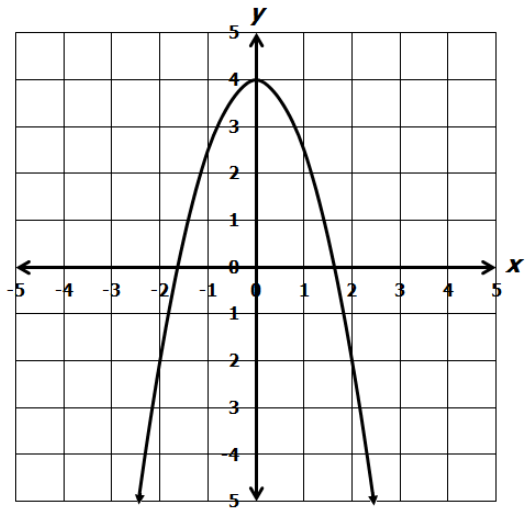

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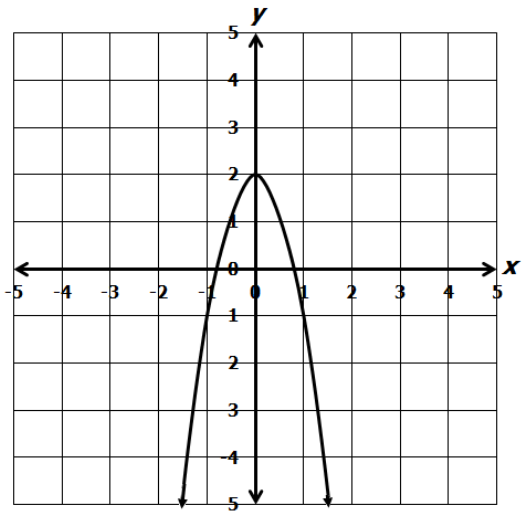


35. Two equations are shown.

$$y = 4x^2 + 2x - 1$$

$$y = 5(2)^x$$

Which x-values represent the *approximate* solutions to the equation $4x^2 + 2x - 1 = 5(2)^x$? Select *ALL* that apply.

A	-1.18
B	-0.93
C	1.77
D	2.26
E	3.28

36. Start with a number n, then double it. Next add n. Then double that value.

Which expression represents the result?

A $2n$

B $3n$

C $6n$

D $12n$

37. A mythical king promised to give his favorite jester one gold coin on January 1 and every day thereafter four times the number of coins given on the previous day. The function represents the number of new coins, C, the jester receives on the n^{th} day after January 1.

$$C = (4)^n$$

What is the *most* reasonable domain of the function in this context?

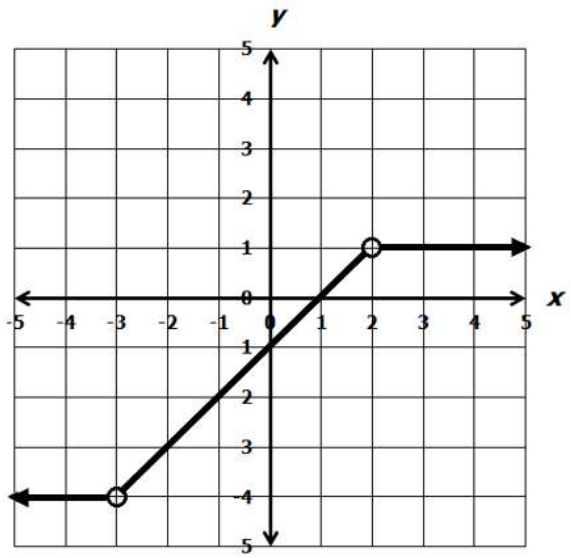
A all real numbers

B all positive real numbers

C all whole numbers

D all integers

38. A piecewise function is graphed on the coordinate grid shown.



Which set of equations *correctly* describes this function?

A $y = \begin{cases} -4 & x < -3 \\ x - 1 & -3 < x < 2 \\ 1 & x > 2 \end{cases}$

B $y = \begin{cases} -4 & x < -4 \\ -x - 1 & -4 < x < 1 \\ 1 & x > 1 \end{cases}$

C $y = \begin{cases} -3 & x < -4 \\ x & -3 < x < 2 \\ 2 & x > 1 \end{cases}$

D $y = \begin{cases} 1 & x < -3 \\ x & -3 < x < 2 \\ 3 & x > 2 \end{cases}$

39. Which situations are modeled by a linear function? Select *ALL* that apply.

A the amount of interest earned in an account each year where interest is compounded monthly

B the cost of a pizza with toppings that each cost the same amount

C the distance a car travels versus time as the car moves at a constant speed

D the number of bricks in a stack versus the weight of the stack

E the volume of water in a swimming pool that is being filled at a constant rate

40. Enrique invested x dollars in an account that pays interest quarterly. The amount, in dollars, in Enrique's account after t years can be given by the expression shown.

$$x\left(1 + \frac{0.08}{4}\right)^{4t}$$

What is the *approximate* percent interest earned on the account each year, to the *nearest* tenth of a percent?

