Student Name _____

P

PARCC

Partnership for Assessment of
Readiness for College and Careers

Algebra I

Test Booklet

Practice Test

TEST BOOKLET SECURITY BARCODE

Unit 1

Directions:

Today, you will take Unit 1 of the Algebra I Practice Test. Unit 1 has two sections. In the first section, you may not use a calculator. In the second section, you may use a calculator. **You will not be allowed to return to the first section of the test after you start the calculator section.** You must complete both the non-calculator and calculator sections of Unit 1 within the time allowed.

Read each question. Then, follow the directions to answer each question. Mark your answers by completely filling in the circles in your answer document. Do not make any pencil marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely. If a question asks you to show or explain your work, you must do so to receive full credit. Only responses written within the provided space will be scored.

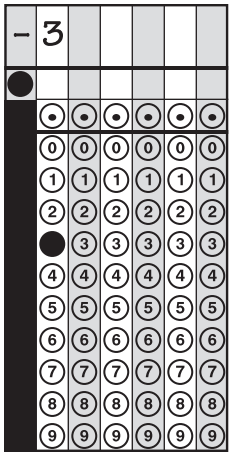
If you do not know the answer to a question, you may go on to the next question. When you finish the first section, you may review your answers and any questions you did not answer in this section ONLY. Once you have reviewed your answers, continue to the calculator section. When you are ready to go on to the calculator section, raise your hand to receive your calculator.

Directions for Completing the Answer Grids

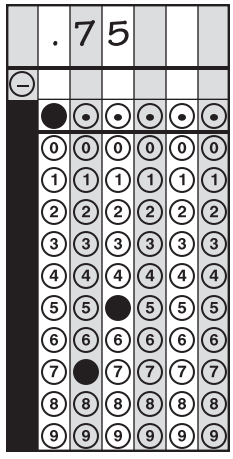
1. Work the problem and find an answer.
2. Write your answer in the boxes at the top of the grid.
3. Print only one number or symbol in each box. Do not leave a blank box in the middle of an answer.
4. Under each box, fill in the circle that matches the number or symbol you wrote above. Make a solid mark that completely fills the circle.
5. Do not fill in a circle under an unused box.
6. Fractions cannot be entered into an answer grid and will not be scored. Enter fractions as decimals.
7. See below for examples on how to correctly complete an answer grid.

EXAMPLES

To answer −3 in a question, fill in the answer grid as shown below.



To answer .75 in a question, fill in the answer grid as shown below.



GO ON TO NEXT PAGE

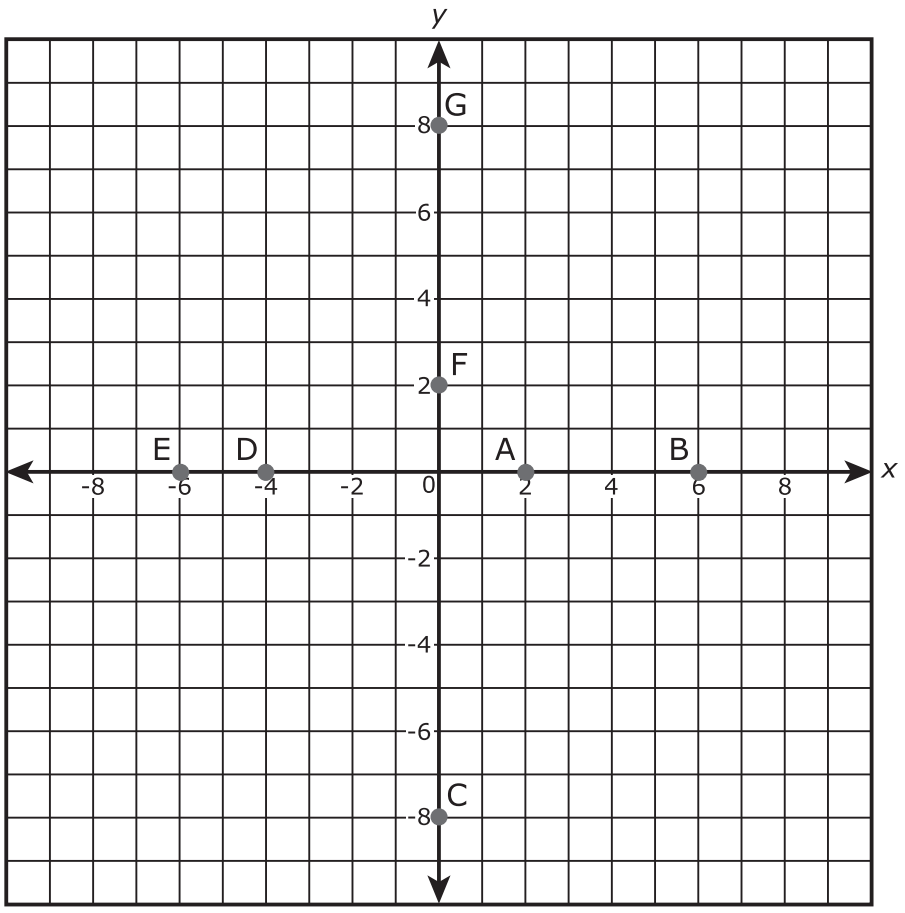
Unit 1 - Section 1 (Non-Calculator)

This unit has two sections: a non-calculator section and a calculator section.

You will now take the non-calculator section of this unit in which you may not use a calculator. You will not be allowed to return to the first section of the test after you start the calculator section. You must complete both sections within the time allowed for this unit.

Once you finish the non-calculator section, read the directions in your test booklet on how to continue.

1. Several points are plotted on the graph.



Which of the plotted points on the graph represent the zeros of the function $f(x) = (x^2 + 2x - 8)(x - 6)$? Select **all** that apply.

A. (2, 0)

B. (6, 0)

C. (0, −8)

D. (−4, 0)

E. (−6, 0)

F. (0, 2)

G. (0, 8)

Use the information provided to answer Part A and Part B for question 2.

Let a represent a non-zero rational number and let b represent an irrational number.

2. Part A

Which expression could represent a rational number?

A. $-b$

B. $a + b$

C. ab

D. b^2

Part B

Consider a quadratic equation with integer coefficients and two distinct zeros. If one zero is irrational, which statement is true about the other zero?

A. The other zero must be rational.

B. The other zero must be irrational.

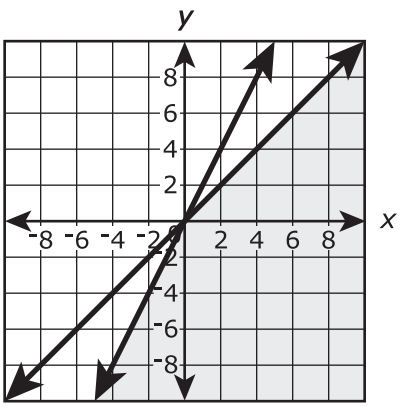
C. The other zero can be either rational or irrational.

