

# Systems of Equations – Quick Reference

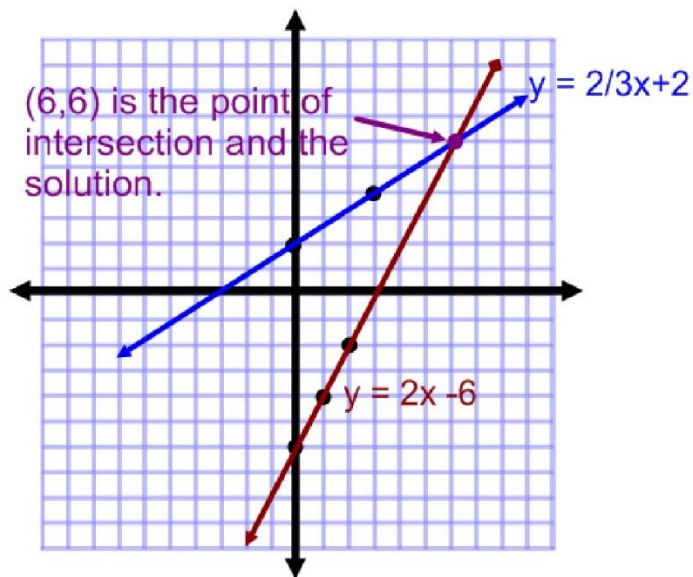
Two **linear** equations form a system of equations. You can solve a system of equations using one of three methods:

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.

Helpful YouTube videos:

<https://www.youtube.com/watch?v=5a6zpf150go>

<https://www.youtube.com/watch?v=V7H1oUHXPkg>

<https://www.youtube.com/watch?v=vA-55wZtLeE>

[https://www.youtube.com/watch?v=wYrxKgt\\_bLg&ebc=ANYPxKrXB6HTBhuFiz5yG2f097\\_s7cYn5MFKivPGuCIM4HBgeMdvPUeQB0CP8o0Tzgc8zHL85bkj6o6H78hahLx86t3q1clx9g](https://www.youtube.com/watch?v=wYrxKgt_bLg&ebc=ANYPxKrXB6HTBhuFiz5yG2f097_s7cYn5MFKivPGuCIM4HBgeMdvPUeQB0CP8o0Tzgc8zHL85bkj6o6H78hahLx86t3q1clx9g)

## Substitution Method

Solve the following system of equations:

$$x - 2y = -10$$

$$y = 3x$$

$$x - 2y = -10$$

$$\downarrow$$

$$x - 2(3x) = -10$$

$$x - 6x = -10$$

$$-5x = -10$$

$$\frac{-5x}{-5} = \frac{-10}{-5}$$

$$x = 2$$

$$y = 3x$$

$$\downarrow$$

$$y = 3(2)$$

$$y = 6$$

**Solution: (2, 6)**

Since we know  $y = 3x$ , substitute  $3x$  for  $y$  into the first equation.

Simplify: Multiply  $2(3x) = 6x$ .

Simplify:  $x - 6x = -5x$

Solve for  $x$  by dividing both sides by  $-5$ .

The  $x$  coordinate is 2.

Since we know that  $x = 2$ , we can substitute 2 for  $x$  into  $y = 3x$ .

The solution!

## Linear Combinations (Addition Method)

Solve the following system of equations:

$$3x + 2y = 10$$

$$2x + 5y = 3$$

$$-2(3x + 2y = 10)$$

$$3(2x + 5y = 3)$$

$$-6x - 4y = -20$$

$$\underline{6x + 15y = 9}$$

$$11y = -11$$

$$\frac{11y}{11} = \frac{-11}{11}$$

$$y = -1$$

$$2x + 5y = 3$$

$$2x + 5(-1) = 3$$

$$2x - 5 = 3$$

$$2x - 5 + 5 = 3 + 5$$

$$\underline{2x = 8}$$

$$\frac{2x}{2} = \frac{8}{2}$$

$$x = 4$$

Create opposite terms. I'm creating opposite  $x$  terms.

Multiply to create opposite terms. Then add the like terms.

Solve for  $y$  by dividing both sides by 11.

The  $y$  coordinate is  $-1$

Substitute  $-1$  for  $y$  into one of the equations.

Solve for  $x$ !

**The solution (4, -1)**