

Unit 5: Systems of Linear Equations

Topic: Solve Systems by Graphing

Objectives:

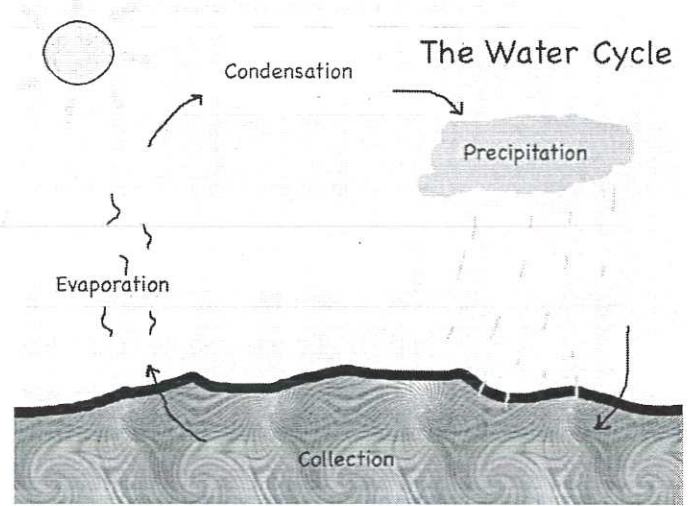
- 1) SWBAT solve a system of equations by graphing
- 2) SWBAT identify the # of solutions

So what is a SYSTEM and why is it messing with ~~out~~ <sup>our</sup> Linear Equations?

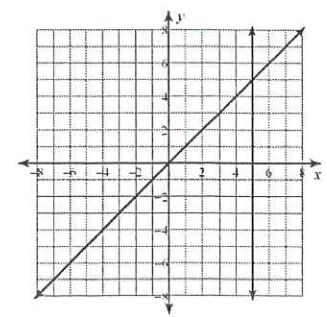
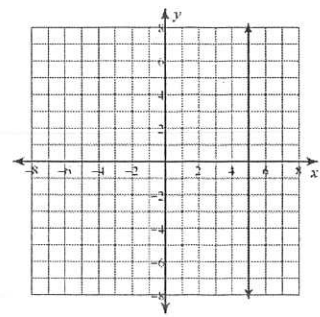
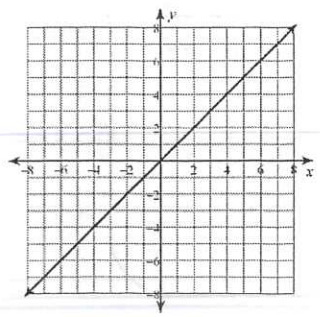
A system is when many things work together.

We see examples of systems all the time in science class!

The WATER CYCLE is a system because everything has to work together!



A system of linear equations is when two lines work together or touch when graphed on the same coordinate plane.



If they do "touch", the point[s] at which they touch are the solution[s]:

(x, y)

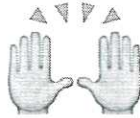
**Explore:** How many ways can straight lines cross? Try using your arms:

You left arm as one linear equation, and the right arm as the other linear equation.

**How many ways can you get them to cross?**

**SCENARIO 1:**

Well we can definitely have our arm NEVER touching! If we graph two lines on the same coordinate plane and they do not cross, we say the system consists of two parallel lines and has no solution.



**SCENARIO 2:**

We also obviously know that we can have our arms cross only at one point! If we graph two lines on the same coordinate plane and they cross at one point, we say that point  $(x, y)$  is the solution to the system of linear equations.

one solution



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**SCENARIO 3:**

But did you think of the scenario where your arms would be lying on top of one another? This is when a system has an infinite amount of solutions. HINT- It means the lines are the same.

Practice: use the graph to determine whether the system of linear equations has NONE, ONE, or INFINITE SOLUTIONS.

