5.1 Start Thinking

Graph the linear equations $y = -x + 7$ and $y = \frac{2}{3}x + \frac{11}{3}$ on a coordinate plane. The two lines intersect at the point $(2, 5)$.

What does the point of intersection of two linear equations represent? Substitute the values into each equation. Is the point a solution to each equation? Are there any other points that will satisfy both equations? Why or why not?

5.1 Warm Up

Tell whether the ordered pair is a solution to the equation.

1. $(4, 4); y = -x + 8$

2. $(-2, 3); y = -2x - 1$

3. $(3, 2); x + 6y = 13$

4. $(1, 3); 4x - 3y = -5$

5. $(-1, -2); y = 3x$

6. $(-3, 9); y = -3x$

7. $(0, -1); y = 4x - 1$

8. $(-2, 8); y = -2x - 1$

5.1 Cumulative Review Warm Up

Write an equation in point-slope form of the line that passes through the given point and has the given slope.

1. $(1, 2); m = 1$

2. $(8, -5); m = -5$

3. $(8, 1); m = -4$

4. $(-5, 5); m = 4$

5. $(4, 0); m = 5$

6. $(-5, 3); m = 1$

7. $(8, 1); m = \frac{2}{3}$

8. $(7, -2); m = -\frac{4}{5}$

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5.1 Practice A

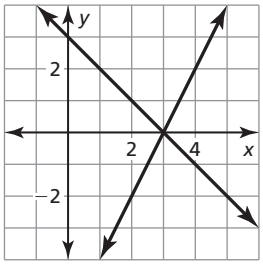
In Exercises 1 and 2, tell whether the ordered pair is a solution of the system of linear equations.

1. $(3, 4)$; $x + y = 7$
$x - 2y = -5$

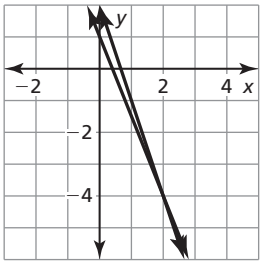
2. $(-5, 2)$; $y = -x - 3$
$y = 3x + 10$

In Exercises 3 and 4, use the graph to solve the system of linear equations. Check your solution.

3. $x + y = 3$
$2x - y = 6$



4. $5x + 2y = 2$
$3x + y = 2$



In Exercises 5 and 6, solve the system of linear equations by graphing.

5. $y = x + 4$
$y = -x + 8$

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

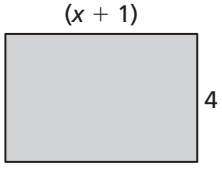
In Exercises 7 and 8, use a graphing calculator to solve the system of linear equations.

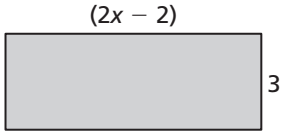
7. $0.2x - 0.2y = 2$
$0.9x + 0.6y = 6$

8. $-1.5x + y = 2.5$
$15x - 1.5y = 4.8$

9. You sell bracelets for \$2 each and necklaces for \$3 each at a local flea market. You collect \$95, selling a total of 37 jewelry items. How many of each type of jewelry did you sell?

10. For each rectangle below, write a linear equation that represents the area y of the rectangle. Solve this system of two linear equations by graphing. Interpret your solution.





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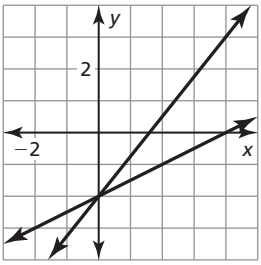
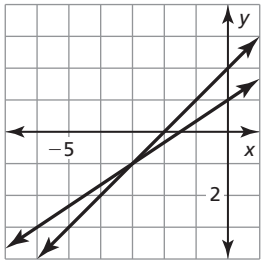
5.1 Practice B

In Exercises 1 and 2, use the graph to solve the system of linear equations. Check your solution.

1. $5x - 4y = 8$
$-x + 2y = -4$



2. $4x - 6y = -6$
$4x - 4y = -8$



In Exercises 3–6, solve the system of linear equations by graphing.