D. The other zero must be non-real.

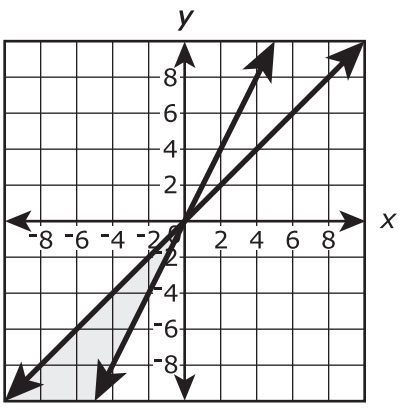
3. Which graph **best** represents the solution to this system of inequalities?

$$x + y \leq 6$$
$$x + 2y \leq 8$$

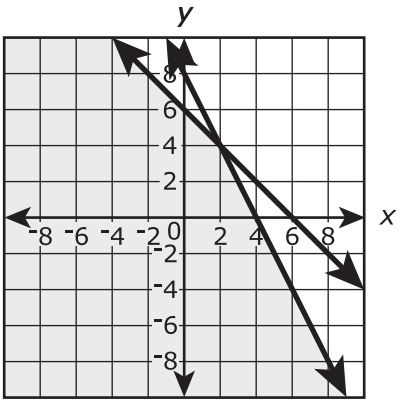
A.



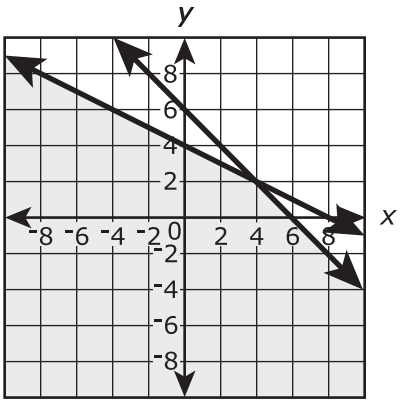
B.



C.



D.



4. Which expression is equivalent to $(3x^5 + 8x^3) - (7x^2 - 6x^3)$?

A. $-4x^3 + 14$

B. $-4x^5 + 14x^3$

C. $3x^5 + 14x^3 - 7x^2$

D. $3x^5 + 2x^3 - 7x^2$

5. Which points are on the graph of the equation $-3x + 6y + 5 = -7$?

Select **all** that apply.

A. $(-3, 6)$

B. $(-2,0)$

C. $(0, -2)$

D. $(6, -3)$

E. $(8, 2)$

Use the information provided to answer Part A and Part B for question 6.

Consider the function $f(x) = 2x^2 + 6x - 8$.

6. Part A

What is the vertex form of $f(x)$?

A. $f(x) = 2(x - 3)^2 - 4$

B. $f(x) = 2(x + 3)^2 - 4$

C. $f(x) = 2(x - 1.5)^2 - 12.5$

D. $f(x) = 2(x + 1.5)^2 - 12.5$

Part B

What is a factored form of $f(x)$?

A. $f(x) = (2x + 1)(x - 8)$

B. $f(x) = (2x - 1)(x + 8)$

C. $f(x) = 2(x + 4)(x - 1)$

D. $f(x) = 2(x - 4)(x + 1)$

7. Which factorization can be used to reveal the zeros of the function $f(n) = -12n^2 - 11n + 15$?

A. $f(n) = -n(12n + 11) + 15$

B. $f(n) = (-4n + 3)(3n + 5)$

C. $f(n) = -(4n + 3)(3n + 5)$

D. $f(n) = (4n + 3)(-3n + 5)$

8. The cost to manufacture x pairs of sunglasses can be represented by a function, $C(x)$. If it costs \$398 to manufacture 4 pairs of sunglasses, which of the following is true?

Select the correct equation.

A. $C(4) = 99.50$

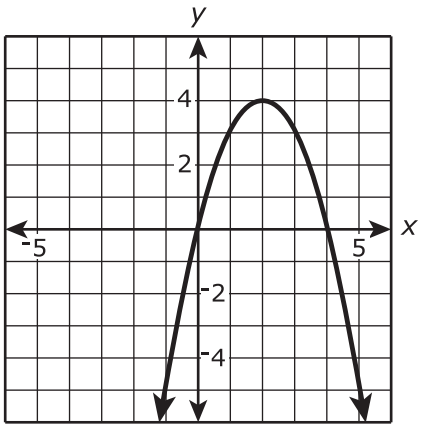
B. $C(398) = 4$

C. $C(4) = 398$

D. $C(99.50) = 1$

Use the information provided to answer Part A and Part B for question 9.

The function $f(x) = 4x - x^2$ is graphed in the xy-coordinate plane as shown.



9. Part A

Based on the graph of the function, which statements are true?

Select **all** that apply.

A. f is increasing on the interval $x < 0$.

B. f is decreasing on the interval $x < 0$.

C. f is increasing on the interval $0 < x < 2$.

D. f is decreasing on the interval $0 < x < 2$.

E. f is increasing on the interval $2 < x < 4$.

F. f is decreasing on the interval $2 < x < 4$.

G. f is increasing on the interval $x > 4$.

H. f is decreasing on the interval $x > 4$.

Part B

Based on the graph of the function, which statements are true?

Select **all** that apply.

A. $f(x) < 0$ on the interval $x < 0$.

B. $f(x) > 0$ on the interval $x < 0$.

C. $f(x) < 0$ on the interval $0 < x < 2$.

D. $f(x) > 0$ on the interval $0 < x < 2$.

E. $f(x) < 0$ on the interval $2 < x < 4$.

F. $f(x) > 0$ on the interval $2 < x < 4$.

G. $f(x) < 0$ on the interval $x > 4$.

H. $f(x) > 0$ on the interval $x > 4$.

STOP

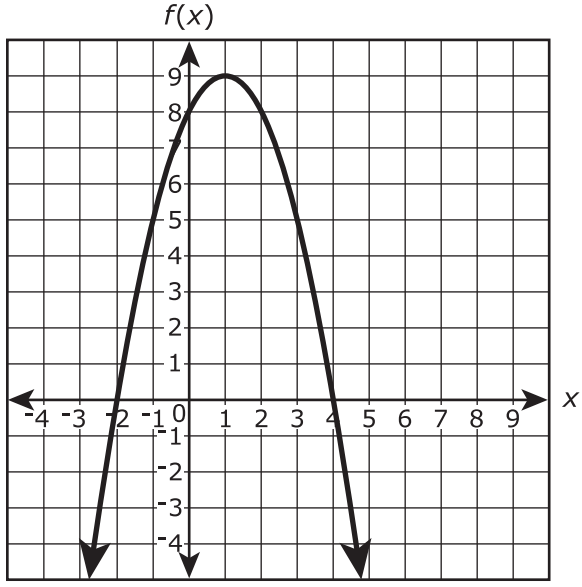
You have come to the end of the non-calculator section in Unit 1 of the test.