A 2.0%

B 3.2%

C 8.0%

D 8.2%

41. The value (V) of property in a particular area depends on the land and the square footage of the house according to the equation given in the box, where x represents the square footage of the house, in square feet.

$$V = 80x + 6{,}000$$

What is the meaning of the V-intercept and slope in this context?

A The V-intercept is the value of the land without the house, and the slope is the rate of increase of the value of the house for each increase in square footage.

B The V-intercept is the value of the house not including the land, and the slope is the total value of the house and land.

C The V-intercept is the total value of the house and land, and the slope is the value of the house not including the land.

D The V-intercept is the rate of increase of the value of the house for each increase in square footage, and the slope is the value of the land without the house.

42. Gracelyn is asked to solve the equation $2(x - 4) + 3 = 4x - 9$. Which description is a possible correct first step in solving this equation?

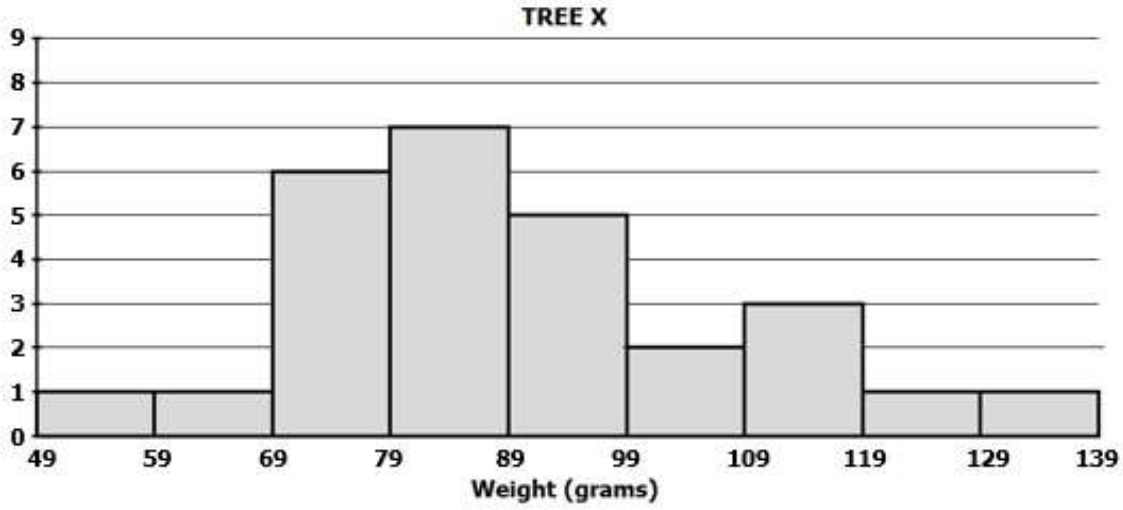
A Add 3 to both sides to get $2(x - 4) = 4x + 6$.

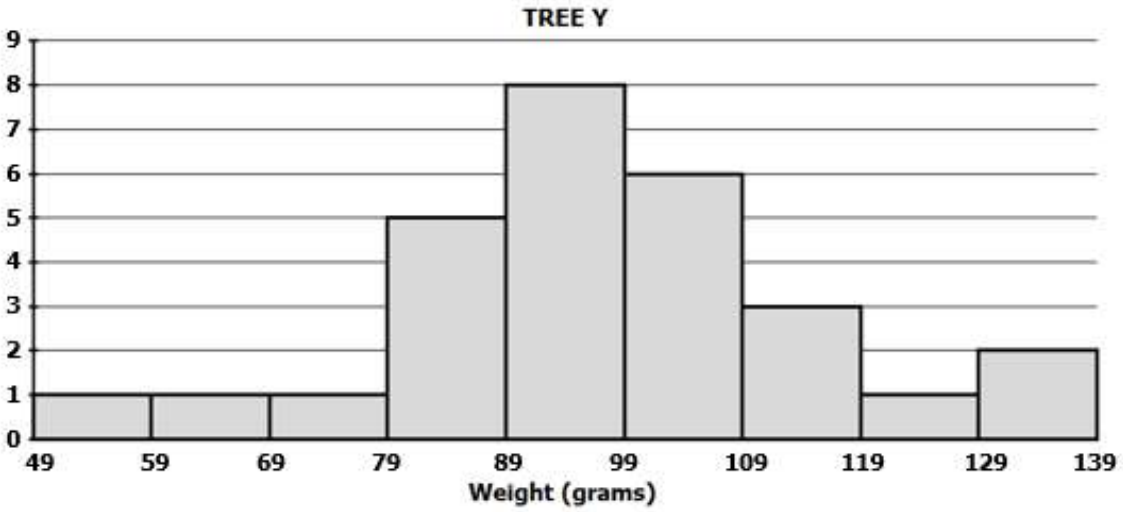
B Subtract 3 from both sides to get $2(x - 4) = 4x - 6$.

