Algebra I Sample Items
(Updated Spring 2009)

Purpose

The purpose of this Item Sampler is to provide teachers and students with examples of the types of questions that will appear on the Algebra I End-of-Course Assessment. The types of questions include multiple-choice, gridded response, and constructed response. *Note: When filling in response grids, any answer that can be written as a mixed number must be bubbled in as an improper fraction or decimal. For example, if the answer to a problem is 2 ½, then the response must be bubbled in as 2.5 or 5/2.*

For schools testing online, there is an online practice test to be given prior to the actual test. The purpose of the online practice test is to help familiarize students with the online functionalities and item types. Schools testing online are encouraged to use this item sampler, as well.

Teachers are encouraged to use this Item Sampler to:

- Familiarize themselves and their students with the types of items that will be part of the Algebra I End-of-Course Assessment.
- Gather information about students' knowledge of the standards and use that information to drive instruction.
- Assist in creating other assessments and activities.

On a related note, High Achiever (http://dualmus.doe.state.in.us/hiach/) is a Web-Based tool that teachers can use to create assessments and exercises based on Indiana's Algebra I Standards.

Depth of Knowledge (DOK)

Every item on the Algebra I test is assigned a "depth of knowledge" level by a committee of Indiana educators consisting of teachers and math specialists. The assignment of Depth of Knowledge (DOK) levels ensures the items on each test represent a range with regard to the cognitive demand required from students as they respond to test questions. The No Child Left Behind Act requires different levels of complexity within assessments.

See the Depth of Knowledge PowerPoint for a general overview at http://www.doe.in.gov/core40eca/.

Reference Sheet

The Algebra I Mathematics Reference Sheet may be used on all sessions of the Algebra I test. Teachers are encouraged to use the reference sheet throughout the year to familiarize students with the structure of and information contained in the reference sheet.

Linear Equations and Inequalities

1. Solve 5x + 12 = x – 4.

   A. -4
   B. $-8/3$
   C. 2
   D. $4/3$

2. Solve 2(2 – x) ≤ -3x – 2 for *x*.

   A. x ≤ -6
   B. x ≤ -3
   C. x ≤ 2
   D. x ≥ 6

3. Solve 5x – 10y = -40 for *y*.

   A. y = -2x – 4
   B. y = $-\frac{1}{2}x+4$
   C. y = $\frac{1}{2}x+4$
   D. y = 2x + 4

4. Solve $\frac{2x+3}{4}=\frac{x}{4}$.

   A. x = -3
   B. x = -1
   C. x = 1
   D. x = 3

5. The formula $A = \frac{1}{2}bh$ represents the area of a triangle where A represents the area, b is the base of the triangle and h is the height of the triangle.

   Solve this formula for b.

   A. $b = 2A - h$
   B. $b = A - \frac{1}{2}h$
   C. $b = \frac{A}{2h}$
   D. $b = \frac{2A}{h}$

6. Megan bought 7 charms for $31.50. Each charm costs the same amount of money.

   Write an inequality that can be used to find the maximum amount of charms (c) Megan can buy with $75.

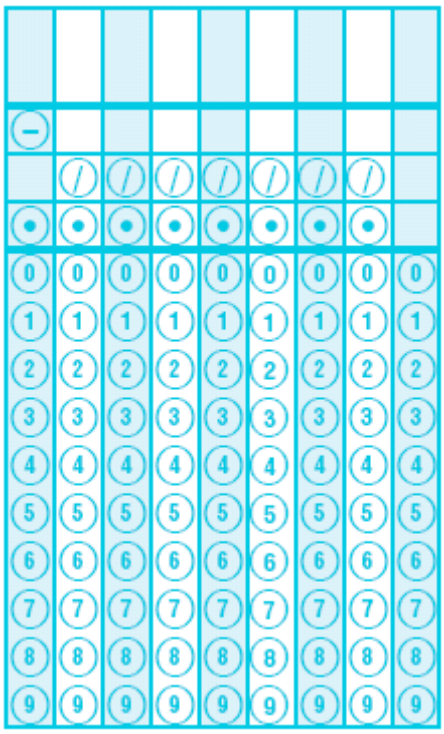
   Answer_____

   What is the maximum amount of charms Megan can buy with $75?