- **You may review your answers in the non-calculator section ONLY. You will not be allowed to return to the non-calculator section once you have received your calculator.**
- **When you are ready to go on to the calculator section, raise your hand to receive your calculator.**

Unit 1 - Section 2 (Calculator)

Once you have received your calculator, continue into the calculator section.

10. The figure shows a graph of the function of $f(x)$ in the xy-coordinate plane, with the vertex at $(1, 9)$ and the zeros at -2 and 4.



The function g is defined by $g(x) = -3x + 2$.

Which statements are true? Select **all** that apply.

A. $f(-2)$ is greater than $g(-2)$.

B. $f(-1)$ is less than $g(-1)$.

C. $f(0)$ is greater than $g(0)$.

D. $f(1)$ is less than $g(1)$.

E. $f(2)$ is greater than $g(2)$.

GO ON TO NEXT PAGE

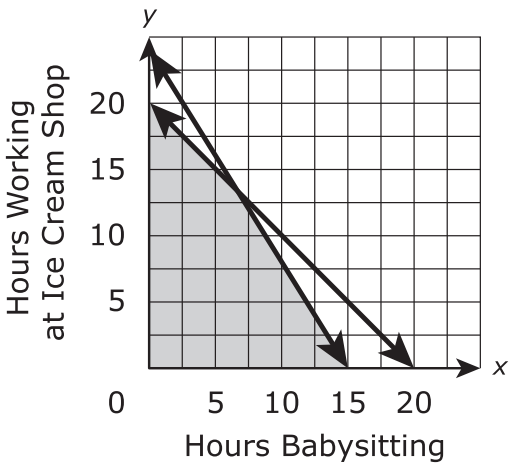
Use the information provided to answer Part A through Part D for question 11.

Leah would like to earn at least $120 per month. She babysits for $5 per hour and works at an ice cream shop for $8 per hour. Leah cannot work more than a total of 20 hours per month. Let *x* represent the number of hours Leah babysits and let *y* represent the number of hours Leah works at the ice cream shop.

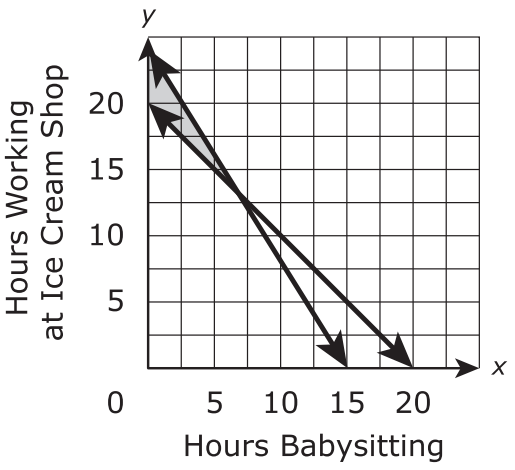
11. Part A

Which graph shows the set of points that represents the number of hours that Leah can work in order to earn at least $120 and not work more than 20 hours per month?

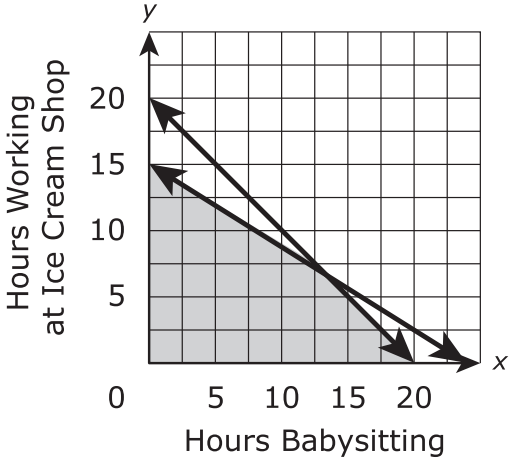
A.



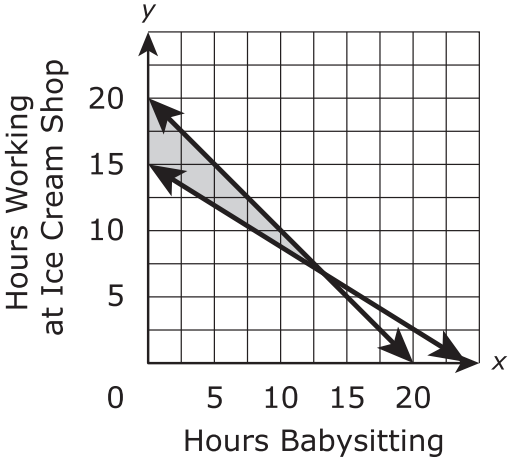
B.



C.



D.



Part B

Which pairs (x, y) represent hours that Leah could work to meet the given conditions?

Select **all** that apply.

A. (4, 15)

B. (5, 12)

C. (10, 9)

D. (15, 5)

E. (19, 1)

Part C

If Leah babysits for 7 hours this month, what is the minimum number of hours she would have to work at the ice cream shop to earn at least $120?

Give your answer to the nearest whole hour.

Enter your answer in the box.

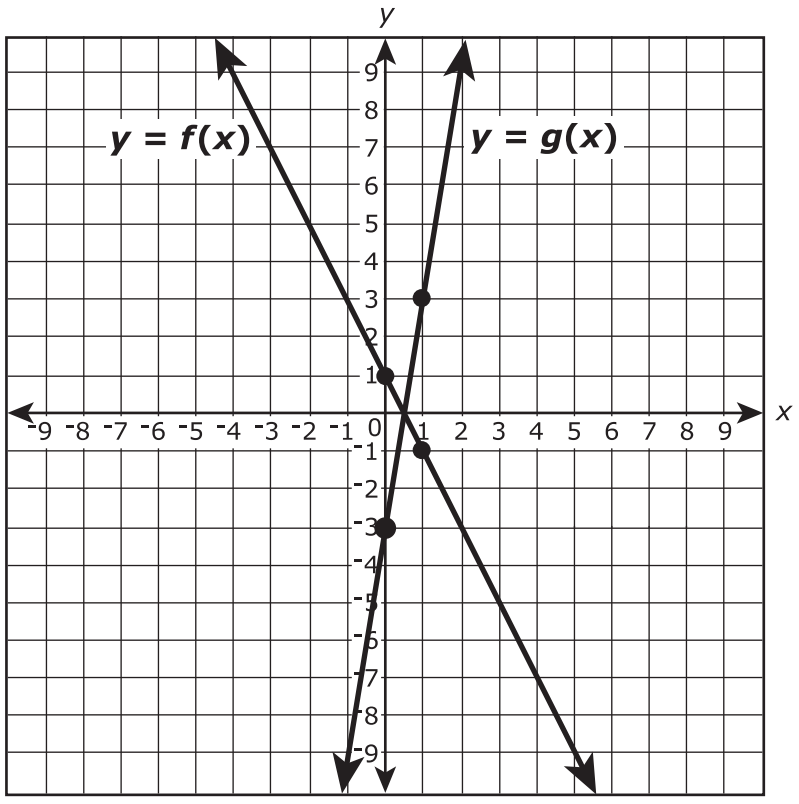
Part D

Leah prefers babysitting over working at the ice cream shop. Out of 20 total hours, what is the maximum number of hours she can babysit to be able to earn at least $120 per month?

