Linear System:

What is a linear system?

-a set of 2 or more linear equations considered at the same time

What is a "solution" to a linear system?

-Point of Intersection (POI)

-Where the lines cross (POI)

-Where the X and Y values are the same in both equations

-Where the independent and dependent variables are the same in both equations.

The Graphs of 2 linear equations (in two variables) may intersect at:

One point- non parallel

No points- parallel and distinct

An infinite number of points: same line

Example:

$y=3x+2$

$y=x+2$

$3x-2=x+2$

$3x-x=2+2$

$2x/2=4/2$

$X=2$

L.S. R.S Check:

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

$y=6-2$ $y=4$

$y=4$

Solving by Elimination:

1. $3x+2y=2$

   $4x+5y=12$

   Multiply one of the equations so that one variable in both equations can add or subtract to cancel each other out.

   *make sure to multiply the ENTIRE equation.

2. $4(3x+2y)=(2)4$
   $3(4x+5y)=(12)3$

3. $12x+8y=8$
   $12x+15y=36$

   Add or subtract the equations, if the equal variables are both positive or both negative than subtract. If the equal variables have the different signs in front of them, then add.

4. $12x+8y=8$
   $- \underline{12x+15y=36}$
   $-7y=-28$
   $y=4$

   The sum of the equation is the other variable. If the variable has a coefficient in front of it, divide so that the variable does not have a coefficient in front of it and you are left with a variable=an integer

5. $3x+2(4)=2$
6. $3x+8=2$
7. $3x+8-8=2-8$
8. $3x=-6$
9. $x=-2$

   Plug the x value into one of the equations. Solve the equation.

$x=-2, y=4$

L.S $=3x+2y$	R.S$=2$
$=3(-2)+2(4)$	
$=-6+8$	
$=2$	

L.S$= 4x+5y$	R.S$=12$
$=4(-2)+5(4)$	
$=-8+20$	
$=12$	

*To check your answer, plus in the variable to the original equations, and if they are true then your answer is correct.

Sample Questions: solve by elimination

1. $2x+3y=4$
   $4x-3y=-10$
2. $2x+5y=3$
   $4x+10y-6=0$
3. $2x-5y=3$
   $3x+2y=14$
4. $2n+4m=360$
   $7n+10m=120$

Solving by Graphing:

Solving two liner equations to find the POI of lines can be solved several different ways. TO solve by graphing is the easiest way to find the POI, however it takes the longest time so it isn't ideal.

THE STEPS:

1. Name your given equations (1) and (2)
2. Solve for "y" in each equation
3. Plot the lines on the graph
4. Find the point where the two lines intersect.

KEEP IN MIND:

- The two lines could be parallel
- The lines could be the same

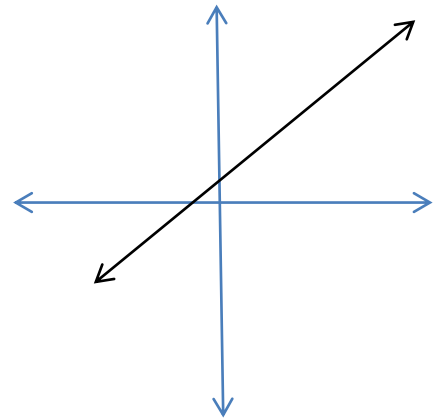**Question**: Find the POI of these two equations:

6x-2y=18

4x+4y=24

A Line with Infinite Solutions: Two lines are the same

Ex. y=x+3

    y=2x+6

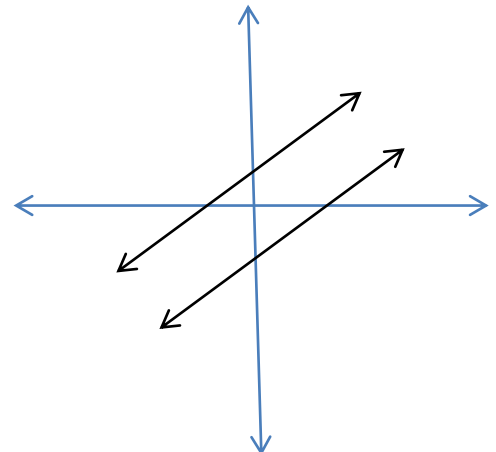They are the same line, just different factors of each other.

A line with no solutions:

The lines will no solutions: The lines will never intersect, they are parallel which means that there will be no POI.

Ex. y=1/2x-3

    y=1/2x+7

They both have the same slope therefore they are parallel.

Solving equations by substitution

a + 4b = 3 ⟵ Step 1

5b = -2a + 3

    1) a + 4b = 3   2) 5b = -2a + 3

        a = -4b + 3   2a + 5b = 3

2a + 5b = 3   a + 4b = 3

Step 2 { = 2 (-4b + 3) + 5b = 3   a + 4(-1) = 3 } **Step 4**

        = -8b + 6 + 5b =3   a + 4 = 3

        = -8b + 5b =3 -6   a = 3 - 4   **Step 5**

Step 3 { = -3b = -3   a = -1

          b = 1

(a,b) → (-1,1) ⟵ Step 6

Steps:

1. Rearrange equation to get the a-value in one of the equations.

    a + 4b = 3

2. Plug the a - value into the other equation for the variable…

    2a + 5b = 3 → = 2 (-4b + 3) + 5b = 3

3. Solve to find the value of b.

4. Plug the b-value into the a-value equation…

    a + 4b = 3 → a + 4(-1) = 3

5. Solve the equation to find the value of a.

6. Show how you are writing the equation…

    Example: (a,b) → (-1,1)