C Distribute the 2 to get $2x - 4 + 6 = 4x - 9$.

D Distribute the 2 to get $2x - 8 + 3 = 4x - 9$.

43. A farmer weighs the apples picked from two different trees, Tree X and Tree Y, and the results are shown in the histograms.



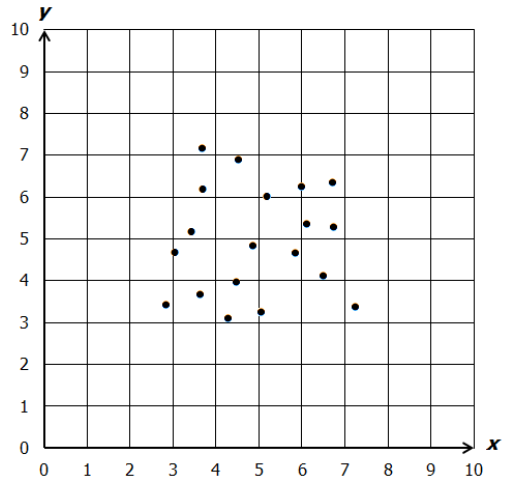


Which statements *best* compare these two data sets? Select *ALL* that apply.

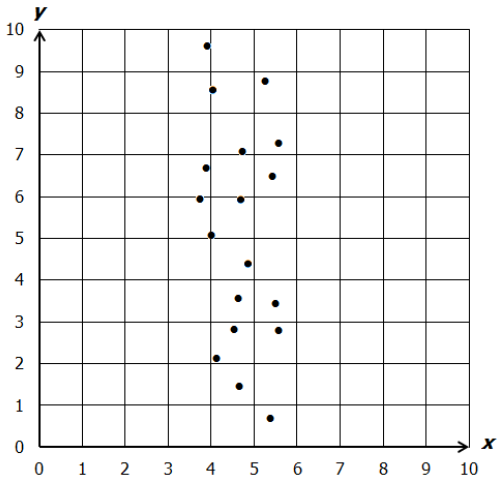
A	Both Tree X and Tree Y had the same number of apples weighing less than or equal to 69 g.
B	Both Tree X and Tree Y had the same number of apples weighing greater than or equal to 129 g.
C	The median weight is the same for both trees.
D	The spread of the data for Tree X is greater than that for Tree Y.
E	Tree X produced heavier apples, on average, than did Tree Y.
F	Tree Y has a slightly more symmetric distribution of weights than does Tree X.

44. Which scatter plot represents data with a relationship that is *most likely* represented with an exponential equation?