Give your answer to the nearest whole hour.

Enter your answer in the box.

12. The figure shows the graphs of the functions $y = f(x)$ and $y = g(x)$. The four indicated points all have integer coordinates.



If $g(x) = k \cdot f(x)$, what is the value of k?

Enter your answer in the box.

Use the information provided to answer Part A through Part C for question 13.

Phil and Matt made cookies for a fundraiser at their high school.

- Phil made 25% more cookies than Matt.
- The cookies sold for $0.25 each.
- After the sale, 20% of the combined total of their cookies remained.

13. Part A

Create an equation to represent the total amount of money Matt and Phil earned at the fundraiser based on the number of cookies Matt made. Explain how you determined your equation.

Enter your equation and your explanation in the space provided.

Part B

Phil and Matt made a total of $72.00 selling the cookies. How many cookies did Phil make and how many cookies did Matt make? Show your work.

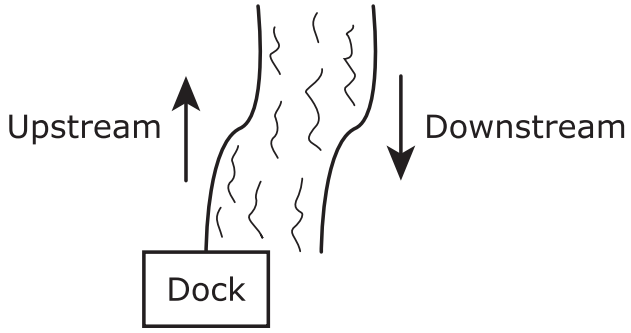
Enter your answers and your work in the space provided.

Part C

Next year Phil and Matt may sell the cookies for $.50 each. They plan to make the same total number of cookies, but they predict that they will only sell 70% of them given the price increase. Based on their prediction, should Phil and Matt raise the price of the cookies? Justify your answer.

Enter your answer and your justification in the space provided.

14. Gabriel operates a riverboat and frequently offers tours of the river. Typically, a tour lasts for 3.25 hours. The riverboat usually takes 2.00 hours to make the 25-mile trip upstream from the dock and 1.25 hours to make the 25-mile return trip downstream.



Gabriel is considering offering a shorter tour that will last 2.50 hours and travel only 20 miles upstream before returning. Will the shorter tour be possible if the riverboat travels at the same speed as it does in the 3.25-hour tour? Show your steps and justify your answer.

Enter your answer, your work, and your justification in the space provided.

You have come to the end of the calculator section in Unit 1 of the test.

- **Review your answers in the calculator section of Unit 1 only.**
- **Then, close your test booklet and answer document and raise your hand to turn in your test materials.**

Unit 2
(Calculator)

Directions:

Today, you will take Unit 2 of the Algebra I Practice Test. You will be able to use a calculator.

Read each question. Then, follow the directions to answer each question. Mark your answers by completely filling in the circles in your answer document. Do not make any pencil marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely. If a question asks you to show or explain your work, you must do so to receive full credit. Only responses written within the provided space will be scored.

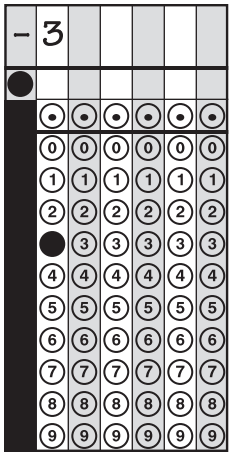
If you do not know the answer to a question, you may go on to the next question. If you finish early, you may review your answers and any questions you did not answer in this unit ONLY. Do not go past the stop sign.

Directions for Completing the Answer Grids

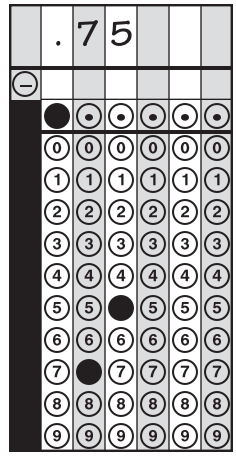
1. Work the problem and find an answer.
2. Write your answer in the boxes at the top of the grid.
3. Print only one number or symbol in each box. Do not leave a blank box in the middle of an answer.
4. Under each box, fill in the circle that matches the number or symbol you wrote above. Make a solid mark that completely fills the circle.
5. Do not fill in a circle under an unused box.
6. Fractions cannot be entered into an answer grid and will not be scored. Enter fractions as decimals.
7. See below for examples on how to correctly complete an answer grid.

EXAMPLES

To answer −3 in a question, fill in the answer grid as shown below.



To answer .75 in a question, fill in the answer grid as shown below.



15. A random sample of 200 teenagers participated in a taste test. Each teenager sampled four choices of fruit drink (labeled A, B, C, and D), and then were asked to pick a favorite. The table shows the results of this taste test.

	A	B	C	D	Total
Boys	45	25	30	20	120
Girls	25	10	30	15	80
Total	70	35	60	35	200

Based on the information given, which of the given statements are true?

Select **all** that apply.

A. 40% of the participants were girls.

B. 70% of the participants preferred A.

C. $\frac{20}{120}$ of the boys preferred D.

D. $\frac{10}{35}$ of the participants who preferred B were girls.

E. The proportion of boys who preferred C is equal to the proportion of girls who preferred C.

16.

$$y = x^2 - 2x - 5$$

$$y = x^3 - 2x^2 - 5x - 9$$

When the two equations shown are graphed in the coordinate plane, they intersect at a point. What is the y-coordinate of the point of intersection?

Enter your answer in the box.

17. Let $|x| + |y| = c$ where, c is a real number.

Determine the number of points that would be on the graph of the equation for **each** given case:

Case 1: $c < 0$

Case 2: $c = 0$

Case 3: $c > 0$

Justify your answers.

Enter your answers and justifications in the space provided.

18. The formula for finding the perimeter, P, of a rectangle with length l and width w is given.

$$P = 2l + 2w$$

Which formula shows how the length of a rectangle can be determined from the perimeter and the width?

