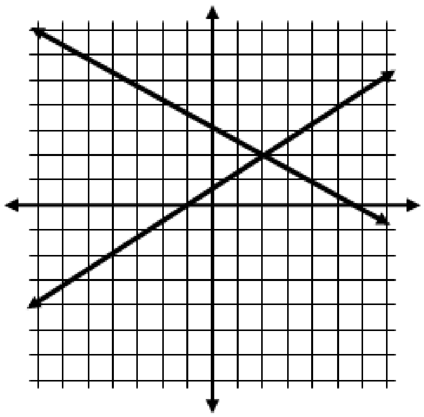
7.5: Special Types of Linear Systems

Goals: *Solve and identify when a system of equations has one solution, no solution or an infinite number of solutions

*Arrange systems so you can state the number of solutions *without solving*

The graph below is the system of equations: $x + 2y = 6$ and $2x - 3y = -2$



What is the solution to the system? How do you know?

Solution: ______________________

How could you *prove* this is the solution to the system?

****Review/Preview****

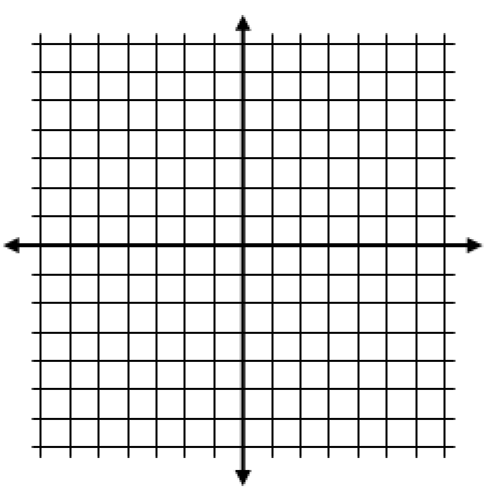
· What is a <u>solution</u> to a linear system?

1)

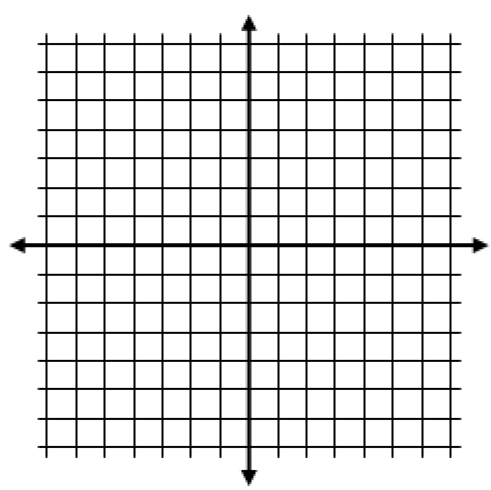
2)

Now graph each system of equations using slope-intercept form or *x* and *y* intercepts.
Then state the solution to each system of equations.