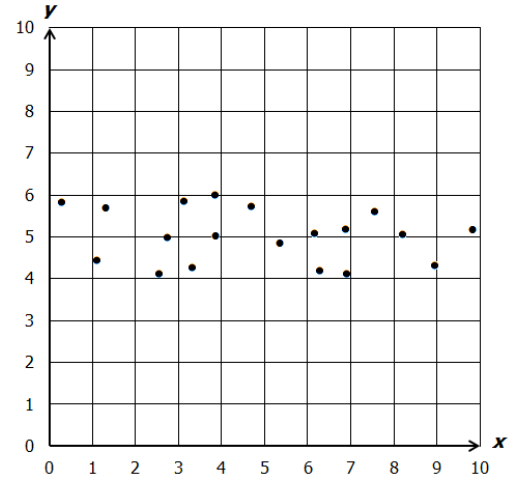
A



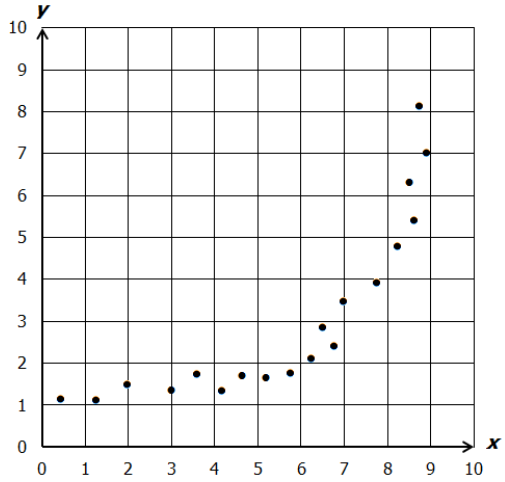
C



B



D



45. Pascal throws a ball straight up. The equation that models the height of the ball as a function of time is given, where h is in meters, and t is in seconds.

$$h = 2 - 10t^2 + 22t$$

What is the meaning of the 2 in this function?

A It is the distance the ball travels in 22 seconds.

B It is the initial height of the ball.

C It is the initial speed of the ball.

D It is the time for the ball to reach its maximum height.

46. Beth *correctly* simplified an expression resulting in the expression shown.

$$(mx^2 - 5x - 6) - (3x^2 + 2) = -2x^2 - 5x - 8$$

What is the value of m ?

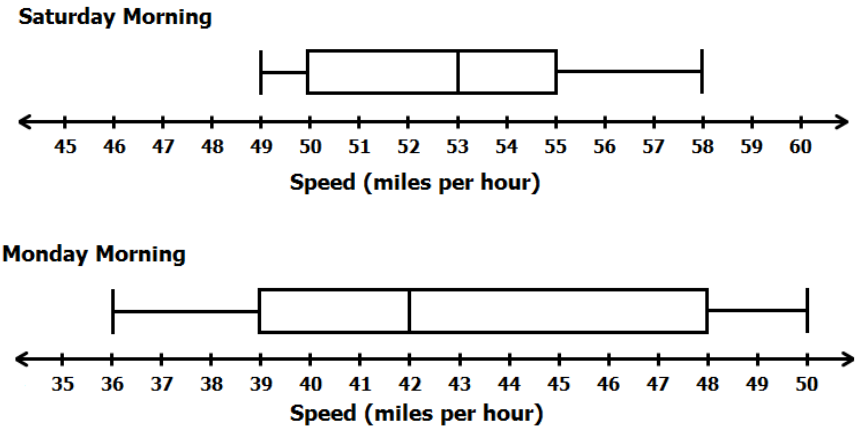
A -5

B -1

C 1

D 5

47. A traffic engineer puts a sensor along a small highway with a speed limit of 45 miles per hour to measure the speeds of vehicles. The engineer collects data during the same time period on a Saturday and on a Monday. The box plots show the results.



Which statement regarding these data sets is correct?

A Half the drivers on Monday drove faster than the posted speed limit.

B People drove at about the same speed on Saturday and on Monday.

C The lowest speed measured on Saturday morning is equal to the highest speed measured on Monday morning.

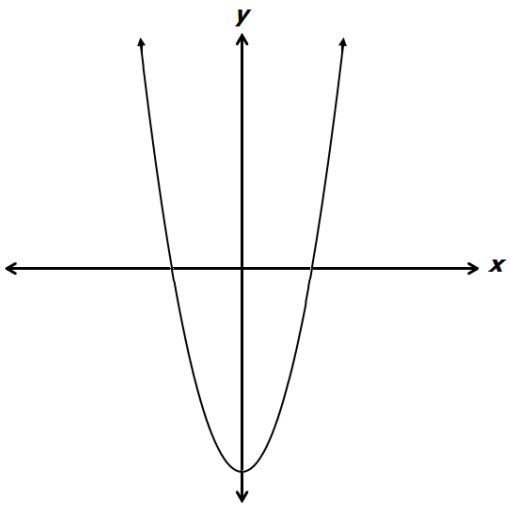
D The median speed for drivers on Saturday morning was 8 mph faster than the posted speed limit.