   Answer_____

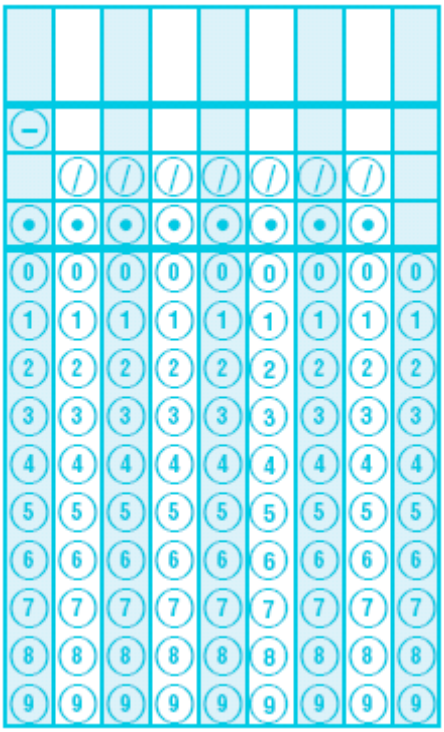
7. Solve $-2x - 1 = \frac{3x+5}{2}$ for x.

   Fill in your answer on the response grid to the right.



8. Solve x + 4.25 = 3.5x – 1.5x – 0.75.

   Fill in your answer on the response grid below.



9. Solve the inequality below for *x*.

$$\frac{3}{4}x + 2 \le 3x - 1$$

A. $x \le 4/3$

B. $x \le 4/15$

C. $x \ge 4/5$

D. $x \ge 4/3$

10. The equation below was solved incorrectly. Study the work below.

$$5x + 5 = -3(x - 1)$$

Step 1: $5x + 5 = -3x + 3$
Step 2: $2x = -2$
Step 3: $x = -1$

Describe the mistake in the work shown above.

_____

_____

_____

What is the solution to the equation $5x + 5 = -3(x - 1)$?

Answer_____

11. Tony works at a bike store. Tony earns $300 every week plus $15 for every bike (*b*) that he sells.

Write an equation that can be used to determine Tony's weekly salary (*T*) given the number of bikes (*b*) he sells.

Answer_____

What is the minimum number of bikes Tony must sell in a week to earn a weekly salary of $500?

Answer_____

12. Alex sells T-shirts. It costs Alex $6.50 to buy each T-shirt. Alex also pays $150 each month to rent equipment to add print to the T-shirts.

    Alex sells each T-shirt for $12.

    Write an inequality that can be used to determine the number of T-shirts (T) Alex must sell each month in order to make a profit for the month. *(Assume that Alex sells each T-shirt he buys.)*

    Answer_____

    What is the minimum number of T-shirts Alex must sell in order to make a profit in a given month? *(Assume that Alex sells each T-shirt he buys.)*

    Answer_____

Relations and Functions

1. What is the domain and range of the relation shown in the table below?

x	y
-1	-5
1	-1
3	3
5	7

Domain_____

Range_____

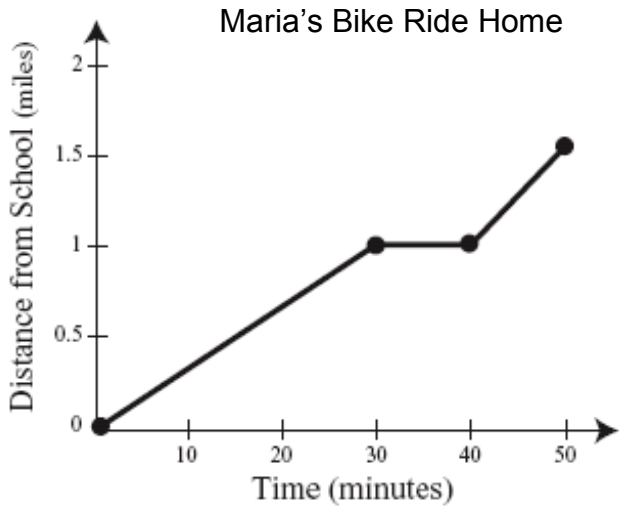
Is the relation in the table above a function?