A. $l = \frac{P}{2} - 2w$

B. $l = \frac{P-2w}{2}$

C. $l = \frac{P}{2} + w$

D. $l = \frac{P-2}{2w}$

19. Find the equation that is equivalent to the quadratic equation shown.

$$x^2 - 6x - 27 = 0$$

A. $x(x - 3) = 27$

B. $(x - 6)^2 = 63$

C. $(x - 3)^2 = 36$

D. $(x - 3)^2 = 28$

Use the information provided to answer Part A and Part B for question 20.

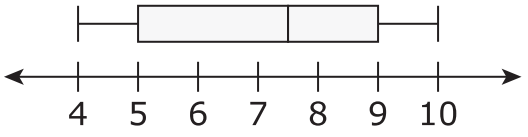
Members of two cross-country teams ran an obstacle course. The table shows the times, in minutes and seconds, for the members of team R to complete the course.

Team R Obstacle Course Times

5:32	6:48	4:25	8:05	7:23
5:37	5:12	6:26	5:31	4:43
6:08	7:16	5:52	5:21	6:53
4:49	5:02	6:33	5:54	6:20

The obstacle course times, in minutes and seconds, for team S are summarized in the box plot shown.

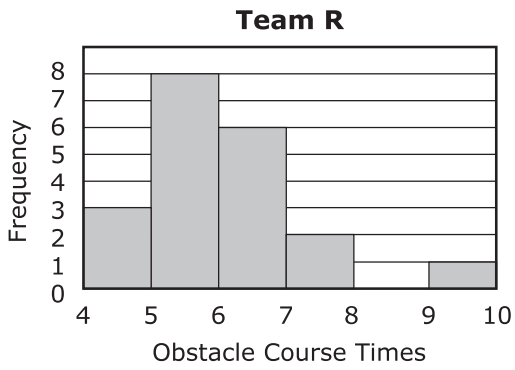
Team S Obstacle Course Times



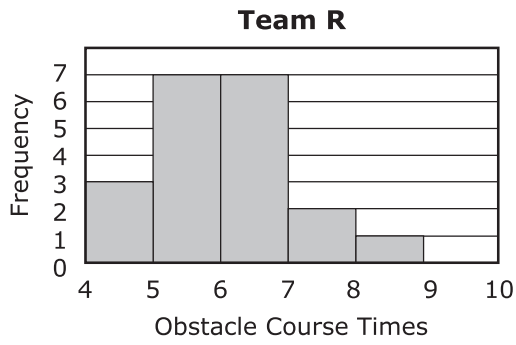
20. Part A

Which histogram represents the times from Team R on the obstacle course?

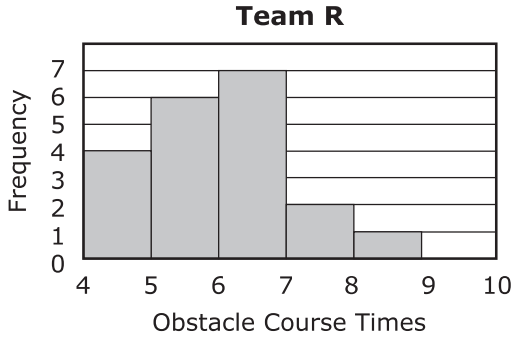
A.



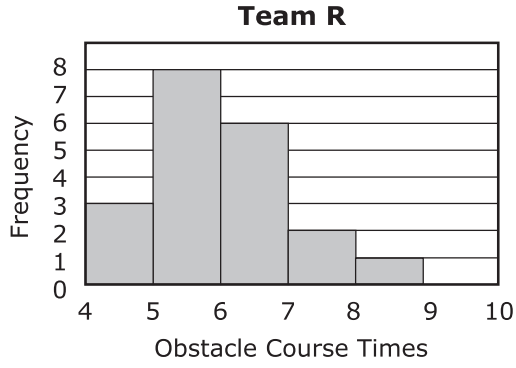
B.



C.



D.



Part B

Which statements are true about the data for team R and team S?

Select **all** that apply.

A. The median time of team R is less than the median time of team S.

B. The median time of team R is greater than the median time of team S.

C. The interquartile range of team R is less than the interquartile range of team S.

D. The interquartile range of team R is equal to the interquartile range of team S.

E. The data for team R is skewed to the left.

F. The data for team S includes an outlier.

21.

Elephant Population Estimates—Namibia
Combined estimates for Etosha National Park and the Northwestern Population

Year	Base Year	Estimated Number of Elephants
1998	3	3,218
2000	5	3,628
2002	7	3,721
2004	9	3,571

The elephant population in northwestern Namibia and Etosha National Park can be predicted by the expression $2{,}649(1.045)^{b}$, where b is the number of years since 1995.

What does the value 2,649 represent?

A. the predicted increase in the number of elephants in the region each year

B. the predicted number of elephants in the region in 1995

C. the year when the elephant population is predicted to stop increasing

D. the percentage the elephant population is predicted to increase each year

Use the information provided to answer Part A and Part B for question 22.

A high school is having a talent contest and will give different prizes for the best 5 acts in the show. First place wins the most money, and each place after that wins $50 less than the previous place.

22. Part A

Create a model that can be used to determine the total amount of prize money based on the value of the first place prize.

Enter your model in the space provided.

Part B

The talent contest has a total of $1,000 in prize money. What is the amount of money for **each** of the five prizes? Show your work.

Enter your answers and your work in the space provided.

23. Jerome is constructing a table of values that satisfies the definition of a function.

Input	−13	20	0	−4	11	−1	17	
Output	−15	−11	−9	−2	−1	5	5	13

Which number(s) can be placed in the empty cell so that the table of values satisfies the definition of a function?

Select **all** that apply.

A. −5

B. −1

C. 0

D. 2

E. 11

F. 17

Use the information provided to answer Part A and Part B for question 24.

Rachel manages a souvenir store. A popular item at the store is a small drum. The store typically sells 1,000 of these drums per month for $10 each. Rachel knows that for each $1 increase in the price of the drum, 20 fewer drums would be sold in a month.

24. Part A

What is a function for the monthly revenue, in dollars, from sales of the drum, $R(x)$, where x represents the number of price increases of $1? Monthly revenue equals the number of drums sold times the price of each drum.

A. $R(x) = (1{,}000 - x)(10 + 20x)$

B. $R(x) = (1{,}000 + 20x)(10 - x)$

C. $R(x) = (1{,}000 + x)(10 - 20x)$

D. $R(x) = (1{,}000 - 20x)(10 + x)$

Part B

Which statements are true about R, the monthly revenue from sales of the small drum?

Select **all** that apply.