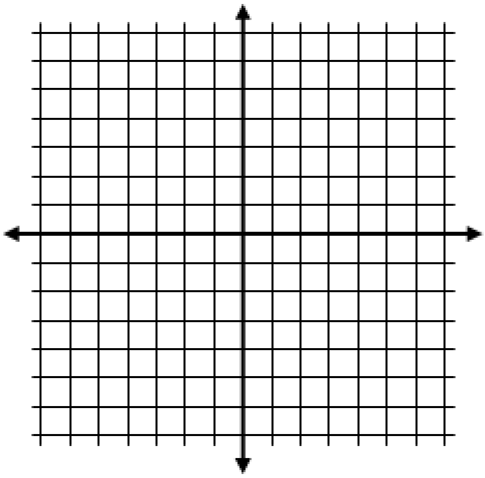
Ex: $y = 2x + 5$
$y = 2x + 1$



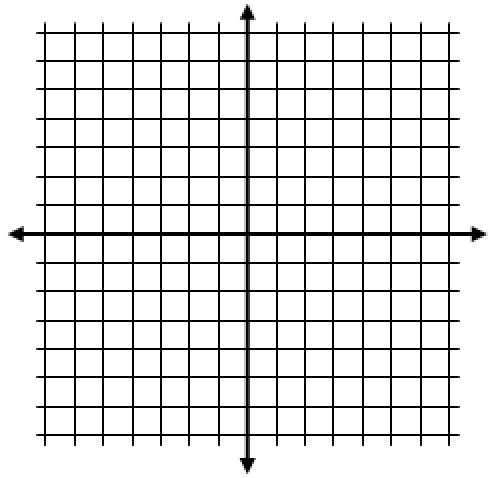
Ex: $-6x + 2y = -2$
$y = 3x + 2$



Ex: $y = 3x + 4$
$3x - y = 3$



Ex: $2x - y = 4$
$-2x + y = -4$

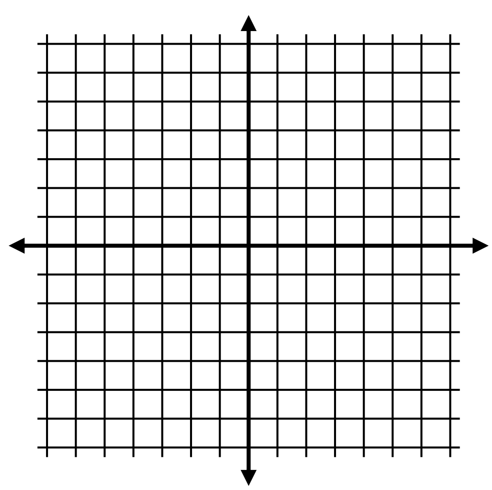


What did you say when you graphed two lines and they happened to be parallel? (Hint: If a solution is where two lines intersect, where do parallel lines intersect?)

What did you say when you graphed two lines and they were the same line, one on top of the other? (Hint: How many points of intersection are there?)

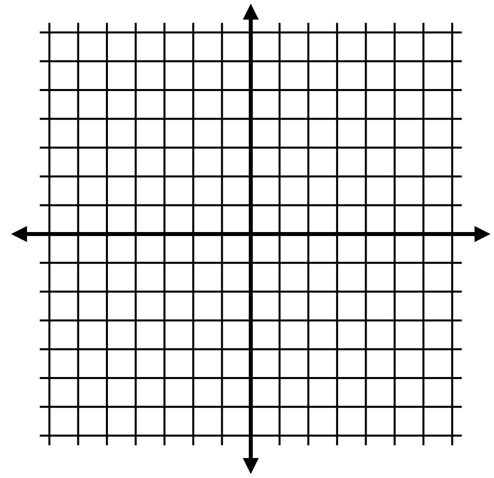
1. **Substitute or Eliminate depending on which method is most efficient.**
2. **Then graph each system of equations on the coordinate plane provided.**
3. **Based on your graph, state the solution to the system of equations.**
4. **Explain how the algebra (substitution or elimination) supports this solution?**