48. A polynomial equation is given.

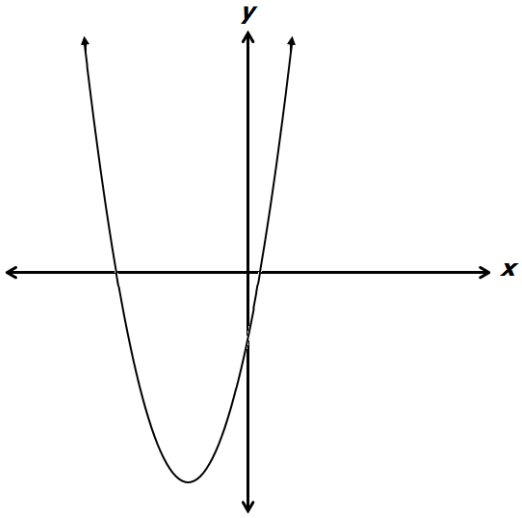
$$y = x^2 + 9x - 10$$

Which is the *best* sketch of the graph of this equation? Assume the x - and y -axes have equal scales.

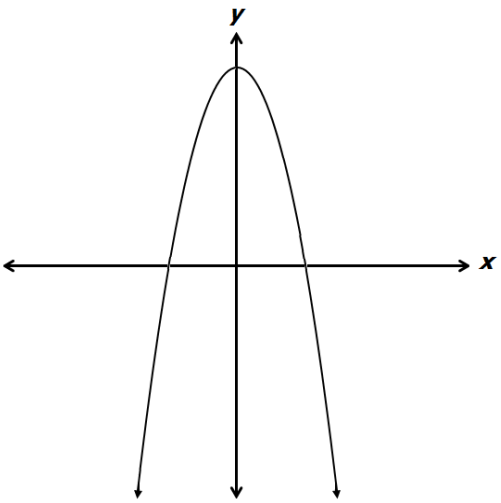
A



C



B



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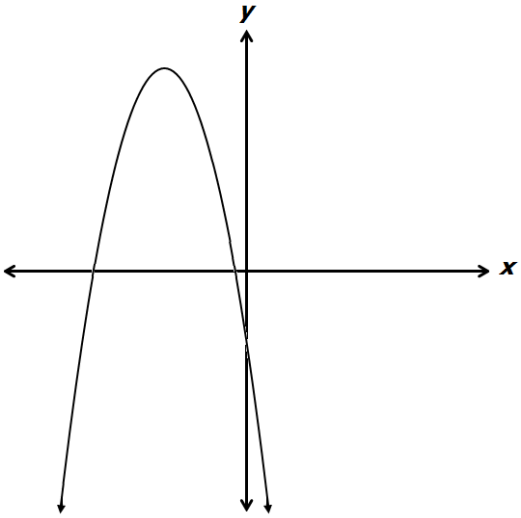


49. Which x -values represent the zeros of the quadratic function $f(x) = -6x^2 - 24x + 72$? Select *ALL* that apply.

A -9	**B** -6	**C** -2	**D** 2	**E** 6	**F** 8

50. Consider the expression shown.

$$(x + 2)^2 - (x^2 - 4)^2$$

Which is an equivalent expression?

A $-4(x + 3)$

B $12(x - 1)$

C $-(x - 3)(x - 1)(x + 2)^2$

D $-(x + 1)(x + 3)(x - 2)^2$

51. A high school track team purchases crates of reusable water bottles for a fundraiser.

- **Each crate holds 25 reusable water bottles.**
- **Each crate costs $45.**

How much should the track team charge for each water bottle to make a profit of *exactly* $180 per crate?

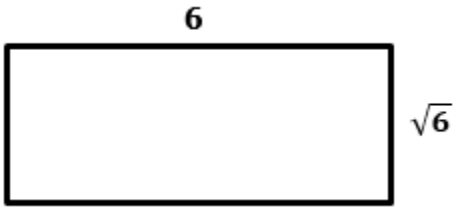
A $1.80

B $5.40

C $7.20

D $9.00

52. Consider the rectangle shown.



Which statement is true?

A Both the area and the perimeter of the rectangle are rational.

B Both the area and the perimeter of the rectangle are irrational.

C The area of the rectangle is rational, but the perimeter of the rectangle is irrational.

D The area of the rectangle is irrational, but the perimeter of the rectangle is rational.

Use the information given to answer questions 53-54.

The function shown is graphed on a coordinate grid, where m, n, and p are real numbers.

$$f(x) = m(x + n)^2 + p$$

Part A

53. Which operation will translate the graph 2 units up?

A Add 2 to n.

B Add 2 to p.

C Subtract 2 from n.

D Subtract 2 from p.

Part B

54. If the value of m is 2 but increases to 8, what will be the effect on the graph of $f(x)$?

A Increasing the value of m from 2 to 8 results in a vertical stretch of the graph.

