Student Name:

Benchmark Assessments

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Math I

(1st Semester)

Final Comprehensive

Thomasville City School District
North Carolina

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CALCULATOR INACTIVE

The items in this test are based on the North Carolina High School Standard Course of Study.

DIRECTIONS FOR THE CALCULATOR INACTIVE SECTION OF THE TEST:

- **Calculators <u>may not</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 CALCULATOR INACTIVE SECTION."**
- **When you have completed the calculator inactive questions, read and follow the directions at the end of this section of the test.**

1. Which expression is equivalent to $\sqrt{144r^4t^6}$?

A $12r^2t^3$

B $12r^2t^4$

C $72r^2t^3$

D $72r^2t^4$

2. The quadratic function $f(x) = -4x^2 + 8x + 12$ can be rewritten as both $f(x) = -4(x - 1)^2 + 16$ and $f(x) = -4(x - 3)(x + 1)$. Which statement is true about the quadratic function?

A The graph of the function has a minimum at (1, 16).

B The graph of the function has a y-intercept at (0, 12).

C The line of symmetry of the function is $x = -1$.

D The function has zeros at (-3, 0) and (1, 0).

3. Consider the quadratic equation.

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

Which values for the x- and y-axes *could* be used to show the entire graph of the quadratic equation with perfect symmetry from the *minimum* y-value(s) to the y-value of 8?

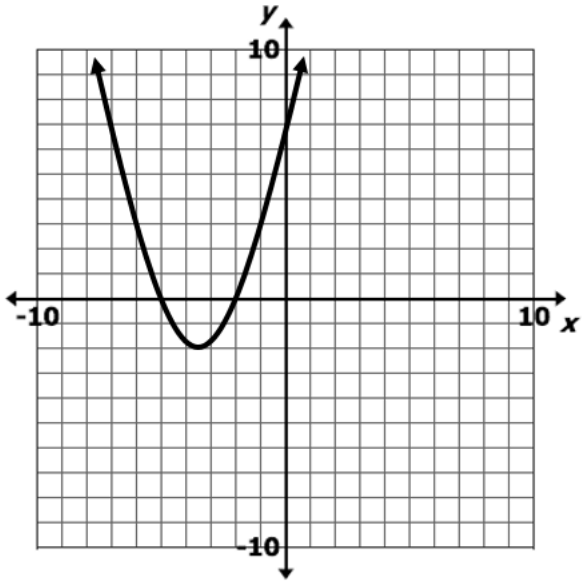
A x-axis from -2 to 2; y-axis from -4 to 8

B x-axis from -4 to 3; y-axis from -3 to 8

C x-axis from -4 to 4; y-axis from 4 to 8

D x-axis from -4 to 8; y-axis from 0 to 8

4. Consider the graph of the quadratic function.



Based on the graph, which points represent the zeros of the function?

A (-5, 0), (-2, 0), and (0, 7)

B (-5, 0) and (-2, 0) only

C (0, -5), (0, -2), and (0, 7)

D (0, -5) and (0, -2) only

5. Which equation can be used to find the zeros of $f(x) = 12x^2 - 5x - 2$, and what are the zeros?

A $(4x + 1)(3x - 2)$; $x = -\frac{1}{4}, \frac{2}{3}$

B $(4x + 1)(3x - 2)$; $x = -\frac{2}{3}, \frac{1}{4}$

C $(4x - 1)(3x + 2)$; $x = -\frac{1}{4}, \frac{2}{3}$

D $(4x - 1)(3x + 2)$; $x = -\frac{2}{3}, \frac{1}{4}$

DIRECTIONS FOR THE GRIDDED RESPONSE SECTION OF THE TEST:

- **Questions 1 through 10 require you to write your answers in the boxes provided on the back of your answer document.**
- **Write only the number or symbol in each box, and fill in the circle in each column that matches what you have printed.**
- **Fill in only 1 circle in each column.**

1. The function $f(x) = 100(80)^x$ represents an aphid population after x weeks. What is the value of $f(2)$, the aphid population after two weeks?

2. A line segment has an endpoint at P (3, -4) and a midpoint at (-1, 2). What is the y-coordinate of the other endpoint?

3. A 3-foot rain barrel is being filled from the runoff of a roof. The barrel has already collected 2.75 feet of water. For every additional inch of rainfall into the barrel, the level of water in the rain barrel rises by 0.75 inch.