Ex: $3x + 2y = 10$
$3x + 2y = 2$



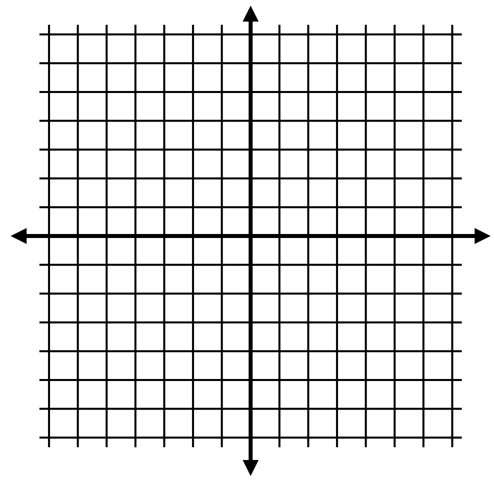
Ex: $x - 2y = -4$

$$y = \frac{1}{2}x + 2$$



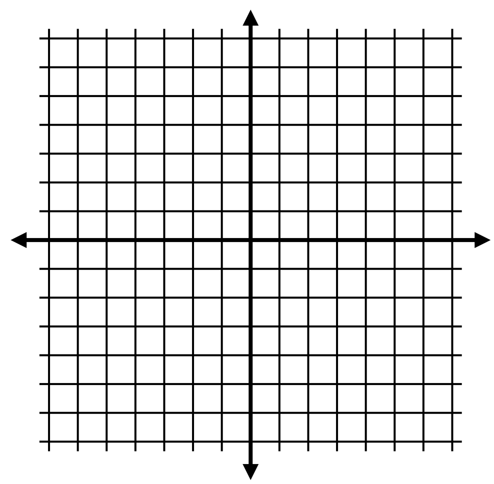
Ex: $5x + 3y = 6$

$-5x - 3y = 3$



Ex: $y = 2x - 4$

$-6x + 3y = -12$



****RECALL****

Solve each equation or inequality.

Ex: $3(x + 4) = 3x + 16$

Ex: $4(2x + 6) = 8(x + 3)$

Ex: $2x - 3x + 6 \leq -(x - 10)$

Ex: $3(6x - 1) > 2(9x - 1)$

***Regardless of if you are solving an <u>equation</u> or an <u>inequality</u> what is the general rule that applies to both types of problems?**

Solve each system by eliminating or substituting.

Ex: $2x - 3y = 6$
$2x - 3y = -4$

Ex: $4x - 2y = 8$
$y = 2x - 4$

Identify the number of solutions of a linear system:

· A system of equations will have **no solution** when the two lines are: ________________

They are ___________________ when: ___________________________________

· A system of equations will have an **infinite number of solutions** when the two lines are: ________________

They are ___________________ when: ____

· A system of equations will have exactly **one solution** when the two lines are: __________________________

They are _____________________ when: ____

Number of Solutions	**Slopes and *y*-intercepts**

If you can quickly identify the slope and *y*-intercept of each line, then you can state how many solutions the system has **without solving.**

- What do you need to do to be able to quickly identify the slope and *y*-intercept of a line?

Without solving the system, tell whether there is *one solution*, *no solution* or *infinitely many solutions*.

Ex: $5x + y = -2$
$-10x - 2y = 4$

Ex: $6x + 2y = 3$
$6x + 2y = -5$

Ex: $-3x + 5y = 6$
$6x - 10y = -12$

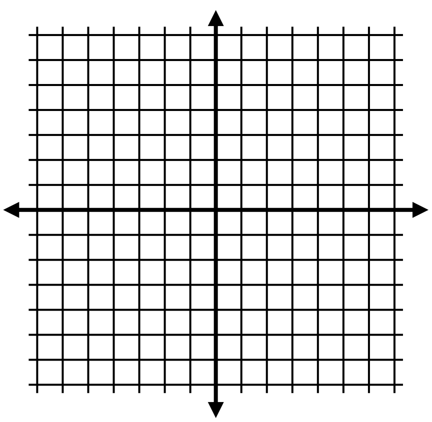
Ex: $3x + 6y = 2$
$2x + 4y = 3$

Ex: $x - 3y = -15$
$2x - 3y = -18$

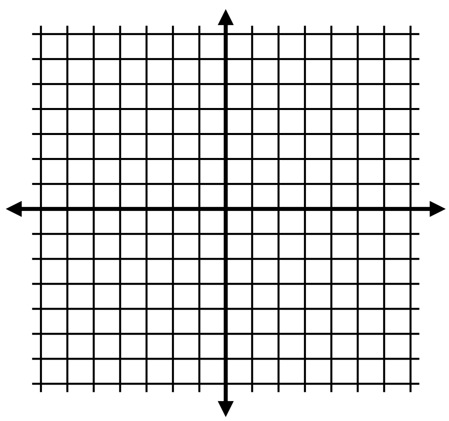
Ex: $y = 2x - 5$
$-4x + 2y = 8$

Use the graphs below to show a system of equations with:

a. No solution



b. One solution



c. Infinitely many solutions