B Increasing the value of m from 2 to 8 results in a vertical shrink of the graph.

C Increasing the value of m from 2 to 8 results in a vertical shift of the graph up 6.

D Increasing the value of m from 2 to 8 results in a vertical shift of the graph down 6.

55. Several input and output values of a function are given in the table.

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

Which coordinate pair *could* be part of this function?

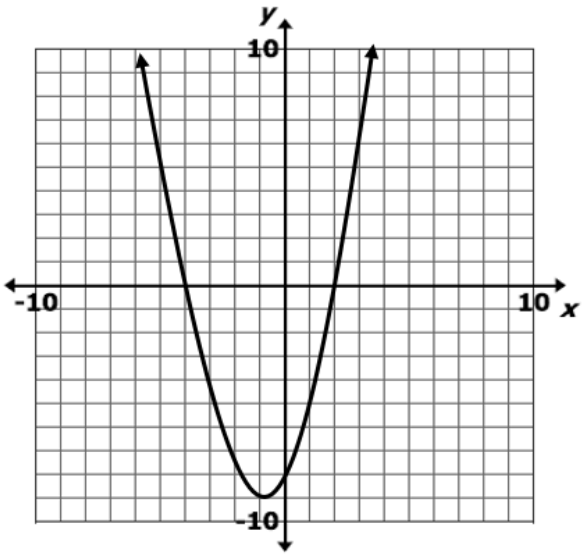
A (-1, -3)

B (0, 2)

C (1, 1)

D (3, -1)

56. Consider the quadratic function.



What are the zeros and factors of the quadratic function?

A zeros: $x = -4$ or $x = 2$; factors: $(x - 4)$ and $(x + 2)$

B zeros: $x = -4$ or $x = 2$; factors: $(x + 4)$ and $(x - 2)$

C zeros: $x = -2$ or $x = 4$; factors: $(x - 4)$ and $(x + 2)$

D zeros: $x = -2$ or $x = 4$; factors: $(x + 4)$ and $(x - 2)$

57. Four students are asked to write statements about the quadratic function $f(x) = x^2 - 8x - 20$ by first completing the square for the equation $x^2 - 8x - 20 = 0$. The table shows the students' responses.

Student	Response
Anders	An equivalent equation is $(x - 4)^2 = 4$.
Collette	The axis of symmetry for $f(x)$ is $x = -4$.
Lance	The *lowest* point on the graph is (4, 4).
Millie	The roots of the function $f(x)$ are $x = -2$ and $x = 10$.

Which student responds with a correct statement about $f(x)$?

A Anders

B Collette

C Lance

D Millie

58. Consider the system of two equations, P and Q. The solution to this system of equations is (1, -1).

$$P: 2x + y = 1$$
$$Q: x - 2y = 3$$

Which other system of equations has the same solution?

A P and $2Q$

B P and $-P$

C P and $2P$

D Q and $-3Q$

Use the information given to answer questions 59-60.

Jamari throws a baseball down a hill next to his house. After 1 second, the baseball has rolled 3 feet. Every second after that, the distance the baseball has rolled doubles until it reaches a fence at the bottom of the hill.

Part A

59. Which equation *best* represents the distance the baseball rolls (d) in n seconds while the baseball is moving?

A $d(n) = 3 + 2(n - 1)$

B $d(n) = 3(2^n - 1)$

C $d(n) = 3 - 2(n - 1)$

D $d(n) = 3(2)^{n-1}$

Part B

60. Jamari also rolls a softball on a flat surface. Every second, the softball rolls 4 feet.

Which ball will travel farther in 4 seconds, and why?

A The baseball will travel 18 feet, which is farther than the 16 feet the softball will travel in 4 seconds.

B The baseball will travel 24 feet, which is farther than the 16 feet the softball will travel in 4 seconds.

C The softball will travel 18 feet, which is farther than the 16 feet the baseball will travel in 4 seconds.

D The softball will travel 24 feet, which is farther than the 16 feet the baseball will travel in 4 seconds.

61. The table shows the correlation coefficients for four *approximately* linear data sets.

Data Set	Correlation Coefficient
J	0.35
K	-0.78
L	0.67
M	-0.15

Which list shows the data sets in order from *weakest* correlation to *strongest* correlation?

A *M*, *J*, *L*, *K*

B *L*, *J*, *M*, *K*

C *K*, *M*, *J*, *L*

D *K*, *L*, *J*, *M*

STOP. END OF PART 1.