1.)  $y = -x - 3$   
 $y = x - 1$

one solution

2.)  $2x + 2y = -6$   
 $y = -x - 3$

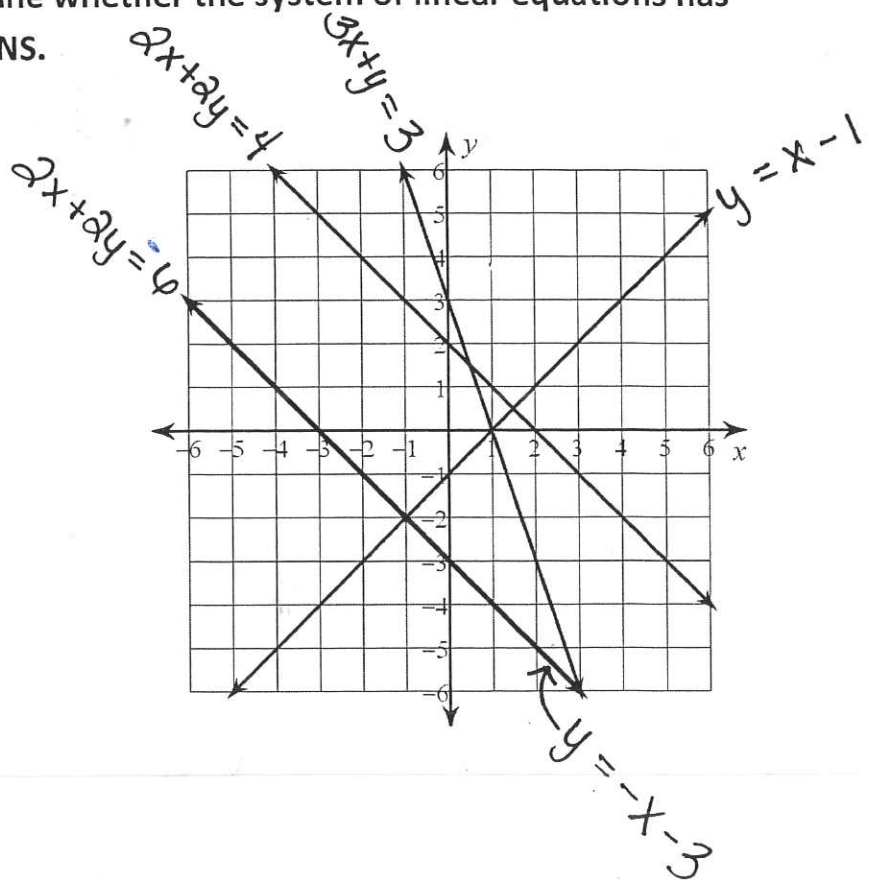
infinite

3.)  $y = -x - 3$   
 $2x + 2y = 4$

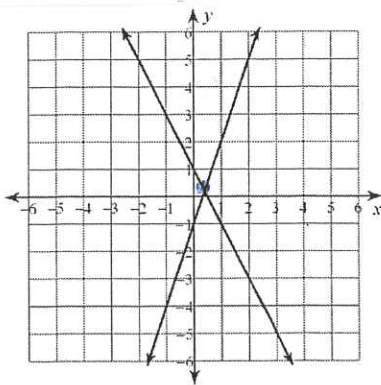
no solution

4.)  $2x + 2y = -6$   
 $3x + y = 3$

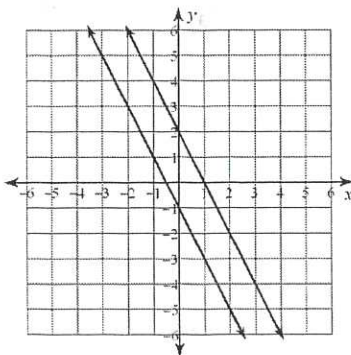
one solution



### YOU DO

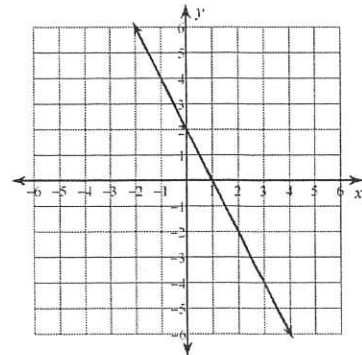


one solution



How many Solutions?

no solution



How many Solutions?

infinite

**RULES & TOOLS: Solving Systems of Equations**

System: Two or more equations on the same plane  
 Solution: A point on both lines.

**WE TRY**

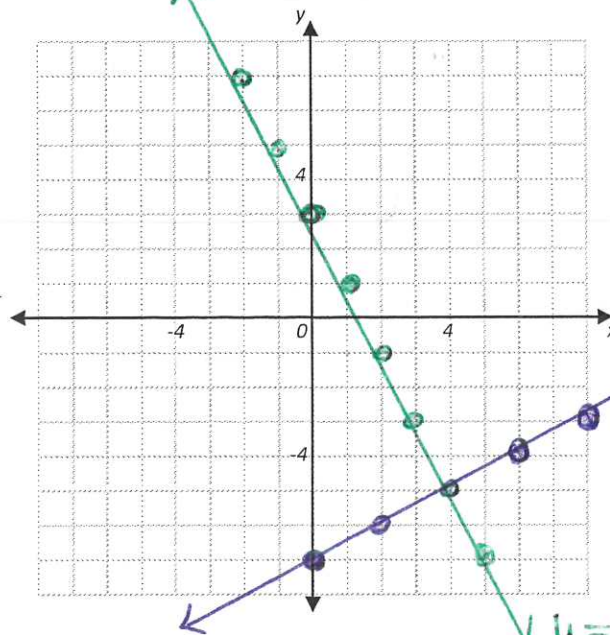
1. Graph the systems of equations and find the solution.