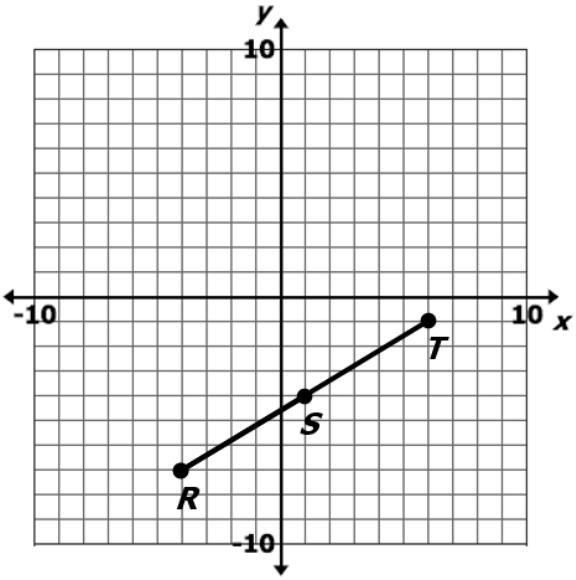
What is the y-intercept of the linear model representing the change in height of water, in inches, based on the rainfall, in inches?

4. Joaquin is four more than half Marjorie's age. Marjorie is also 32 less than three times Joaquin's age.

How old is Marjorie, in years?

5. The third term of an arithmetic sequence is 7, and the fifth and sixth terms are 13 and 16, respectively. What is the first term of this sequence?

6. Consider the line segment with endpoints R (-4, -7) and T (6, -1) and midpoint S (1, -4).



What improper fraction represents the y-intercept of the line perpendicular to line segment RT through point S?

7. Consider the two sequences.

Sequence 1	**26, 52, 78, 104, ...**
Sequence 2	**3, 6, 12, 24, ...**

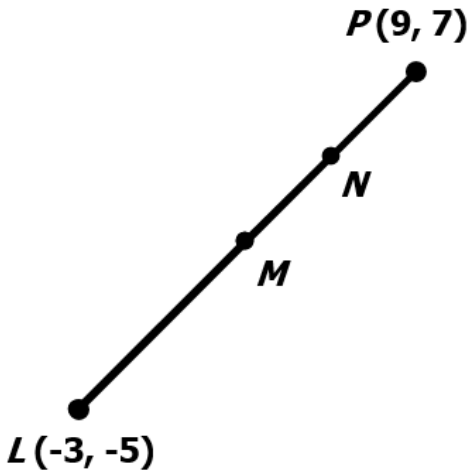
If the patterns of the sequences continue, for which term does Sequence 2 first exceed Sequence 1?

8. Consider the linear inequality.

$$2x + 4 < -x + 2$$

If the solution to the inequality is written as $x < n$, what fraction represents the value of n ?

9. Consider the line segment LP with endpoints at L (-3, -5) and P (9, 7) and midpoint M.



What is the x -coordinate of N, the midpoint of line segment MP ?

10. Zoe is riding her bike from her house to the park. Every 5 minutes, Zoe marks how far she has traveled from home.

Time (minutes)	Distance from Home (miles)
0	0
5	2
10	3.5
15	6
20	7.5
25	8

How much faster, in miles per minute, does Zoe bike in the *first* 5 minutes (0 – 5) of her trip compared to the *last* 5 minutes (20 – 25) of her trip, written as a decimal?

END OF CALCULATOR INACTIVE SECTION

DIRECTIONS:

- **Look back over your answers for the calculator inactive questions. You will *not* be able to go back and work on these questions once you are given a calculator.**
- **Raise your hand to let your teacher know you are ready to begin the calculator active questions.**
- **Do not begin work on the calculator active test questions until your teacher has given you a calculator.**
- **Turn your answer document over to the multiple choice side.**
- **When your teacher has given you a calculator, GO TO THE NEXT PAGE, and BEGIN the calculator active questions.**
- **Stop when you see the words "STOP. END OF MATH TEST."**

6. An online video receives 50 views on the first day it is loaded online. The number of total views doubles each day for a month.

Which function represents the total number of views, V, after d days when $d > 2$?

A $V(d) = 2d + 50$

B $V(d) = 2d(50)$

C $V(d) = 2^{d-1} + 50$

D $V(d) = 50(2)^{d-1}$

7. A printer can print 25 pages in a minute. Which inequality shows the number of minutes, n, the printer takes to print more than 250 pages?

A $25n > 250$

B $25n < 250$

C $25 + n > 250$

D $25 + n < 250$

8. A high school environmental science class decides to spend one day each week cleaning a river by collecting discarded plastic water bottles. Each week, the class collects half as many bottles as the previous week.

If the number of bottles collected in the first week is 256, which function models the number of bottles, B, collected during week n?

A $B = 256(n-1)^{1/2}$

B $B = 256\left(\frac{1}{2}\right)^{n-1}$

C $B = \frac{1}{2}n - 256$

D $B = \frac{1}{2}n + 256$

Go to the next page

9. A population of bacteria after t hours can be represented by the equation $P(t) = 1{,}008(0.88)^t$. Which statement is true?

