Algebra 1: 6.2 Guided Notes **Name** _____ **Period** _____

Using Linear Combinations to Solve a Linear System

Learning Goal:
To solve a system of equations algebraically using linear combinations (elimination).

Solving Systems of Equations

1) Use **graphing** to get an approximate answer or if the lines are easy to graph, i.e. slope-intercept form.
2) Use **substitution** if one variable can be easily replaced by it's value or an expression that includes the other variable, i.e. $y =$ or $x =$.
3) Use **linear combinations** when it easy to eliminate a variable by **adding** or **subtracting** the system of equations.

Solving a System of Equations Using Linear Combinations

1. **Stack the system of equations** so common terms (like x and y) line up.
2. **Choose which variable to eliminate**. The coefficients should be equal, but with opposite signs.
   a. *Does one of the variables have the same coefficient in both equations?*
   b. *Can you multiply one or both equations by a number so one of the variables will have the same coefficient in both equations? Hint: find the LCM (least common multiple).*
3. **Add the system of equations** to eliminate one of the variables.
4. **Solve for one variable**.
5. Plug the solution into one of the equations to **solve for the other variable**.
6. **Write** your solution **as an ordered pair**.

Solving a System by Adding Equations

Steps:

- Eliminate y by adding the system of equations.
- Solve for x.
- Replace the value of x in one of the equations to solve for y.

Example 1

$$2x + 5y = 17$$
$$6x - 5y = -9$$

$2x + 5y = 17$
$6x - 5y = -9$
$8x + 0 = 8$
$8x = 8$
$x = 1$

Since 5y + –5y = 0, add the equations to eliminate y.

$2x + 5y = 17$
$2(1) + 5y = 17$
$2 + 5y = 17$
$5y = 15$
$y = 3$

The solution is (1, 3).

Let's Practice:

$2x + 3y = 11$
$-2x + 9y = 1$

The solution is (4, 1).

What if the 2nd equation was $2x - 9y = -1$? How would you solve it?

Solving a System by Multiplying One Equation

Steps:

- Stack the equations so common terms line up.
- Multiply the 2nd equation by -3 so the coefficients of y are equal but with opposite signs.
- Eliminate y by adding the system of equations.
- Solve for x.
- Replace the value of x in one of the equations to solve for y.

Example 2

$15y = 2x - 32$
$-7x + 5y = -17$

$-2x + 15y = -32$
$-7x + 5y = -17$ → [-7x + 5y = -17] x -3

$-2x + 15y = -32$
$21x - 15y = 51$
$19x + 0 = 19$
$19x = 19$
$x = 1$

$-2x + 15y = -32$
$-2(1) + 15y = -32$
$-2 + 15y = -32$
$15y = -30$
$y = -2$

The solution is (1, -2).

Let's Practice:

$6x + 3y = -6$
$-2x + 5y = 14$

The solution is (-2, 2).