Answer_____

2. Which relation below is NOT a function?

   A. { (-2, 4), (1, 3), (0, 4) }
   B. { (5, 5), (4, 4), (3,3) }
   C. { (-4, 0), (-7, 0), (11, 0) }
   D. { (1, 4), (2, 5) (1, 7) }

3. Maria rode her bike home from school. The graph below shows Maria's distance from school over time.



Describe Maria's bike ride home with respect to time and distance. Be sure to include any changes in speed during the bike ride.

Linear Functions and Inequalities

1. Which equation has a graph with no y-intercept?

   A. $y = 5$
   B. $x = 1$
   C. $x = y$
   D. $y = -x$

2. What is the slope, x-intercept, and y-intercept of the graph of $3x + y = 7$?

   Slope = _____ **x-intercept = _____** **y-intercept = _____**

3. What is the y-intercept of the graph of $-2y = x – 4$?

   A. -4
   B. -2
   C. 2
   D. 4

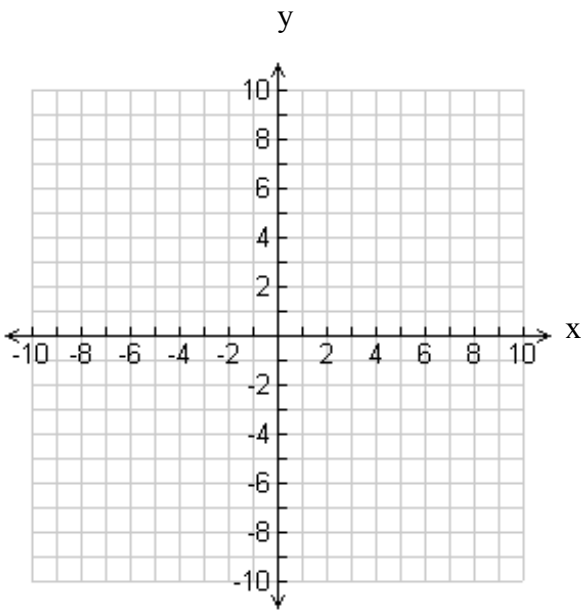
4. Which of the following is an equation of a line with a slope of -2 that passes through the point (-4, 3)?

   A. $y = -2x – 5$
   B. $y = -2x – 4$
   C. $y = -2x + 3$
   D. $y = -2x + 11$

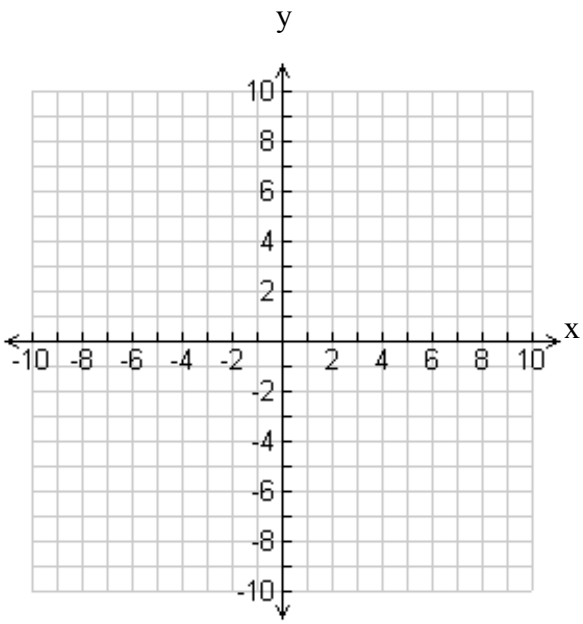
5. Write an equation of a line that passes through the points (-2, 5) and (1, 2).

   Answer_____

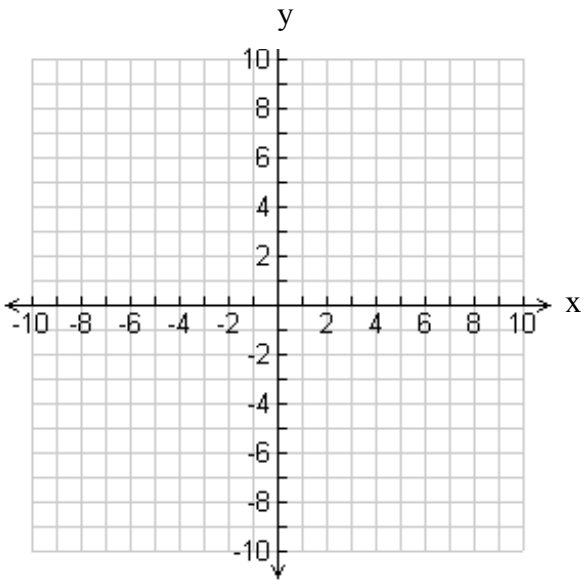
6. Graph $y = \frac{2}{3}x - 1$.