$$y = -2x + 3$$

$$b = (0, 3)$$

$$m = -\frac{2}{1}$$

$$\begin{cases} y = -2x + 3 \\ y = \frac{1}{2}x - 7 \end{cases}$$



$$y = \frac{1}{2}x - 7$$

$$b = -7$$

$$m = \frac{1}{2}$$

$$y = \frac{1}{2}x - 7$$

$$y = -2x + 3$$

Check your solution for both equations algebraically.

one solution  $(4, -5)$



## YOU DO



2. Graph the systems of equations and find the solution.

$$\begin{cases} y = -\frac{1}{2}x \\ y = 2x + 5 \end{cases}$$

$$y = -\frac{1}{2}x + 0$$

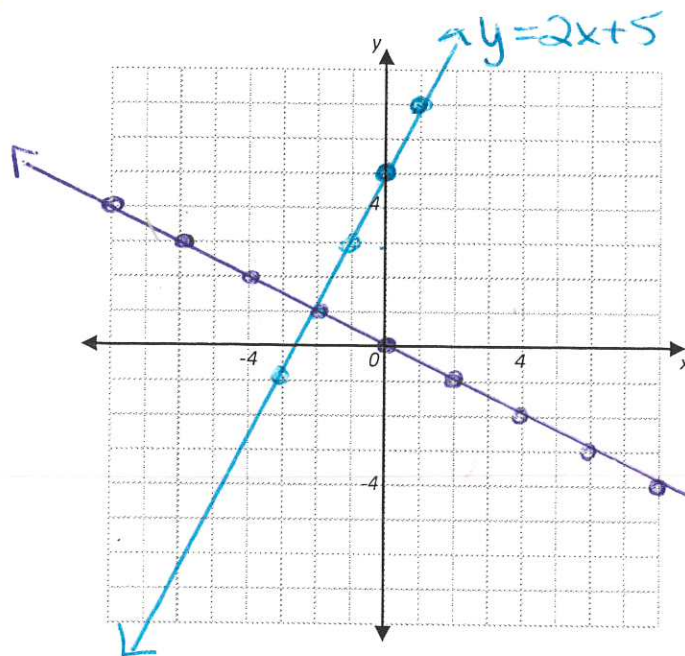
$$b = 0$$

$$m = -\frac{1}{2}$$

$$y = 2x + 5$$

$$b = 5$$

$$m = \frac{2}{1}$$

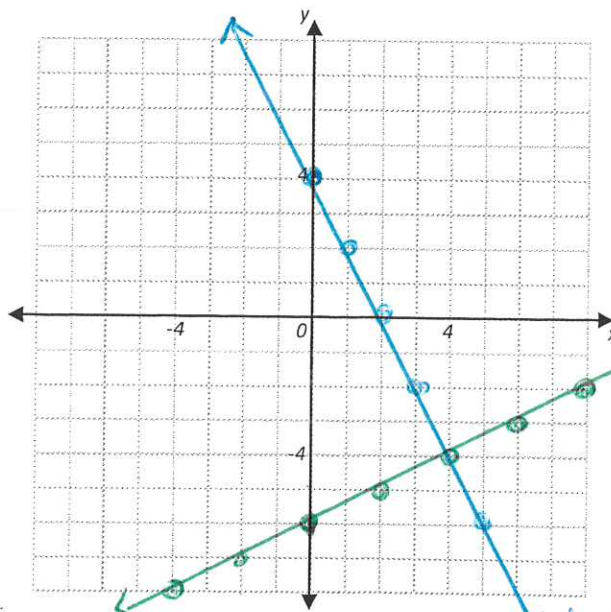


$(-2, 1)$

one solution.

3. Graph the systems of equations and find the solution.

$$\begin{cases} y = \frac{1}{2}x - 6 \\ y = -2x + 4 \end{cases}$$



one sol.

