

## UNIT 3 LESSON 3 – SYSTEM OF EQUATIONS

### GRAPHING, SUBSTITUTION, ELIMINATION

So now that you have some practice with systems of equations, let's add some more techniques.

#### MULTIPLY BY -1 TO ELIMINATE

Sometimes multiplying one equation by -1 will allow elimination of one variable.

Example 1) Solve:  $x - y = 4$

$$x - 2y = 10$$

**\*\*Look for variables that have the same coefficient**

Since the x variable has the same coefficient = 1, one equation needs to be multiplied by -1 to make them opposites

$$\begin{array}{l} -1(x - y = 4) \\ x - 2y = 10 \end{array} \quad \longrightarrow \quad \begin{array}{l} -x + y = -4 \\ \underline{x - 2y = 10} \end{array} \quad \longrightarrow \quad \begin{array}{l} -y = 6 \end{array} \quad \longrightarrow \quad y = -6$$

**\*\*Now plug  $y = -6$  into either equation to solve for x**

$$x - (-6) = 4 \quad \longrightarrow \quad x + 6 = 4 \quad \longrightarrow \quad x = -2$$

One solution at point  $(-2, -6)$

#### MULTIPLY BY LEAST COMMON FACTOR (LCF) TO ELIMINATE

Sometimes multiplying one equation by a least common factor will allow elimination of one variable.

Example 2) Solve:  $2x + 3y = 9$

$$x + 5y = 8$$

**\*\*Eliminate one of the variables by multiplying one of the equations by a least common factor.**

$$2x + 3y = 9$$

$-2(x + 5y = 8)$  **\*multiply equation by -2 so elimination can happen**

$$2x + 3y = 9$$

$$\underline{-2x - 10y = -16}$$
 **\*new equation after multiplication by -2**

$$-7y = -7$$

$y = -1$  **\* Now plug  $y = -1$  into either equation to solve for x**

$$x + 5(-1) = 8$$

$$x - 5 = 8$$

$x = 13$  **One solution at point  $(-1, 13)$**

## SYSTEM OF EQUATIONS WORD PROBLEMS

Now we will write a system of equations based on a word problem. Remember a system of equations will produce two equations with two variables.

Example 3) In a talent show of singing and comedy acts, singing acts are 5 minutes long and comedy acts are 3 minutes long. The show has 12 acts and lasts a total of 50 minutes. How many singing acts and comedy acts are in the show? Write and solve a system of equations.

<p>Step 1) Identify your variables S = singing acts C = comedy acts</p>	<p>Step 2) Write a system of equations <math>S + C = 12</math> <math>5S + 3C = 50</math></p>
<p>Step 3) Solve the system <math>-3(S + C = 12)</math>   <math>\longrightarrow</math>   <math>-3S - 3C = -36</math> <math>5S + 3C = 50</math></p> <p><math>2S = 14</math> <math>S = 7</math></p> <p>**Plug <math>S = 7</math> into either equation to solve for C</p> <p><math>7 + C = 12</math> <math>C = 5</math></p>	<p>Step 4) Interpret your answer</p> <p>There are 7 singing acts and 5 comedy acts.</p>