

System of Equations

Goal:

- to find the solution to a system of equations
 - using a graph
 - using table of values
 - using comparison

If a problem has more than one equation it is called a **system of equations**.

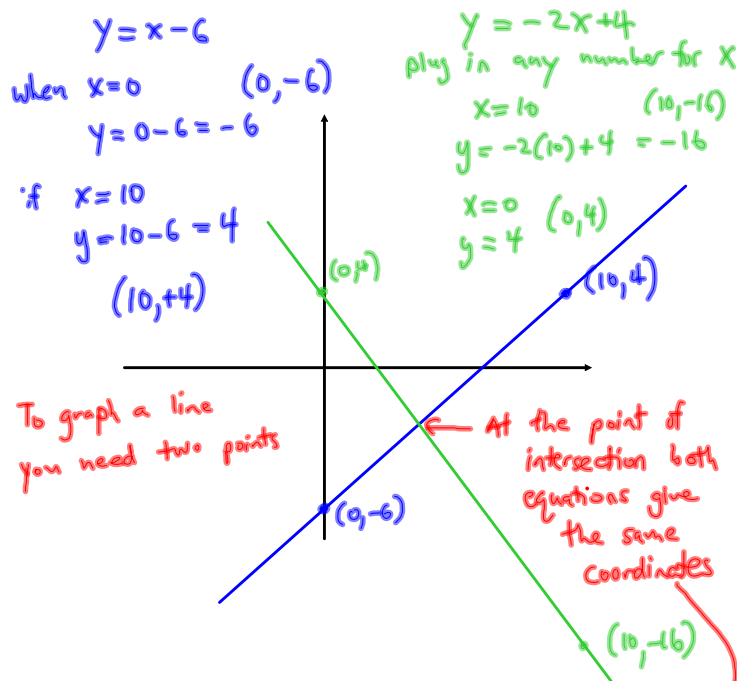
$$\begin{aligned} y &= x - 6 & \textcircled{1} \\ y &= -2x + 4 & \textcircled{2} \end{aligned}$$

What is the solution to this system of equations?

The solution is a point with an x - and y -coord.
Graphically, it is the point of intersection.

It can be found by graphing, a table of values or using algebraic comparison.

By graphing:



The solution to the system of equations

* The negative of graphing is you may have to estimate the coordinates.

(In example above $x = 3.\bar{3}$ $y = -2.\bar{6}$)
using algebra
you would probably estimate
 $(3.5, -2.5)$ from graph.

Solve:

$$\begin{aligned} y &= 4x & \textcircled{1} \\ y &= -x + 15 & \textcircled{2} \end{aligned}$$

Another method is to use a table of values.

$$\textcircled{1} \quad y = 4x$$

x	y
-2	-8
-1	-4
0	0
1	4
2	8
3	12
4	16

$$\textcircled{2} \quad y = -x + 15$$

x	y
-2	17
-1	16
0	15
1	14
2	13
3	12
4	11

The solution is a point with same coordinates, (3,12).

You can see the solution in a table of values, but you won't make one to find the solution.

Instead use algebra!

Three methods:

1. comparison
2. substitution
3. elimination

1. COMPARISON:

Compare y-values (could also compare x-values)

$$y_1 = 4x \quad y_2 = -x + 15$$

the y-values must be equal

$$y_1 = y_2$$

$$4x = -x + 15$$

then solve using usual algebra techniques

$$4x = -x + 15$$

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

plug $x=3$ into either equation (3,12)

$$y = 4x = 4(3) = 12$$

Solve:

$$y=3x-6$$

$$2x-y=-4$$

①
② ⇒ this equation is not in function form ($y=ax+b$)

Rewrite equation ② in function form

$$2x - y = -4$$

$$2x = y - 4$$

$$2x + 4 = y \quad \text{OR} \quad y = 2x + 4 \quad \text{②}$$

$$y_1 = 3x - 6 \quad y_2 = 2x + 4$$

$$y_1 = y_2$$

$$3x - 6 = 2x + 4$$

$$x - 6 = 4$$

$$x = 10$$

$$\begin{aligned} y &= 3x - 6 \\ &= 3(10) - 6 \\ &= 30 - 6 \\ &= 24 \end{aligned}$$

The solution is $(10, 24)$

Check:

Use other equation

$$y = 2x + 4$$

$$y = 2(10) + 4$$

$$= 20 + 4$$

$$= 24$$

$(10, 24)$ ✓

this is the same so solution is confirmed

Homework:



1-4