A The initial population of bacteria is 88.

B The population of bacteria at $t = 1$ is 1,008.

C The population decays at a rate of 12% per hour.

D The population grows at a rate of 12% per hour.

10. The equation models the charge, in dollars, for water running from a faucet in a community as a function of the number of gallons, g, used.

$$C = 12 + 0.002g$$

What is a reasonable domain for this function?

A all real numbers

B only positive integers including zero

C only whole numbers

D all positive real numbers including zero

11. Consider the sequence.

12, 24, 48, 96, 192, ...

If n is an integer, and $n \geq 1$, which function represents the sequence?

A $f(n) = 12(2n)$

B $f(n) = 12(2)^n$

C $f(n) = 12(2)^{n-1}$

D $f(n) = 12(2n - 1)$

12. A mechanic charges a flat fee of $30 plus $25 an hour for labor. Which equation can be used to determine how many hours, *h*, the mechanic spends working on a particular job if the total amount earned is *T* dollars?

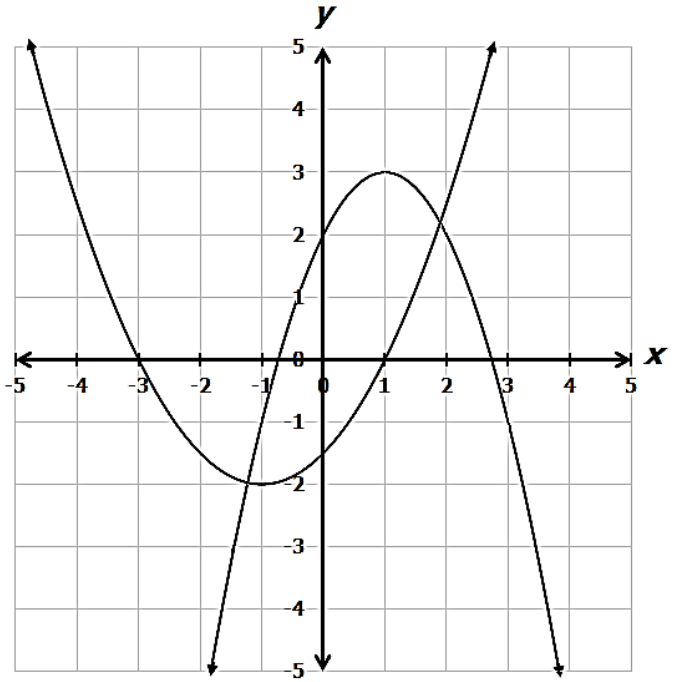
A $T = 25 - 30h$

B $T = 25 + 30h$

C $T = 30 - 25h$

D $T = 30 + 25h$

13. Consider the system of equations graphed on the coordinate plane.



What are the *best approximations* of the solutions to this system?

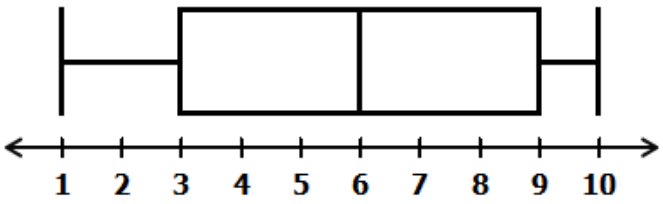
A (-1.5, -2.1) and (1.5, 2.5)

B (-1.2, -2.0) and (1.9, 2.2)

C (-1.0, -2.0) and (2.0, 2.0)

D (-1.0, 2.7) and (-2.0, 2.4)

14. Consider the box plot.



Which *could* be the data set for this box plot?

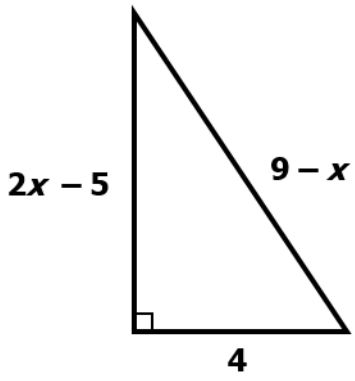
A {1, 2, 3, 7, 9, 10}

B {1, 2, 4, 5, 8, 10}

C {1, 3, 4, 6, 8, 10}

D {1, 3, 6, 6, 9, 10}

15. Consider the triangle, where dimensions are shown in units.



What are the area and perimeter of the triangle?

A area = $4x$ – 10 square units; perimeter = x + 8 units

B area = $4x$ – 10 square units; perimeter = $3x$ – 10 units

C area = $8x$ – 20 square units; perimeter = x + 8 units

D area = $8x$ – 20 square units; perimeter = $3x$ – 10 units

16. A student is solving the equation $\frac{5}{3}(2x - 6) + 18 = \frac{2}{3}(x + 3) - 4$. The table shows the steps of the solution.