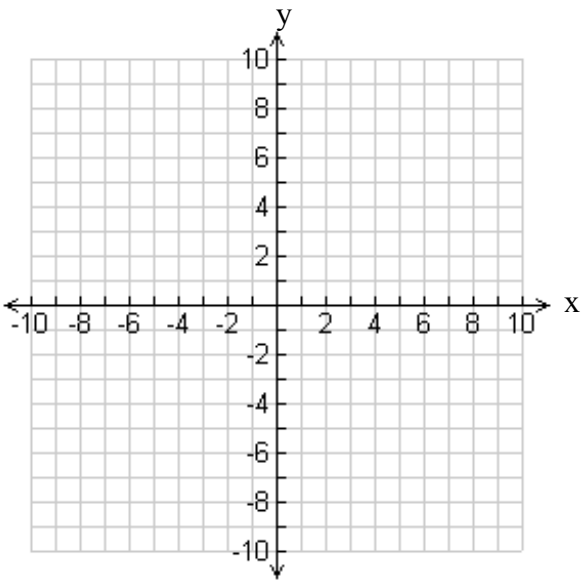
7. Graph 6x – 2y = 10.



8. Graph $y \le \frac{-1}{3}x + 4$.



9. Graph -5y < 10x.



10. Sue earns $2 for each CD she sells and $2.50 for each DVD she sells. Sue earned $950 last week selling CDs and DVDs.

    Write an equation that can be used to determine the number of DVDs (*d*) Sue sold last week if she sold 305 CDs.

    Answer_____

    How many DVDs did Sue sell last week?

    Answer_____

11. Wes bought a pizza with 2 toppings from Bill's Pizza Place for $11.00. Lisa bought a pizza with 5 toppings from Bill's Pizza Place for $14.75.

    Each topping at Bill's Pizza Place costs the same amount.

    What is the price per topping at Bill's Pizza Place?

    Answer_____

    Write an equation that can be used to determine the cost (*C)*, in dollars, of a pizza at Bill's Pizza Place given the number of toppings *(T)*.

    Answer_____

Pairs of Linear Equations and Inequalities

1. Solve the system of equations below.

$$-5y + 3x = -16$$
$$10y + 4x = 62$$

What is the x-value in the solution?

A. 3
B. 4.6
C. 5
D. 6.6

2. Solve the system of equations below.

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

What is the value of *y* in the solution?

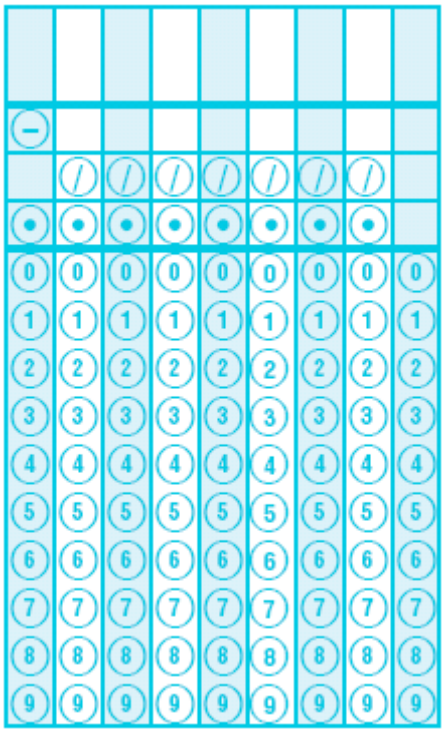
A. -3
B. -1
C. 1
D. 3

3. Kim bought 4 shirts and 3 pairs of jeans for $109.85.
Jim bought 6 shirts and 1 pair of jeans for $94.95.

Each shirt costs the same amount.
Each pair of jeans costs the same amount.

What is the cost, in dollars, for 1 pair of jeans?

