Week One

Semester Algebra

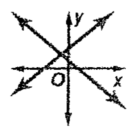
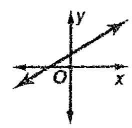
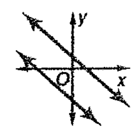
Desoto County Schools

NAME ______________________________ DATE ____________ PERIOD _____

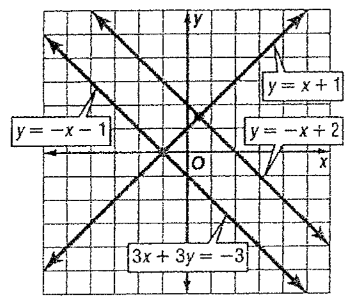
5-1 Study Guide and Intervention

Graphing Systems of Equations

Number of Solutions Two or more linear equations involving the same variables form a **system of equations**. A solution of the system of equations is an ordered pair of numbers that satisfies both equations. The table below summarizes information about systems of linear equations.

Graph of a System	intersecting lines 	same line 	parallel lines 
Number of Solutions	exactly one solution	infinitely many solutions	no solution
Terminology	consistent and independent	consistent and dependent	inconsistent

Example **Use the graph at the right to determine whether the system has *no* solution, *one* solution, or *infinitely many* solutions.**



a. $y = -x + 2$
$y = x + 1$

Since the graphs of $y = -x + 2$ and $y = x + 1$ intersect, there is one solution.

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

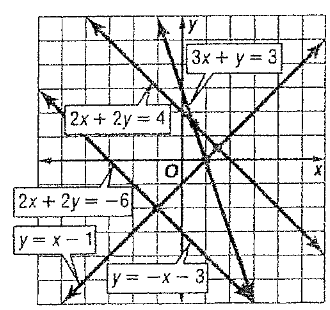
Since the graphs of $y = -x + 2$ and $3x + 3y = -3$ are parallel, there are no solutions.

c. $3x + 3y = -3$
$y = -x - 1$

Since the graphs of $3x + 3y = -3$ and $y = -x - 1$ coincide, there are infinitely many solutions.

Exercises

Use the graph at the right to determine whether each system has *no* solution, *one* solution, or *infinitely many* solutions.



1. $y = -x - 3$
$y = x - 1$

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

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

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

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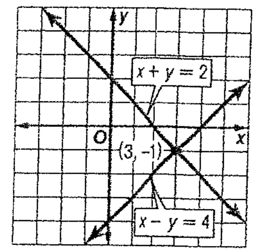
5-1 Study Guide and Intervention *(continued)*

Graphing Systems of Equations

Solve by Graphing One method of solving a system of equations is to graph the equations on the same coordinate plane.

Example **Graph each system of equations. Then determine whether the system has *no* solution, *one* solution, or *infinitely many* solutions. If the system has one solution, name it.**

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

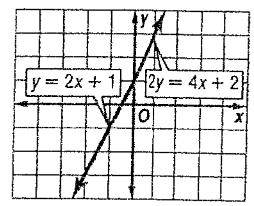


The graphs intersect. Therefore, there is one solution. The point (3, −1) seems to lie on both lines. Check this estimate by replacing x with 3 and y with −1 in each equation.

$x + y = 2$
$3 + (-1) = 2$ ✓
$x - y = 4$
$3 - (-1) = 3 + 1$ or 4 ✓

The solution is (3, −1).

b. $y = 2x + 1$
$2y = 4x + 2$

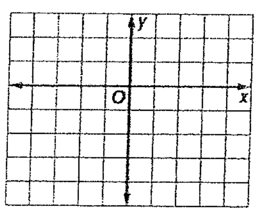


The graphs coincide. Therefore there are infinitely many solutions.

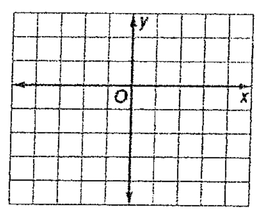
Exercises

Graph each system of equations. Then determine whether the system has *no* solution, *one* solution, or *infinitely many* solutions. If the system has one solution, name it.