Step	Equation
Given	$\frac{5}{3}(2x - 6) + 18 = \frac{2}{3}(x + 3) - 4$
Step 1	$\frac{10}{3}x - 10 + 18 = \frac{2}{3}x + 2 - 4$
Step 2	$\frac{10}{3}x + 8 = \frac{2}{3}x + 2 - 4$
Step 3	$\frac{10}{3}x + 8 = \frac{2}{3}x - 2$
Step 4	$\frac{10}{3}x = \frac{2}{3}x - 10$
Step 5	$\frac{8}{3}x = -10$
Step 6	$8x = -30$
Step 7	$x = -240$

In which step does the student make a mistake, and why?

A The student makes a mistake distributing between the Given and Step 1.

B The student makes a mistake subtracting between Step 3 and Step 4.

C The student makes a mistake dividing by 3 instead of multiplying by 3 between Step 5 and Step 6.

D The student makes a mistake multiplying by 8 instead of dividing by 8 between Step 6 and Step 7.

17. Which data set has the *smallest* standard deviation?

A {-11, -3, 5, 6, 8}

B {-5, -2, 1, 4, 6}

C {0, 1, 2, 5, 8}

D {3, 5, 6, 7, 11}

18. The set of coordinates represents a function.

(x, y), (-2, -5), (0, 1), (4, -2), (-3, 7)

Which coordinates *could* replace (x, y) and have the set of coordinates still represent a function?

A (-3, 6)

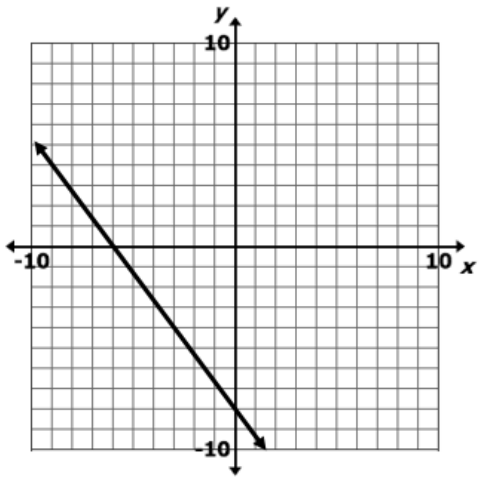
B (-2, 9)

C (1, -5)

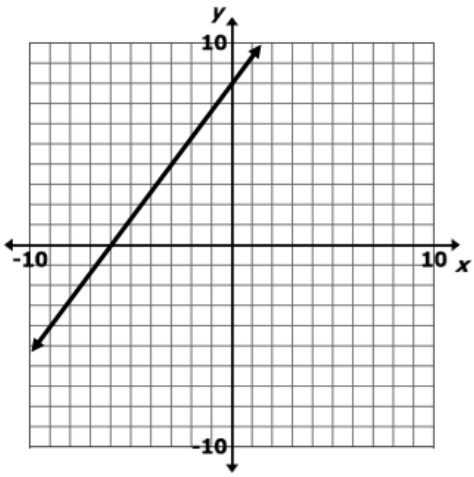
D (4, 7)