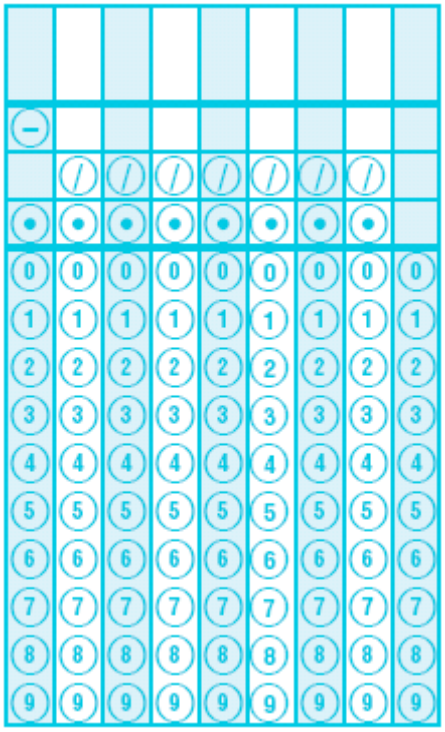
Fill in your answer on the response grid to the right.



4. Jen is 13 years younger than Andre. The sum of their ages in years is 137.

   What is Andre's age in years?

   Fill in your answer on the response grid below.



5. Solve the system of equations below.

   $3x - 2y = -7$
   $-4x + y = 11$

Answer_____

6. A group of 2 adults and 4 children paid $95 for admission to a water park. A different group of 3 adults and 7 children paid $155 for admission to the same water park.

   Write a system of equations that can be used to determine the admission price to the water park for an adult (A) and a child (C).

   Answer_____

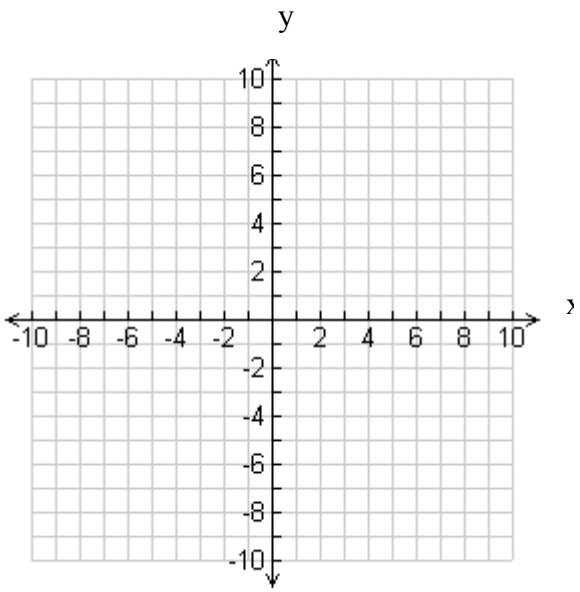
   _____

   What is the admission price, in dollars, for 1 child?

   Answer_____

7. Graph the system of linear inequalities below.

   $-3x + 2y > -6$
   $-y \geq 2x - 5$



Polynomials

1. Multiply (3x – 1) (2x + 5).

   A. $6x^2 + 6x - 5$
   B. $6x^2 - 13x + 4$
   C. $6x^2 + 13x - 5$
   D. $6x^2 + 17x - 5$

2. Which of the following is equivalent to $(x-4)^2$?

   A. $x^2 - 16$
   B. $x^2 + 16$
   C. $x^2 - 8x - 16$
   D. $x^2 - 8x + 16$

3. Add $(5x^3 - 3x + 7) + (2x^3 + 6x^2 - x)$.

   A. $7x^3 + 3x^2 - x + 7$
   B. $7x^3 - 3x^2 - x + 7$
   C. $7x^3 + 6x^2 - 4x + 7$
   D. $7x^3 + 6x^2 - 2x + 7$

4. Subtract $(9x^2 + 3x - 4) - (3x^2 + 8x - 1)$.

   A. $6x^2 - 5x - 3$
   B. $6x^2 + 5x - 5$
   C. $6x^2 + 11x - 5$
   D. $6x^2 - 5x - 4$

5. What is the greatest common factor of the expression below?

$$24a^6b^2 - 18a^3b + 12a^2b^3$$

   A. $2ab$
   B. $2a^3b^2$
   C. $6a^2b$
   D. $6a^6b^3$

6. Divide $(18m^5p^4 + 36m^7p^3 - 4m^3p)$ by $(2m^3p)$.

   A. $9m^2p^3 + 18m^4p^2 - 2$
   B. $12m^2p^3 + 34m^4p^2 - 2$
   C. $9m^2p^3 + 18m^4p^2 - 2mp$
   D. $12m^2p^3 + 34m^4p^2 - 2mp$

