Systems of Equations – Quick Reference

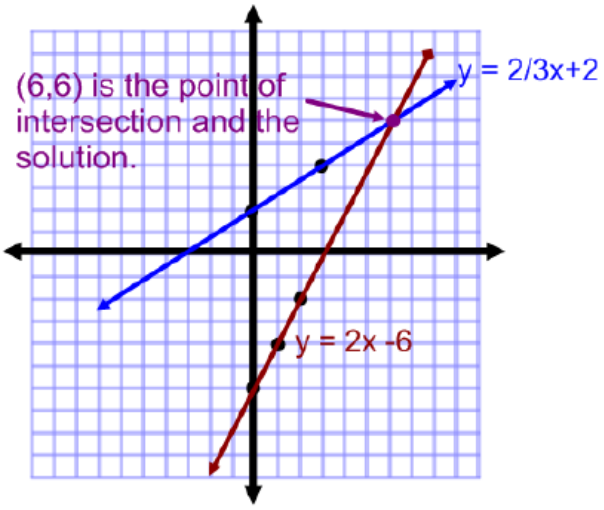
Two linear equations form a system of equations. You can solve a system of equations using one of three methods:

1. **Graphing**
2. **Substitution Method**
3. **Linear Combinations Method**

Graphing Systems of Equations

$y = 2/3x + 2$

$y = 2x - 6$



The solution to this system of equations is (6,6)

The solution to a system of equations is the **point of intersection**.

The **ordered pair** that is the point of intersection represents the solution that satisfies **BOTH** equations.

If two lines are **parallel** to each other, then there is **no solution**. The lines will never intersect.

If two lines lay **one on top of another** then there are **infinite solutions**. Every point on the line is a solution.

Substitution Method

Solve the following system of equations:

$$x - 2y = -10$$
$$y = 3x$$

$x - 2y = -10$	Since we know $y = 3x$, substitute $3x$ for y into the first equation.
$x - 2(3x) = -10$	
$x - 6x = -10$	Simplify: Multiply $2(3x) = 6x$.
$-5x = -10$	Simplify: $x - 6x = -5x$
$\frac{-5x}{-5} = \frac{-10}{-5}$	Solve for x by dividing both sides by -5.
$x = 2$	The x coordinate is 2.
$y = 3x$	Since we know that $x = 2$, we can substitute 2 for x into $y = 3x$.
$y = 3(2)$	
$y = 6$	
Solution: (2, 6)	The solution!

Linear Combinations (Addition Method)

Solve the following system of equations:

$$3x + 2y = 10$$
$$2x + 5y = 3$$

$-2(3x + 2y = 10)$ $3(2x + 5y = 3)$	Create opposite terms. I'm creating opposite x terms.
$-6x - 4y = -20$ $6x + 15y = 9$ $11y = -11$	Multiply to create opposite terms. Then add the like terms.
$\frac{11y}{11} = \frac{-11}{11}$	Solve for y by dividing both sides by 11.
$y = -1$	The y coordinate is -1
$2x + 5y = 3$ $2x + 5(-1) = 3$	Substitute -1 for y into one of the equations.
$2x - 5 = 3$ $2x - 5 + 5 = 3 + 5$ $\frac{2x}{2} = \frac{8}{2}$	Solve for x!
$x = 4$	**The solution (4, -1)**