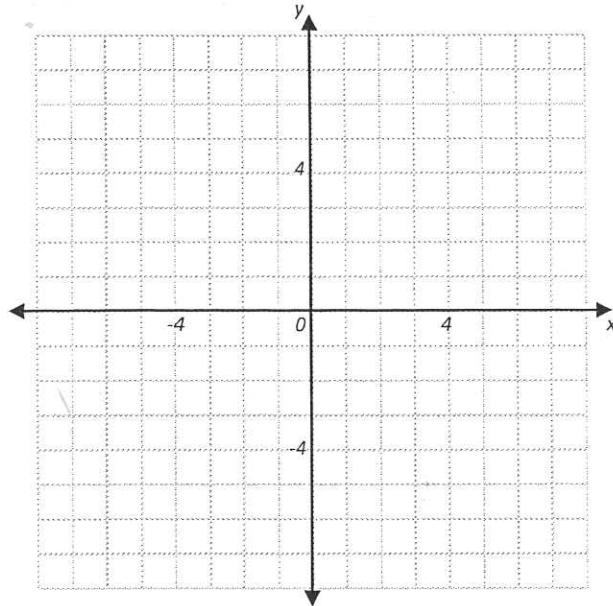
$(4, -4)$

$$y = -2x + 4$$

$$y = \frac{1}{2}x - 6$$

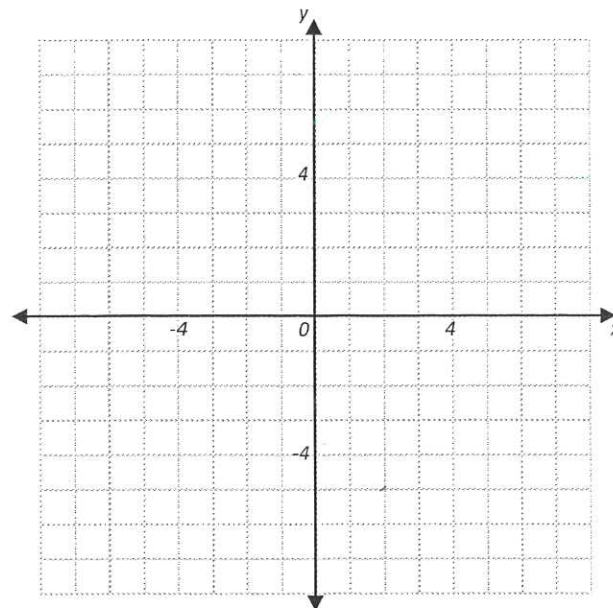
4. Graph the systems of equations and find the solution.

$$\begin{cases} y = -3x + 3 \\ y = -2x + 1 \end{cases}$$



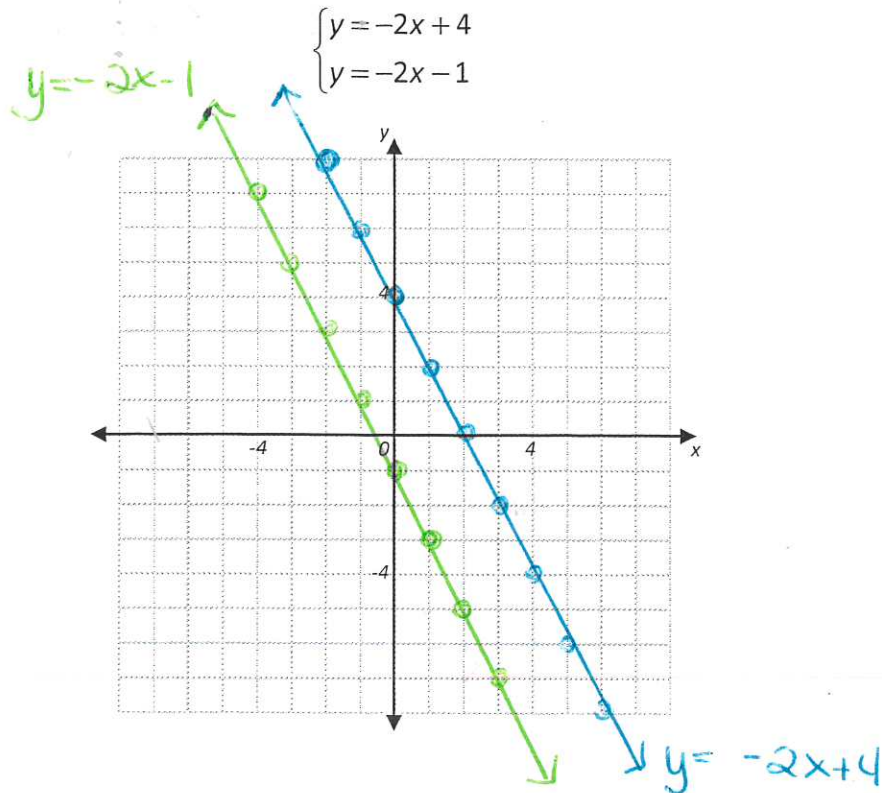
5. Graph the systems of equations and find the solution.

$$\begin{cases} y = \frac{2}{3}x - 2 \\ y = -2x + 6 \end{cases}$$



## TWIST

6. Graph the systems of equations and find the solution.



7. What do you notice about these lines? parallel lines
8. What is the solution and why? no solution, because they do not touch.
9. Do you think this will always be true of a system of parallel lines? Why or why not? yes

LOCK IT IN: parallel lines = no solution.