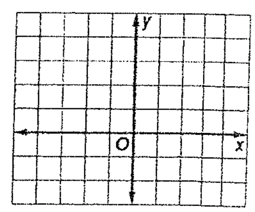
1. $y = -2$
$3x - y = -1$



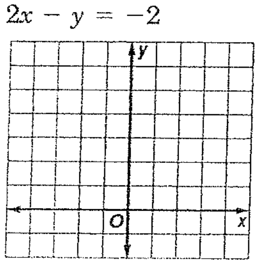
2. $x = 2$
$2x + y = 1$



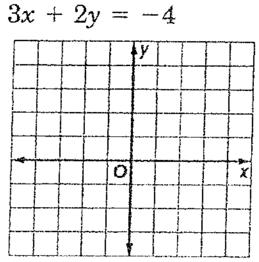
3. $y = \frac{1}{2}x$
$x + y = 3$



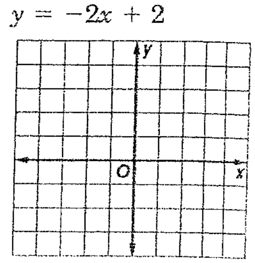
4. $2x + y = 6$
$2x - y = -2$



5. $3x + 2y = 6$
$3x + 2y = -4$



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



Lesson 5-1

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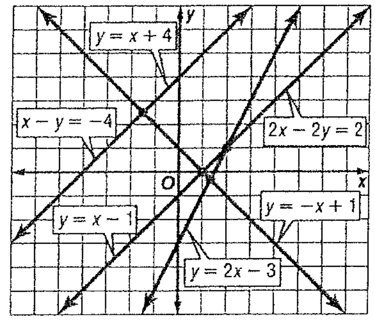
5-1 Skills Practice

Graphing Systems of Equations

Use the graph at the right to determine whether each system has *no* solution, *one* solution, or *infinitely many* solutions.



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

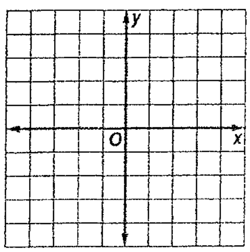
2. $x - y = -4$
$y = x + 4$

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

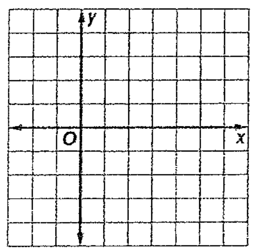
4. $y = 2x - 3$
$2x - 2y = 2$

Graph each system of equations. Then determine whether the system has *no* solution, *one* solution, or *infinitely many* solutions. If the system has one solution, name it.

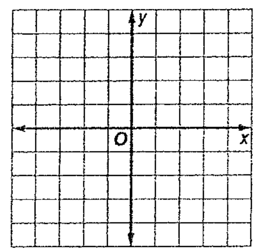
5. $2x - y = 1$
$y = -3$



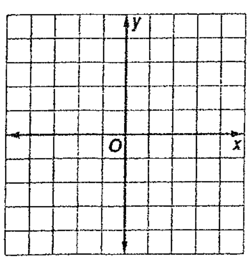
6. $x = 1$
$2x + y = 4$



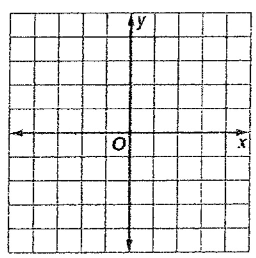
7. $3x + y = -3$
$3x + y = 3$



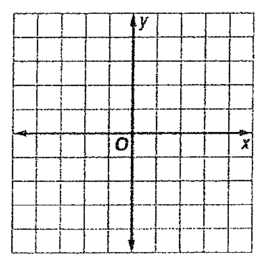
8. $y = x + 2$
$x - y = -2$



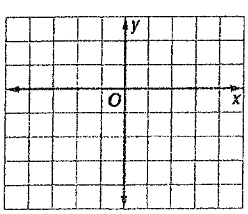
9. $x + 3y = -3$
$x - 3y = -3$



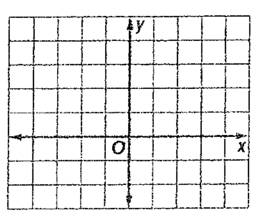
10. $y - x = -1$
$x + y = 3$



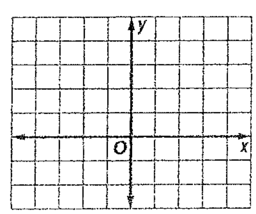
11. $x - y = 3$
$x - 2y = 3$



12. $x + 2y = 4$
$y = -\frac{1}{2}x + 2$



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



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5-2 Study Guide and Intervention

Substitution

Substitution One method of solving systems of equations is **substitution**.

Example 1 **Use substitution to solve the system of equations.**

$y = 2x$

$4x - y = -4$

Substitute $2x$ for y in the second equation.