7. Which is equivalent to $3x^2 \cdot 2x^4$?

   A. $5x^6$
   B. $5x^8$
   C. $6x^6$
   D. $6x^8$

8. Which expression is equivalent to $(g^6h^3)^3$?

   A. g^9h^6
   B. g^9h^9
   C. $g^{18}h^6$
   D. $g^{18}h^9$

9. The volume *(V)* of a right circular cone can be found using the formula $V = \frac{1}{3}\pi \cdot r^2h$, where r is the radius and h is the height.

   Which equation represents the volume of a right circular cone with a radius of $6x$ and a height of 5?

   A. $V = 20\pi \cdot x$
   B. $V = 20\pi \cdot x^2$
   C. $V = 60\pi \cdot x$
   D. $V = 60\pi \cdot x^2$

10. Simplify $\frac{15m^7c^6}{3mc^2}$.

A. $5m^6c^3$
B. $5m^6c^4$
C. $5m^7c^4$
D. $12m^6c^4$

11. Factor $4x^2 - 1$.

Answer_____

12. Factor $x^2 - 3x - 28$.

Answer_____

Quadratic and Radical Equations and Functions

1. Solve $x^2 = -x + 30$.

A. x = -6, -5
B. x = -6, 5
C. x = -5, 6
D. x = 5, 6

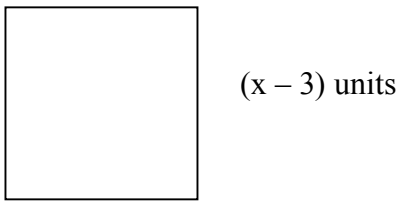
2. Solve $(x+3)^2 = 36$.

A. x = 3
B. x = 9
C. x = -9, 3
D. x = 3, 9

3. Solve $2x^2 - 4x - 3 = 0$.

   A. $x = 1 \pm 2\sqrt{10}$
   B. $x = 2 \pm \sqrt{10}$
   C. $x = \dfrac{2 \pm \sqrt{10}}{2}$
   D. $x = \dfrac{2 \pm \sqrt{2}}{2}$

4. Consider the square below.



   What is the value of x if the area of the square is126.5625 square units?

   A. 8.25
   B. 11.25
   C. 14.25
   D. 17.25

5. The graph of which function has x-intercepts (-4, 0) and (7, 0)?

   A. y = (x – 4) (x + 7)
   B. y = (x + 4) (x – 7)
   C. y = (x + 4) (x + 7)
   D. y = (x – 4) (x – 7)

6. What are the zeros of the function $y = x^2 - x - 20$?

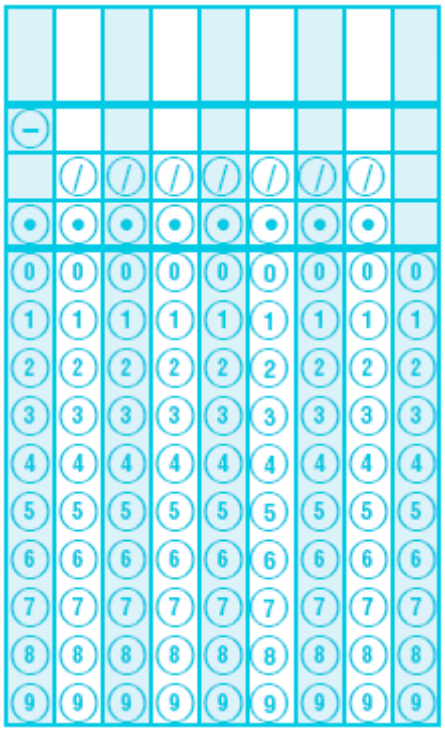
   A. -5 and -4
   B. -5 and 4
   C. -4 and 5
   D. 4 and 5