19. Which graph *best* represents a linear function with an x-intercept at (-8, 0) and a y-intercept at (0, -6)?

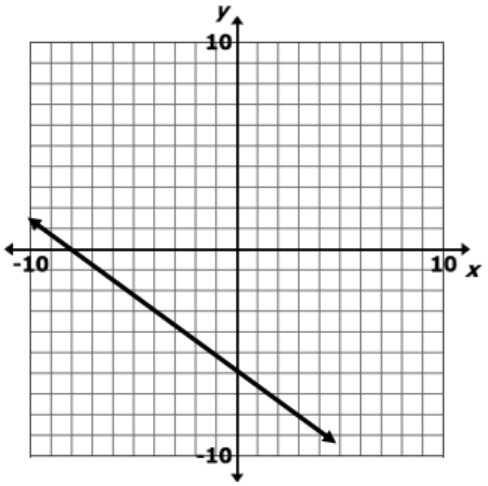
A



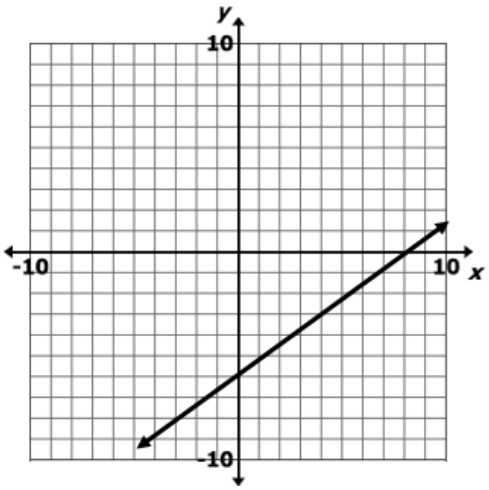
C



B



D



20. Which scenario represents an exponential function?

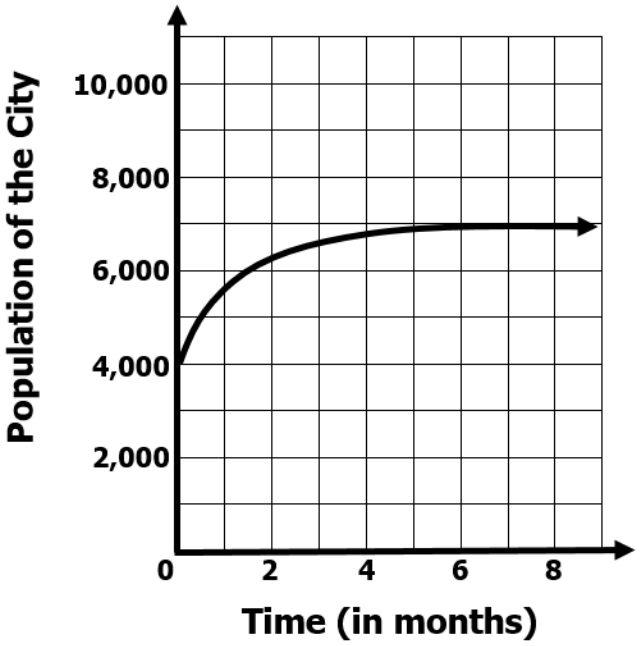
A A landlord collects monthly rent payments in the amount of $450 per month.

B A restaurant serves an average of 35 patrons per hour.

C An athlete training for a race cuts the time it takes to complete a 10K by 5% each week.

D The volume of a cube is the length of the side of the cube raised to the third power.

21. The graph shows the population of a city *n* months after the establishment of a new automobile plant in the city.



Based on the graph, which statement is true?

A The population of the city increased rapidly for the first 4 months and then slowly approached 4,000 people.

B The population of the city increased rapidly for the first 4 months and then slowly approached 7,000 people.

C The population of the city increased at a constant rate for the first 4 months and then slowly approached 4,000 people.

D The population of the city increased at a constant rate for the first 4 months and then slowly approached 7,000 people.

22. The volume of a cylinder can be expressed as $V = \pi r^2 h$, where r is the radius, and h is the height of the cylinder.

Which formula can be used to determine the radius of the cylinder?

A $r = \frac{V}{\pi h}$

B $r = \frac{2V}{\pi h}$

C $r = \left(\frac{V}{\pi h}\right)^2$

D $r = \sqrt{\frac{V}{\pi h}}$

23. To raise funds for a charity, Jacob and Amy decide to make and sell necklaces and bracelets. They make 36 bracelets and 12 necklaces to sell, and they are hoping to make a profit of *at least* $150. The costs to make each bracelet and each necklace are such that Jacob and Amy earn a profit of $4 selling each bracelet and $7 selling each necklace.

Which set of constraints represents all possible number of bracelets, b, and necklaces, n, that Jacob and Amy should sell to make a profit of *at least* $150?

A $36b + 12n \geq 150$
$b = 4$
$n = 7$

B $36b + 12n \leq 150$
$b = 4$
$n = 7$

C $4b + 7n \geq 150$
$b \leq 36$
$n \leq 12$

D $4b + 7n \geq 150$
$b \geq 36$
$n \geq 12$

Go to the next page

24. The population of a town t years after the year 2005 can be modeled by the function $p(t) = 2{,}020(1.036)^t$. Which statement is true?

A The population of the town is increasing at the rate of 0.6% every year.

B The population of the town is increasing at the rate of 3.6% every year.

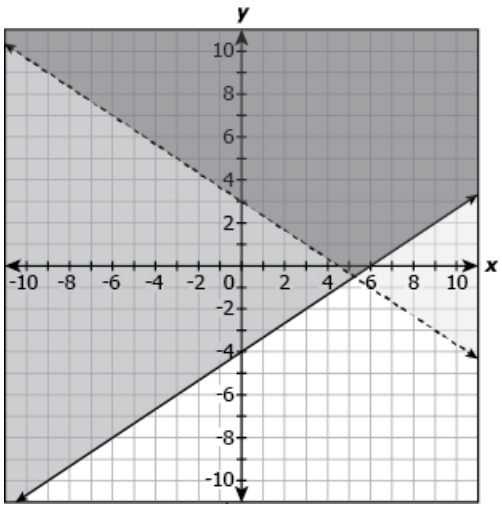
C The population of the town is increasing at the rate of 0.036% every year.