A. To maximize revenue, the drum should be sold for $20.

B. To maximize revenue, the drum should be sold for $30.

C. To maximize revenue, the drum should have a price increase of $20.

D. The revenue is the same for a price increase of $10 and a price increase of $30.

E. The amount of revenue from the sales of the drum is 60% greater with a price increase of $5.

F. The maximum revenue is $8,000 more than the revenue from selling the drum with no price increase.

25. A local theater sells admission tickets for $9.00 on Thursday nights. At capacity, the theater holds 100 customers. The function $M(n) = 9n$ represents the amount of money the theater takes in on Thursday nights, where n is the number of customers. What is the domain of $M(n)$ in this context?

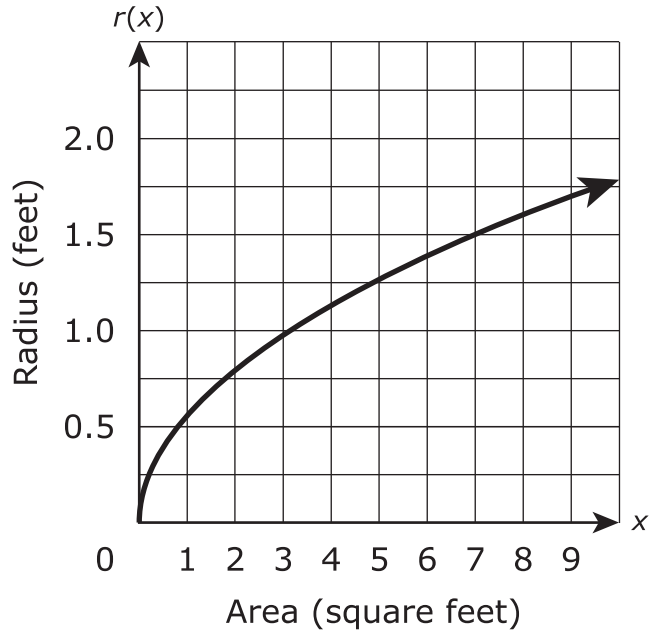
A. all whole numbers

B. all non-negative rational numbers

C. all non-negative integers that are multiples of 9

D. all non-negative integers less than or equal to 100

26. The function $r(x)$ represents the radius of a circle for a given area, x. A graph of the function is shown in the figure.



According to the graph, what is the approximate average rate of change in the radius of the circle as the area increases from 3 square feet to 7 square feet?

A. 0.125 foot per square foot

B. 0.25 foot per square foot

C. 0.5 foot per square foot

D. 8 feet per square foot

Use the information provided to answer Part A through Part C for question 27.

Consider the three points $(-4, -3)$, $(20, 15)$, and $(48, 36)$.

27. Part A

Which points are on the same line that passes through $(-4, -3)$, $(20, 15)$, and $(48, 36)$?

Select **all** that apply.

A. $(-8, -6)$

B. $(-2, -1)$

C. $(0, 0)$

D. $(4, 3)$

E. $(6, 8)$

Part B

Use the information from Part A to explain why the ratio of the y-coordinate to the x-coordinate is the same for any point on the line except the y-intercept.

Explain why this is not true for the y-intercept.

Enter your explanations in the space provided.

Part C

Do the points on the line $y = 3x - 2$ have a constant ratio of the y-coordinate to the x-coordinate for any point on the line except the y-intercept? Explain your answer.

Enter your answer and your explanation in the space provided.

28. In the equations listed, a, b, c, and d are real numbers. Which of the equations could have solutions that are non-real?

Select **all** that apply.

A. $ax^2 = b$

B. $ax^2 + bx = 0$

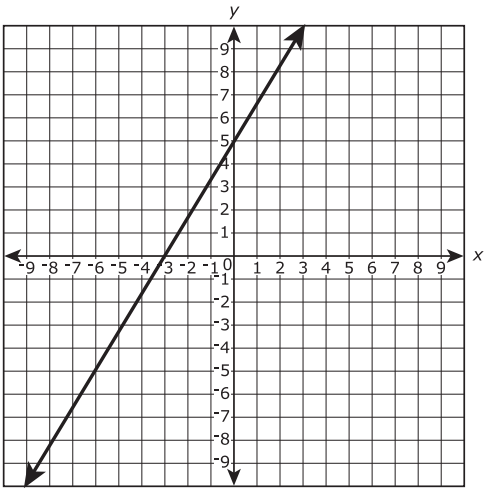
C. $ax^2 + bx + c = 0$

D. $(ax + b)(cx + d) = 0$

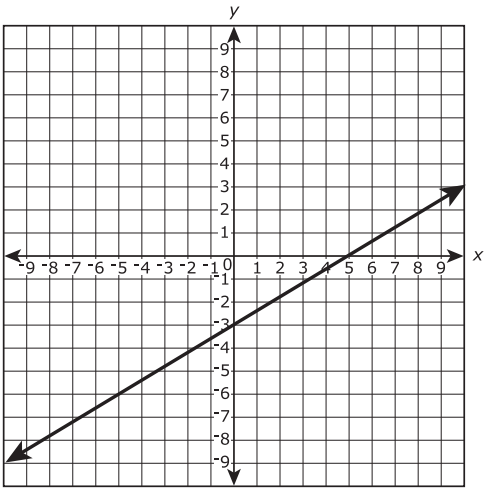
E. $a(bx + c)^2 = d$

29. Which graph represents the equation $5y - 3x = -15$?

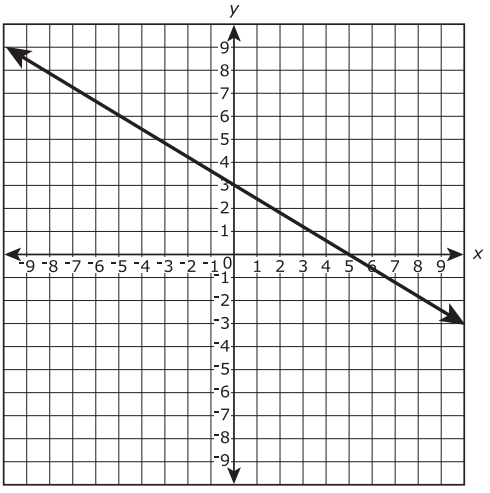
A.



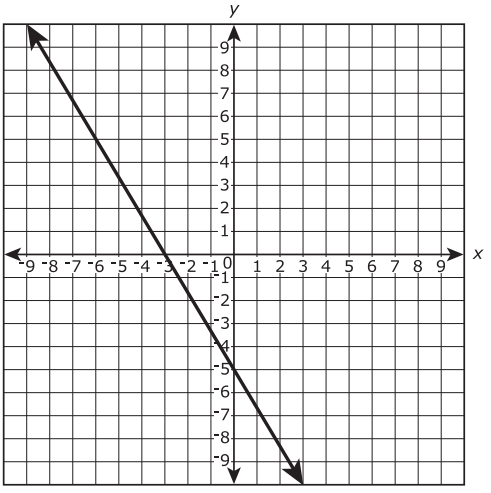
B.



C.