7. What are the x-intercepts of the graph of $y = 2x^2 + x - 10$?

   A. (-5, 0) and (2, 0)
   B. (-2, 0) and (5, 0)
   C. (-2, 0) and (2.5, 0)
   D. (2, 0) and (-2.5, 0)

8. What is the solution of $x^2 - 16x = -64$?

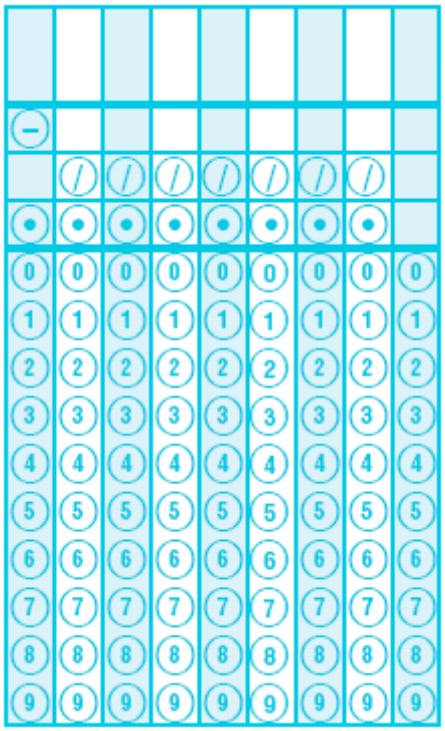
   Fill in your answer on the response grid to the right.



9. The height (h) of a stone, in meters, thrown into the air can be modeled by the equation $h = -4.9t^2 + 20t + 10$, where t represents time in seconds.

   How many seconds will it take for the stone to hit the ground $(h = 0)$ after it is thrown into the air? Round your answer to the tenths place.

   Fill in your answer on the response grid to the right.



10. A rectangular dance floor measures 24 feet by 32 feet. The length and width of the floor will both be increased by x feet.

    Write an equation that can be used to determine the value of x, in feet, if the area of the new dance floor is 1,174.25 square feet.

    Answer_____

    What are the dimensions of the new dance floor, in feet, if the area is 1,174.25 square feet?

    Answer_____

    What is the perimeter of the new dance floor, in feet, if the area is 1,174.25 square feet?

    Answer_____

11. Solve $\sqrt{2x+3} = x$.

    A. $x = -3$
    B. $x = 1$
    C. $x = 3$
    D. $x = -1, 3$

12. The height (h) of a certain insect, in feet, that jumps straight up into the air is modeled by the equation $h = -16t^2 + vt$, where t is the time in seconds after the insect jumps, and v is the initial upward velocity of the insect.

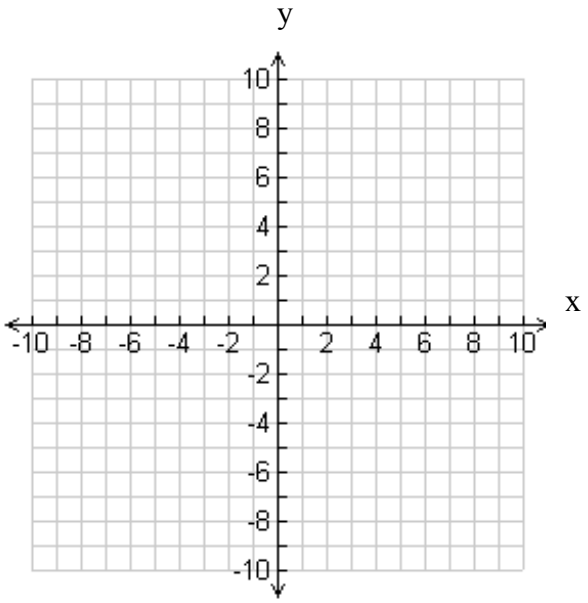
    Write an equation that can be used to find the height (h) of the insect, in feet, after t seconds, if the insect's initial upward velocity is 4 feet per second.