D The population of the town is increasing at the rate of 1.036% every year.

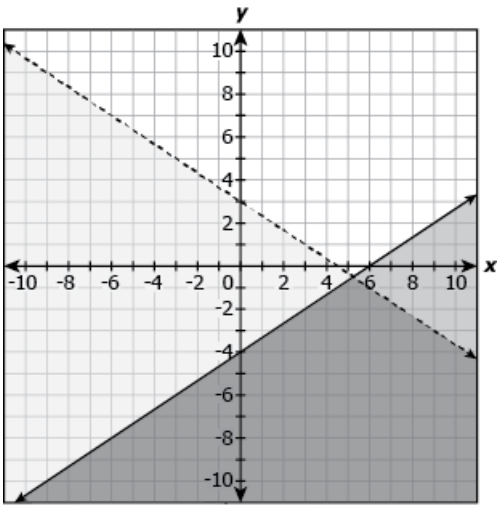
25. Which graph *best* represents the solution to the system of inequalities?

$$6x + 9y > 27$$
$$4x - 6y \leq 24$$

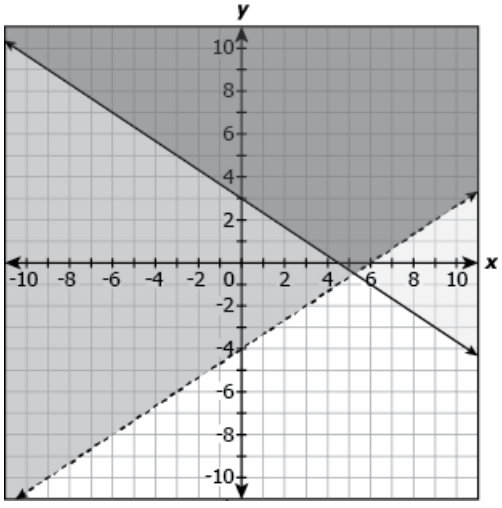
A



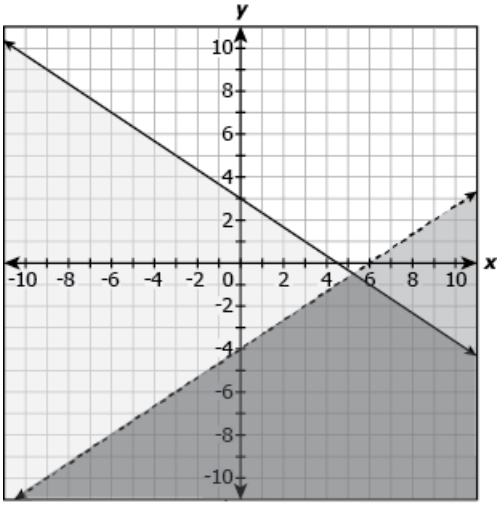
C



B



D



26. Which expression is equivalent to $\frac{(2x^3y^{-4})^3}{24x^{-2}y}$?

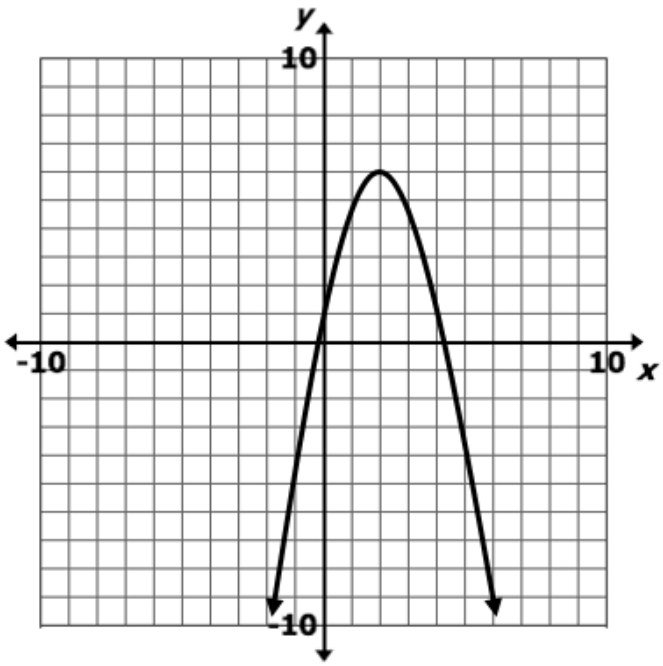
A $\frac{x^8}{3y^{13}}$

B $\frac{x^8}{4y^{13}}$

C $\frac{x^{11}}{3y^{13}}$

D $\frac{x^{11}}{4y^{13}}$

27. A function, $f(x)$, is defined by the equation $f(x) = -(x - 3)^2 + 4$. The graph shows the function $g(x)$.



Which statement is true?