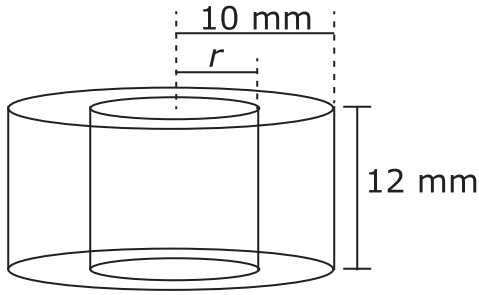


D.



Use the information provided to answer Part A and Part B for question 30.

The diagram shows two cylinders with bases that have the same center and heights of 12 millimeters.



30. Part A

Which is a function for the volume, V, that is inside the larger cylinder but outside the one with the smaller radius, r?

A. $V(r) = 1{,}200\pi - 12\pi r^2$

B. $V(r) = 120\pi - 12\pi r^2$

C. $V(r) = 12\pi r^2$

D. $V(r) = 12\pi(10 - r)^2$

Part B

Suppose that there is space between the inner and outer cylinders and the radius of the inner cylinder must be an integer greater than or equal to 3. What is the domain of V?

A. all integers greater than or equal to 3

B. 3, 4, 5, 6, 7, 8, 9, or 10

C. 3, 4, 5, 6, 7, 8, or 9

D. $3 \leq r \leq 9$

You have come to the end of Unit 2 of the test.

- **Review your answers from Unit 2 only.**
- **Then, close your test booklet and answer document and raise your hand to turn in your test materials.**


STOP

Unit 3
(Calculator)

Directions:

Today, you will take Unit 3 of the Algebra I Practice Test. You will be able to use a calculator.

Read each question. Then, follow the directions to answer each question. Mark your answers by completely filling in the circles in your answer document. Do not make any pencil marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely. If a question asks you to show or explain your work, you must do so to receive full credit. Only responses written within the provided space will be scored.

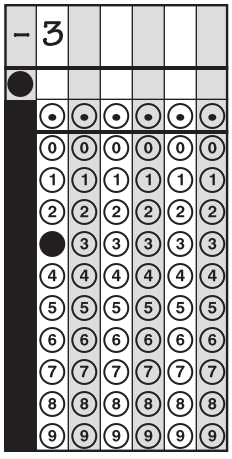
If you do not know the answer to a question, you may go on to the next question. If you finish early, you may review your answers and any questions you did not answer in this unit ONLY. Do not go past the stop sign.

Directions for Completing the Answer Grids

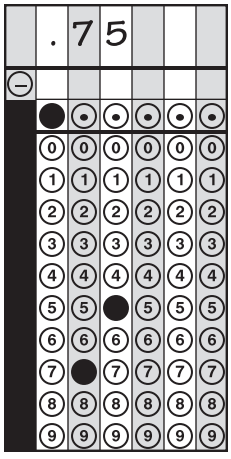
1. Work the problem and find an answer.
2. Write your answer in the boxes at the top of the grid.
3. Print only one number or symbol in each box. Do not leave a blank box in the middle of an answer.
4. Under each box, fill in the circle that matches the number or symbol you wrote above. Make a solid mark that completely fills the circle.
5. Do not fill in a circle under an unused box.
6. Fractions cannot be entered into an answer grid and will not be scored. Enter fractions as decimals.
7. See below for examples on how to correctly complete an answer grid.

EXAMPLES

To answer −3 in a question, fill in the answer grid as shown below.



To answer .75 in a question, fill in the answer grid as shown below.



31. A certain type of lily plant is growing in a pond in such a way that the number of plants is growing exponentially. The number of plants, N, in the pond at time t is modeled by the function $N(t) = ab^t$, where a and b are constants and t is measured in months. The table shows two values of the function.

t	$N(t)$
0	150
1	450

Which equation can be used to find the number of plants in the pond at time t?

A. $N(t) = 150(1)^t$

B. $N(t) = 450(1)^t$

C. $N(t) = 150(3)^t$

D. $N(t) = 450(3)^t$

Use the information provided to answer Part A and Part B for question 32.

The area, A, in square feet, of a rectangular storage bin in a warehouse is given by the function $A(x) = -2x^2 + 36x$, where x is the width, in feet, of the storage bin.

32. Part A

If the function is graphed in a coordinate plane, which statement would be true?

A. The x-intercepts of the function are 0 and 8, which are a lower bound and an upper bound for the possible values of the length of the storage bin.

B. The x-intercepts of the function are 0 and 8, which are a lower bound and an upper bound for the possible values of the width of the storage bin.

C. The x-intercepts of the function are 0 and 18, which are a lower bound and an upper bound for the possible values of the length of the storage bin.

D. The x-intercepts of the function are 0 and 18, which are a lower bound and an upper bound for the possible values of the width of the storage bin.

Part B

The process of completing the square can be used to calculate the width, in feet, of the storage bin that gives a maximum area. What is the missing value?

$$A = -2x^2 + 36x$$

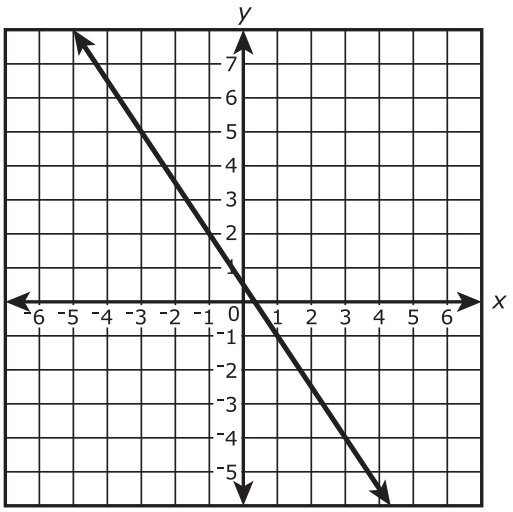
$$A = -2(x - 9)^2 + ?$$

Enter your answer in the box.

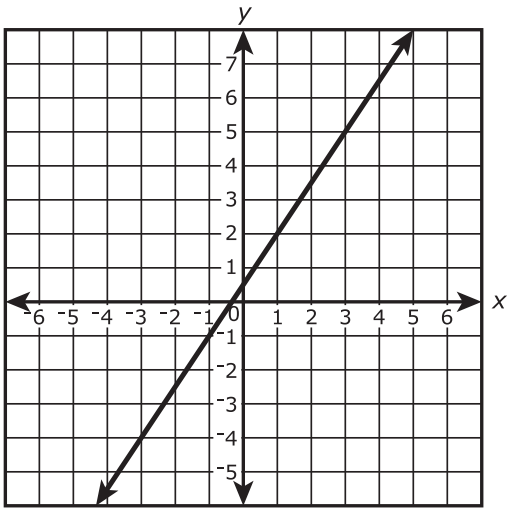
33. The ordered pairs $(20, -29.5), (21, -31)$, and $(22, -32.5)$ are points on the graph of a linear equation.