$4x - y = -4$	Second equation
$4x - 2x = -4$	$y = 2x$
$2x = -4$	Combine like terms.
$x = -2$	Divide each side by 2 and simplify.

Use $y = 2x$ to find the value of y.

$y = 2x$	First equation
$y = 2(-2)$	$x = -2$
$y = -4$	Simplify.

The solution is $(-2, -4)$.

Example 2 **Solve for one variable, then substitute.**

$x + 3y = 7$

$2x - 4y = -6$

Solve the first equation for x since the coefficient of x is 1.

$x + 3y = 7$	First equation
$x + 3y - 3y = 7 - 3y$	Subtract $3y$ from each side.
$x = 7 - 3y$	Simplify.

Find the value of y by substituting $7 - 3y$ for x in the second equation.

$2x - 4y = -6$	Second equation
$2(7 - 3y) - 4y = -6$	$x = 7 - 3y$
$14 - 6y - 4y = -6$	Distributive Property
$14 - 10y = -6$	Combine like terms.
$14 - 10y - 14 = -6 - 14$	Subtract 14 from each side.
$-10y = -20$	Simplify.
$y = 2$	Divide each side by -10 and simplify.

Use $y = 2$ to find the value of x.

$x = 7 - 3y$

$x = 7 - 3(2)$

$x = 1$

The solution is $(1, 2)$.

Exercises

Use substitution to solve each system of equations. If the system does *not* have exactly one solution, state whether it has *no* solution or *infinitely many* solutions.

1. $y = 4x$
$3x - y = 1$

2. $x = 2y$
$y = x - 2$

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

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

5. $c - 4d = 1$
$2c - 8d = 2$

6. $x + 2y = 0$
$3x + 4y = 4$

7. $2b = 6a - 14$
$3a - b = 7$

8. $x + y = 16$
$2y = -2x + 2$

9. $y = -x + 3$
$2y + 2x = 4$

10. $x = 2y$
$0.25x + 0.5y = 10$

11. $x - 2y = -5$
$x + 2y = -1$

12. $-0.2x + y = 0.5$
$0.4x + y = 1.1$

5-3 Study Guide and Intervention

Elimination Using Addition and Subtraction

Elimination Using Addition In systems of equations in which the coefficients of the x or y terms are additive inverses, solve the system by adding the equations. Because one of the variables is eliminated, this method is called **elimination**.

Example 1 **Use addition to solve the system of equations.**
$x - 3y = 7$
$3x + 3y = 9$

Write the equations in column form and add to eliminate y.

$$\begin{array}{rl} x - 3y &= 7 \\ (+)\ 3x + 3y &= 9 \\ \hline 4x \quad &= 16 \end{array}$$

Solve for x.

$\frac{4x}{4} = \frac{16}{4}$

$x = 4$

Substitute 4 for x in either equation and solve for y.

$4 - 3y = 7$

$4 - 3y - 4 = 7 - 4$

$-3y = 3$

$\frac{-3y}{-3} = \frac{3}{-3}$

$y = -1$

The solution is $(4, -1)$.

Example 2 **The sum of two numbers is 70 and their difference is 24. Find the numbers.**

Let x represent one number and y represent the other number.

$$\begin{array}{rl} x + y &= 70 \\ (+)\ x - y &= 24 \\ \hline 2x \quad &= 94 \end{array}$$

$\frac{2x}{2} = \frac{94}{2}$

$x = 47$

Substitute 47 for x in either equation.

$47 + y = 70$

$47 + y - 47 = 70 - 47$

$y = 23$

The numbers are 47 and 23.

Exercises

Use elimination to solve each system of equations.

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

2. $2m - 3n = 14$
   $m + 3n = -11$

3. $3a - b = -9$
   $-3a - 2b = 0$

4. $-3x - 4y = -1$
   $3x - y = -4$

5. $3c + d = 4$
   $2c - d = 6$

6. $-2x + 2y = 9$
   $2x - y = -6$

7. $2x + 2y = -2$
   $3x - 2y = 12$

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

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

10. $2x - 3y = 12$
    $4x + 3y = 24$

11. $-0.2x + y = 0.5$
    $0.2x + 2y = 1.6$

12. $0.1x + 0.3y = 0.9$
    $0.1x - 0.3y = 0.2$

13. Rema is older than Ken. The difference of their ages is 12 and the sum of their ages is 50. Find the age of each.

14. The sum of the digits of a two-digit number is 12. The difference of the digits is 2. Find the number if the units digit is larger than the tens digit.

Lesson 5-3