A $f(-1)$ is greater than $g(-1)$.

B $f(3)$ is greater than $g(3)$.

C The maximum value of $f(x)$ is greater than the maximum value of $g(x)$.

D The maximum value of $f(x)$ is less than the maximum value of $g(x)$.

28. A study shows that at a particular convenience store, there is a strong positive correlation between the chance of rain in the forecast and the sale of umbrellas. What can be inferred from these results?

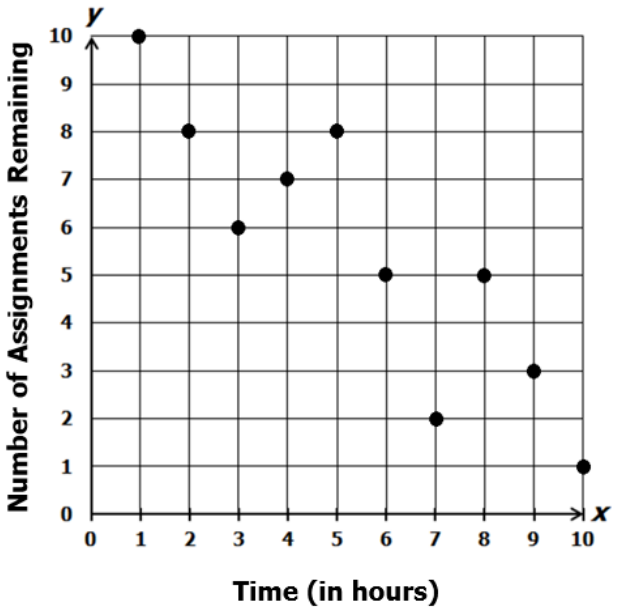
A As the chance of rain increases, the number of umbrellas purchased will likely decrease.

B As the chance of rain increases, the number of umbrellas purchased will likely increase.

C As the chance of rain increases, the number of umbrellas purchased will remain the same.

D There is not enough information to infer any information from these results.

29. Ten high school students track the amount of time already spent on homework during the week versus the number of assignments they have remaining for the week. The results are shown in the scatter plot.



Which linear model *best* fits the data shown on the scatter plot?

A $y = -0.84x + 10.1$

B $y = -0.89x + 10.4$

C $y = -x + 11$

D $y = -2x + 12$

30. Xavier is trying to save money for college. His grandmother gives him $500 to start a savings account. For every hour Xavier works at his part-time job, he contributes 15% of his hourly wage to his savings account.

Which equation represents the amount Xavier will save, S, as a function of the number of hours, h, he works if he makes $10 per hour?

A $S = 500 + 150h$

B $S = 500 + 15h + 10$

C $S = 500(0.15)(h + 10)$

D $S = 0.15(10)h + 500$

31. The table shows the temperatures, in degrees Celsius, for seven consecutive days of two different cities, P and Q.

Temperature of City P (in °C)	Temperature of City Q (in °C)
10.2	13.4
14.1	13.9
14.4	15.2
14.4	15.2
14.5	15.4
14.5	15.5
17.6	16.6

Which statement is true?

A The average daily temperature of City P is approximately 2.4°C less than the average daily temperature of City Q.

B The average daily temperature of City Q is approximately 2.4°C less than the average daily temperature of City P.

C If the two outliers in City P are removed from the data sets, the new average daily temperature of City P is approximately 0.65°C less than the average daily temperature of City Q.

D If the two outliers in City P are removed from the data sets, the average daily temperature of City Q is approximately 0.65°C less than the new average daily temperature of City P.

32. Two employees at a department store each earn a different base pay for each week of work. Each employee also earns a different percentage for the amount of merchandise sold, or commission rate. The table shows the functions that represent each employee's weekly pay with respect to the total amount, in dollars, of merchandise sold, x.

Employee	Pay (in dollars)
1	$P(x) = 0.025x + 420$
2	$P(x) = 0.03x + 400$

Which statement is true?

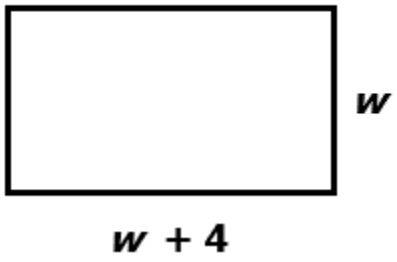
A The base pay for Employee 1 is larger than the base pay for Employee 2 by $5 per week.

B The base pay for Employee 2 is larger than the base pay for Employee 1 by $5 per week.

C The commission rate for Employee 1 is larger than the commission rate for Employee 2 by 0.5% per week.

D The commission rate for Employee 2 is larger than the commission rate for Employee 1 by 0.5% per week.

33. Consider the rectangle.



Which expression represents the area of the rectangle based on the width of the rectangle?

