

## What do you know about Systems of Equations and Inequalities?

<p>1. What is a system of equations?</p> <p>A set of 2 or more equations</p>	<p>2. Three possible solutions for a system of equations are:</p> <ol style="list-style-type: none"><li>1. intersect</li><li>2. No Solution</li><li>3. Infinitely Many Solutions</li></ol>	<p>3. Three methods (ways) to solve a system of equations:</p> <ol style="list-style-type: none"><li>1. Graphing</li><li>② Substitution</li><li>③ Elimination</li></ol>
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## Solving Systems of Linear Equations Algebraically

**Substitution** – Look for the easiest variable to solve for!

Example 1:  $x + 2y = 5$   
 $3x + 5y = 14$

$$\begin{array}{r} x + 2y = 5 \\ -2y \quad -2y \\ \hline x = 5 - 2y \end{array}$$

$$x = 5 - 2(1)$$

$$x = 3$$

$$(3, 1)$$

$$3(5 - 2y) + 5y = 14$$

$$15 - 6y + 5y = 14$$

$$\begin{array}{r} 15 - y = 14 \\ -15 \quad -15 \\ \hline \end{array}$$

$$\frac{-y}{-1} = \frac{-1}{-1}$$

$$y = 1$$

## Substitution

Example 2:  $3x - y = 1$   
 $3x + 2y = 16$

$$\begin{array}{r} 3x - y = 1 \\ +y \quad +y \\ \hline 3x = 1 + y \\ -1 \quad -1 \\ \hline \boxed{3x - 1} = y \end{array}$$

$$3x + 2(3x - 1) = 16$$
$$3x + 6x - 2 = 16$$

$$\begin{array}{r} 9x - 2 = 16 \\ +2 \quad +2 \\ \hline 9x = 18 \end{array}$$

$$\frac{9x}{9} = \frac{18}{9}$$

$$\boxed{x = 2}$$

$$3(2) - 1 = y$$
$$\boxed{5 = y}$$

$$\boxed{(2, 5)}$$

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**Elimination** - Look for 2 like terms to cancel

Example 2 (Different Method):

$$\begin{array}{l} 3x - y = 1 \\ 3x + 2y = 16 \end{array}$$

$$-1 (3x - y = 1)$$

$$~~3x + y = -1~~$$

$$+ \del{3x + 2y = 16}$$

$$\frac{3y}{3} = \frac{15}{3}$$

$$y = 5$$

$$\begin{array}{r} 3x - 5 = 1 \\ +5 \quad +5 \\ \hline 3x = 6 \\ \frac{3x}{3} = \frac{6}{3} \end{array}$$

$$x = 2$$

$$(2, 5)$$

**Elimination** - Look for like terms to cancel

Example 3:  $4x + 2y = -8$

$$\frac{1}{2}x - y = -\frac{7}{2}$$

$$2\left(\frac{1}{2}x - y = -\frac{7}{2}\right)$$

$$~~x - 2y = -7~~$$

$$~~+4x + 2y = -8~~$$

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$$\frac{5x}{5} = \frac{-15}{5} \quad \boxed{x = -3}$$

$$4(-3) + 2y = -8$$

$$\begin{array}{r} -12 + 2y = -8 \\ +12 \qquad +12 \\ \hline \end{array}$$

$$\frac{2y}{2} = \frac{4}{2}$$

$$\boxed{y = 2}$$

$$\boxed{(-3, 2)}$$

You try! You either method we've discussed

$$\begin{array}{l} x + 2y = 11 \\ x + 2y = 2 \end{array}$$

$$\begin{array}{r} -1(x + 2y = 11) \\ -x - 2y = -11 \\ x + 2y = 2 \\ \hline 0 = -9 \end{array}$$

No Solution

If we were to graph these linear equations, what would they look like? Would they intersect?

Parallel, No

Example 4  $2(-4x + y = 3)$   
 $8x = 2y - 6 \rightarrow$

$$\begin{array}{r} -8x + 2y = 6 \\ 8x - 2y = -6 \\ \hline 0 = 0 \end{array}$$

$$8x = 8x$$

Infinitely Many Solutions

If we were to graph these linear equations, what would they look like? Would they intersect?

Homework is Page 1.1 in Packet