    Answer_____

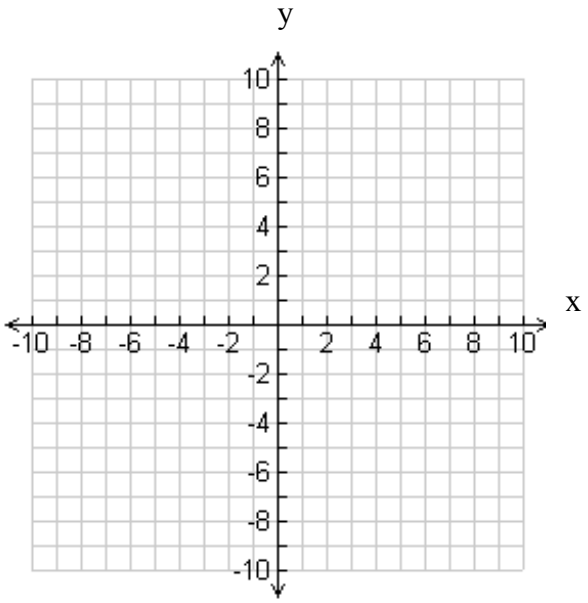
    How long, in seconds, will it take for the insect to hit the ground after it jumps?

    Answer_____

13. Graph $y = x^2 + 4x - 3$.



14. Graph $y = -2x^2 + 8x$.



Linear Equations and Inequalities

1. A
2. A
3. C
4. A
5. D
6. $4.5c \leq 75$ and 16
7. -1
8. 5
9. D
10. In step 2, the equation should read 8x = -2. When combining like terms, 3x was subtracted from 5x instead of adding 3x to both sides of the equation. (Or other valid explanation.)
    $x = -\frac{1}{4}$.
11. $T = 300 + 15b$ and 14
12. $12T > 6.5T + 150$ and 28

Relations and Functions

1. Domain: -1, 1, 3, 5
   Range: -5, -1, 3, 7
   Yes
2. D
3. Maria rode her bike at a constant speed for the first 30 minutes. Then, she rested for 10 minutes. Finally, during the last 10 minutes, Maria rode at a constant speed, but at a faster pace than before.

Linear Functions and Inequalities

1. B
2. slope = -3, x-int. = $7/3$, y-int. = 7
3. C
4. A
5. y = -x + 3
6. The graph of $y = \frac{2}{3}x - 1$. The line contains the y-intercept of -1. Other points contained in the line are (3, 1) and (-3, -3).
7. The graph of 6x – 2y = 10. The line contains the y-intercept of -5. Other points contained in the line are (1, -2), (-1, -8), and ($5/3$, 0).
8. The graph of $y \le \frac{-1}{3}x + 4$. A solid line with a y-intercept of 4 should be graphed. Other points contained in the line are (3, 3) and (-3, 5). The solution (shading) is below the line $y = \frac{-1}{3}x + 4$.
9. The graph of -5y < 10x (y > -2x). A dashed line with a y-intercept of 0 should be graphed. Other points contained in the line are (1, -2) and (-1, 2). The solution (shading) is above the dashed line y = -2x.
10. 2.5*d* + 610 = 950 and 136
11. $1.25 and *C* = 8.5 + 1.25*T*

Pairs of Linear Equations and Inequalities

1. A
2. B
3. 19.95
4. 75
5. (-3, -1)
6. 2A + 4C = 95
   3A + 7C = 155
   $12.50
7. The graph of -3x + 2y > -6 (Slope Int. Form: y > 3/2x – 3). Shading should be above the dashed line.
   The graph of –y ≥ 2x – 5 (Slope Int. Form: y ≤ -2x + 5). Shading should be below the solid line.
   The solution set is the intersection of the graphs (overlapping shaded region).

Polynomials

1. C
2. D
3. C
4. A
5. C
6. A
7. C
8. D
9. D
10. B
11. (2x – 1) (2x + 1)
12. (x – 7) (x + 4)

Quadratic and Radical Equations and Functions

1. B
2. C
3. C
4. C
5. B
6. C
7. D
8. 8
9. 4.5 or 9/2 **(NOT 4 ½ -- Mixed #'s are not allowed on gridded response items.)**
10. (x + 24) (x + 32) = 1,174.25 and 30.5 feet by 38.5 feet and 138 feet
11. $h = -16t^2 + 4t$ and ¼
12. C
13. The graph of $y = x^2 + 4x - 3$: Vertex at (-2, -7). Parabola passing through (-2, -7), (0, -3), (-4, -3), and/or other points contained in the graph of $y = x^2 + 4x - 3$.
14. The graph of $y = -2x^2 + 8x$: Vertex at (2, 8). Parabola passing through (2, 8), (0, 0), (4, 0), and/or other points contained in the graph of $y = -2x^2 + 8x$.