A $(4 + w)^2$

B $(4 + w)w$

C $4w^2$

D $4 + w^2$

34. Triangle *JKL* has coordinates *J* (-5, 6), *K* (0, -6), and *L* (3, -2). What is the *approximate* perimeter of triangle *JKL*?

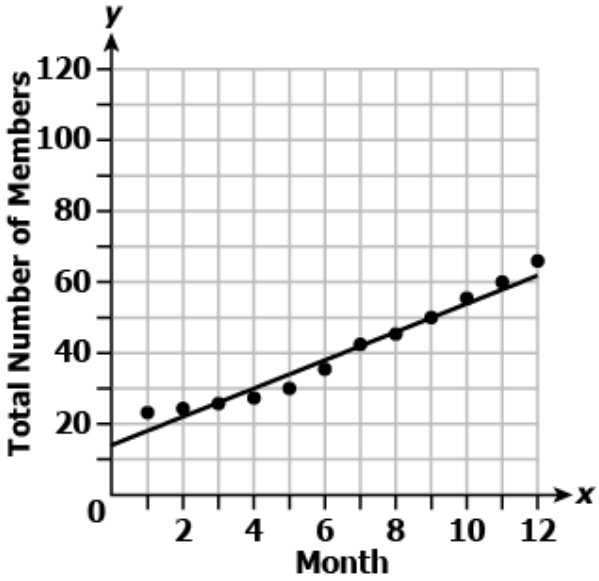
A 6.3 units

B 17.9 units

C 29.3 units

D 39.6 units

35. The graph shows the total number of library members at the end of every month for the year 2016.



The line-of-best fit for the data is given by the equation $y = 4x + 14$, where y is the total number of library members after x months from the beginning of 2016. Which statement interprets the slope of the line-of-best fit *correctly*?

A The rate of change is 1 new registration every 4 months.

B The rate of change is 4 new registrations every 4 months.

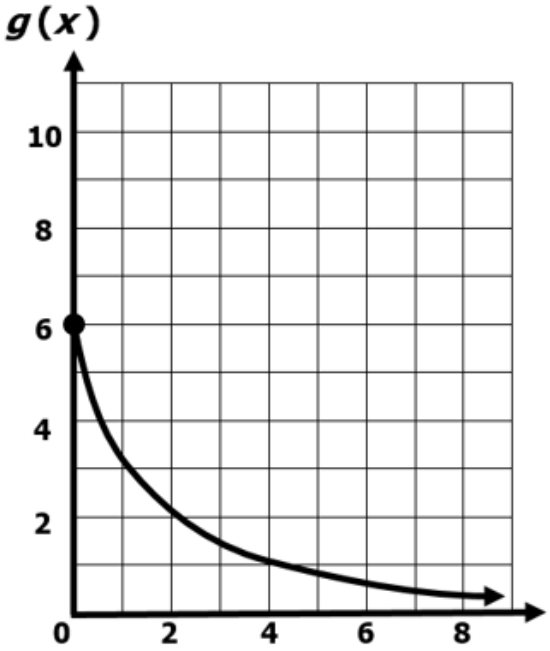
C The rate of change is 4 new registrations every month.

D The rate of change is 14 new registrations every month.

36. The table shows a linear function $f(x)$.

x	$f(x)$
-3	21
-1	11
2	-4
4	-14

The graph shows an exponential function $g(x)$.



Which statement is true?

A Both $f(x)$ and $g(x)$ have the same y-intercept.

B $f(x)$ is increasing at a constant rate.

C $g(x)$ is decreasing at a constant rate.

D The y-intercept of $f(x)$ is greater than the y-intercept of $g(x)$.

37. A data set has an outlier that is significantly below the expected range. How does including this value affect a plot of the distribution?

A The outlier will flatten the distribution so that it looks uniform.

B The outlier will have no effect on the distribution at all.

C The outlier will negatively skew the distribution.

D The outlier will positively skew the distribution.

38. Quadrilateral *EFGH* has vertices of *E* (-1, 3), *F* (4, 2), *G* (2, -2), and *H* (-3, -1). Which term *best* describes quadrilateral *EFGH*?

A parallelogram

B rectangle

C rhombus

D square

39. The correlation coefficient between two variables is -0.95. Which *best* describes the relationship between the two variables?

A strong and negative

B strong and positive

C weak and negative

D weak and positive

40. Consider the sequence.

972, 324, 108, 36, 12, ...

Which represents the function used to find any term, *x*, of the sequence?

A $f(x) = 2{,}916(3)^x$

B $f(x) = 2{,}916\left(\frac{1}{3}\right)^x$

C $f(x) = 972(3)^x$

D $f(x) = 972\left(\frac{1}{3}\right)^x$