Which of the following graphs shows **all** of the ordered pairs in the solution set of this linear equation?

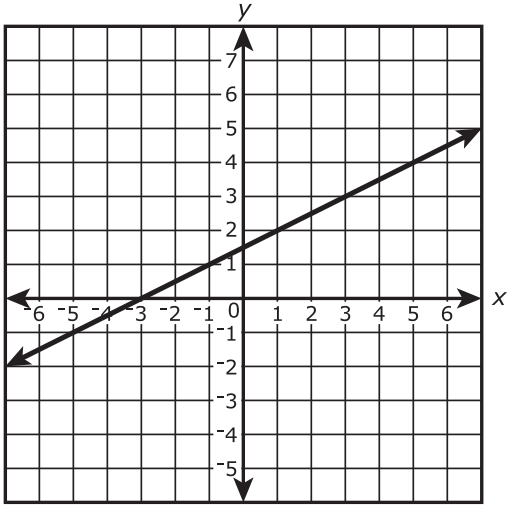
A.



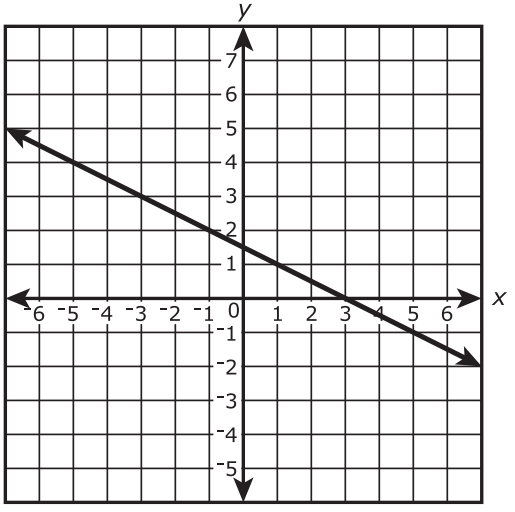
B.



C.



D.



Unit 3

GO ON ▶

34. Consider the following claim: If the point $(2 + d, y)$ is on the graph of the function $f(x) = x(x - 4)$, then the point $(2 - d, y)$ is also on the graph.

- Use algebra to show that the claim is true.
- What is the relationship between the line $x = 2$ and the graph of $f(x)$? Justify your reasoning.

Enter your work, your answer, and your justification in the space provided.

35. At the beginning of an experiment, the number of bacteria in a colony was counted at time $t = 0$. The number of bacteria in the colony t minutes after the initial count is modeled by the function $b(t) = 4(2)^t$. Which value and unit represent the average rate of change in the number of bacteria for the first 5 minutes of the experiment?

Select **all** that apply.

A. 24.0

B. 24.8

C. 25.4

D. 25.6

E. bacteria

F. minutes

G. bacteria per minute

H. minutes per bacteria

Use the information provided to answer Part A and Part B for question 36.

The function f is defined by $f(x) = x^2 - 2x - 24$.

36. Part A

If $f(x + 3) = x^2 + kx - 21$, what is the value of k?

Enter your answer in the box.

Part B

What are the zero(s) of $f(x + 3)$?

Select **all** that apply.

A. $x = -7$

B. $x = -4$

C. $x = -2$

D. $x = 0$

E. $x = 3$

F. $x = 6$

37. A ball was thrown upward into the air. The height, in feet, of the ball above the ground t seconds after being thrown can be determined by the expression $-16t^2 + 40t + 3$. What is the meaning of the 3 in the expression?

A. The ball took 3 seconds to reach its maximum height.

B. The ball took 3 seconds to reach the ground.

C. The ball was thrown from a height of 3 feet.

D. The ball reached a maximum height of 3 feet.

Use the information provided to answer Part A and Part B for question 38.

The Water Watch program is encouraging customers to reduce the amount of water they use each day. The program is selling low-flow showerheads, which use 2 gallons of water per minute, for $54.00 each.

A family currently has a showerhead that uses 5 gallons of water per minute and is considering replacing it with one of the low-flow showerheads. The family uses the shower an average of 20 minutes per day and pays $0.002 per gallon of water.

38. Part A

Create a model that can be used to determine the cost savings, in dollars, for the family to purchase and use a low-flow showerhead in terms of the number of days.

Then determine the number of days at which the family will start saving money. Justify your answer in terms of the context.

Enter your model, answer, and justification in the space provided.

Part B

One year after the low-flow showerhead is purchased, the cost of water increases by 5%. Create a new model to determine the cost savings, in dollars, with the increase in the cost of water.

Use your model to determine the number of days at which the family will start saving money after the increase in the cost of water. Justify your answer.

Enter your model, answer, and justification in the space provided.

39. If a is a non-zero, real number and $a(x - 3)^2 - b = c$,

- Prove that $x = 3 \pm \sqrt{\frac{b+c}{a}}$. Show your work.
- If $a = 2$ and $b = 5$, determine what condition(s) on c will restrict the solutions for x to real numbers.

Explain your reasoning.

Enter your proof, your answer, and your explanation in the space provided.

Use the information provided to answer Part A through Part D for question 40.

The population of a city in 2005 was 36,000. By 2010, the city's population had grown to 43,800 people.

40. Part A

Assuming that the population of the city has grown linearly since 2005 and continues to grow at the same rate, what will be the population in 2015?

Enter your answer in the box.

Part B

Which expression is an appropriate exponential model for the population of the city? Let t represent the time, in years, since 2005.

A. $36{,}000(1.04)^{t}$

B. $36{,}000(1.04)^{5t}$

C. $36{,}000(1.217)^{t}$

D. $36{,}000(1.217)^{5t}$

Part C

Assuming that the population of the city has grown exponentially since 2005 and continues to grow at the same rate, what will be the population in 2015? Give your answer to the nearest whole number.

Enter your answer in the box.

Part D

Another town's population could be modeled by the function $P(t) = 27{,}400(1.66)^{\frac{t}{10}}$, where P represents the population and t represents the time, in years, since 2005. Based on the model, by approximately what percent does the population of this town increase each year?

A. 1

B. 3

C. 5

D. 7

41. Caroline knows the height and the required volume of a cone-shaped vase she's designing. Which formula can she use to determine the radius of the vase?

A. $r = \sqrt{\frac{V}{3\pi h}}$

B. $r = \sqrt{\frac{3V}{\pi h}}$

C. $r = \frac{\sqrt{3V}}{\pi h}$

D. $r = \pm\sqrt{\frac{3V}{\pi h}}$

You have come to the end of Unit 3 of the test.

- **Review your answers from Unit 3 only.**
- **Then, close your test booklet and answer document and raise your hand to turn in your test materials.**

STOP

P

ALG I

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