3. $3x - 5y = 2$
$y = 2$

4. $-x + 4y = -10$
$2x - 3y = 5$

5. $y = -\frac{3}{2}x - 3$
$y = \frac{1}{2}x + 5$

6. $3x + 3y = -3$
$5x + 2y = 1$

In Exercises 7 and 8, use a graphing calculator to solve the system of linear equations.

7. $0.8x - 0.9y = 0$
$x - 0.5y = 1$

8. $4.2x - y = 3$
$2x - y = -0.3$

9. You spend \$11 on school supplies. You purchase pencils for \$0.25 each and pens for \$2 each. You purchase a total of 30 pencils and pens. How many of each did you purchase?

10. You begin with \$90 in your savings account and your friend begins with \$35 in her savings account. You deposit \$10 in savings each week, and your friend deposits \$15 in savings each week.

a. Write and graph a system of linear equations that represent the amounts in each of your savings accounts.

b. Your friend says that in 10 weeks you will both have the same amount of money in your savings accounts. Is your friend correct? Use the graph from part (a) to explain your answer.

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5.1 Enrichment and Extension

Solving Systems Using Matrices

Example: Solve the system of equations by using matrices. Check your solution.

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

Set up a matrix equation: $\begin{bmatrix} -1 & 4 \\ -1 & 1 \end{bmatrix} \bullet \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -4 \\ 2 \end{bmatrix}$

To solve a matrix equation, multiply each side of the equation by the inverse of the coefficient matrix. Anything multiplied by its multiplicative inverse will equal the multiplicative identity, eliminating the values on the left side of the equation, and solving for x and y.

If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then $A^{-1} = \frac{1}{ad - bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$. A^{-1} is the inverse of A.

$$\frac{1}{3}\begin{bmatrix} 1 & -4 \\ 1 & -1 \end{bmatrix}\begin{bmatrix} -1 & 4 \\ -1 & 1 \end{bmatrix} \bullet \begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{3}\begin{bmatrix} 1 & -4 \\ 1 & -1 \end{bmatrix}\begin{bmatrix} -4 \\ 2 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \bullet \begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{3}\begin{bmatrix} -12 \\ -6 \end{bmatrix}$$

$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -4 \\ -2 \end{bmatrix} \rightarrow (-4, -2)$ is the solution to the system of equations.

In Exercises 1–4, solve the system of equations by using matrices. Check your solution.

1. $-10x - 6y = 8$
$6x - 3y = 15$

2. $x - 4y = 11$
$5x - 7y = -10$

3. $-4x + 5y = -19$
$-x - 2y = 5$

4. $7x - y = -1$
$-3y = -3 + 6x$

5. The sum of two numbers is 5. One of the numbers is 9 less than the other number. What are the two numbers?

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5.1 Puzzle Time

What Asks No Questions But Must Be Answered?

Write the letter of each answer in the box containing the exercise number.

Tell whether the ordered pair is a solution of the system of linear equations.

1. $(-1, 6)$; $6x + 3y = 18$
$2x + y = 7$

2. $(12, 0)$; $2x + 6y = 24$
$\frac{1}{2}x + 3y = 6$

3. $(5, -8)$; $9x + 7y = -11$
$-2x - 5y = 30$

4. $(16, 1)$; $y = -\frac{1}{4}x + 5$
$y = \frac{1}{6}x - 2$

Solve the system of linear equations by graphing.

5. $y = x + 1$
$y = -x - 1$

6. $y = -2x - 4$
$y = 3x + 1$

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

8. $4x - y = 2$
$x - y = -1$

9. $x + y = -5$
$-x + 2y = 5$

10. $x + 2y = 12$
$x - 2y = -12$

11. The perimeter of your closet is equal to 18 feet. The difference of the length and the width equals 1 foot. Write a system of linear equations which represent the perimeter of your closet in respect to its width (x-axis) and length (y-axis), and solve the system by graphing.

Answers

E. yes

L. no

O. $(-5, 0)$

R. $(-3, 4)$

D. $(4, 5)$

H. $(-1, 0)$

B. $(0, 6)$

T. $(1, 2)$

O. $(-1, -2)$

8	5	3		11	6	9	7	10	2	4	1

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