Algebra RH

Essential Questions: What is a system of linear equations? How can they be solved?

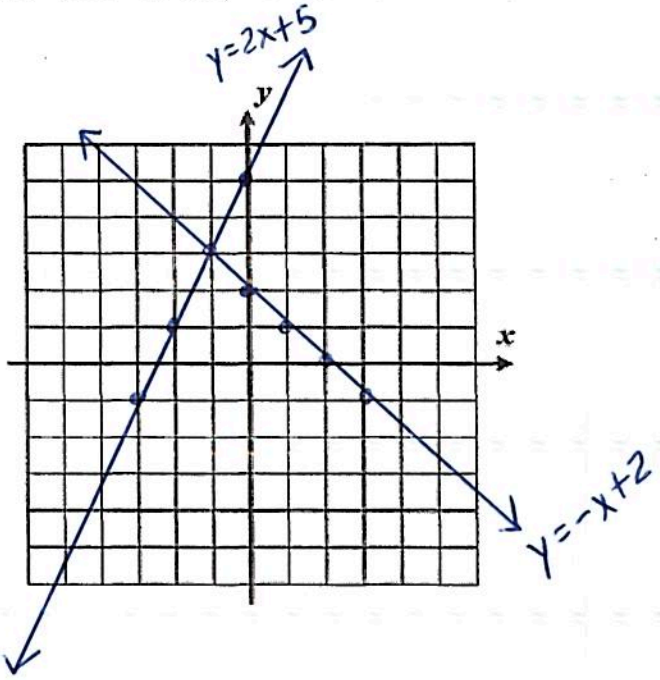
Do Now:

(a) Graph both equations on the grid shown.

$y = 2x + 5$ $\quad$ $y = -x + 2$

slope = $\frac{2}{1}$ $\quad$ slope = $\frac{-1}{1}$

y int = 5 $\quad$ y int = 2



(b) At what point do the two lines intersect?

$(-1, 3)$

(c) Justify that this point is a solution for each linear equation.

can show by math calculations or explain in words

check $(-1,3)$

$y = 2x + 5$ $\quad$ $y = -x + 2$

$3 = 2(-1) + 5$ $\quad$ $3 = -(-1) + 2$

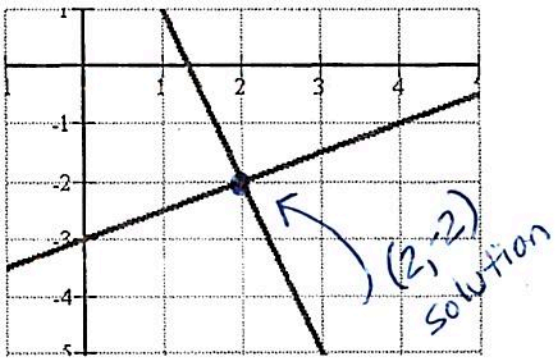
$3 = 3$ ✓ $\quad$ $3 = 3$ ✓

Solving Systems of Linear Equations Graphically

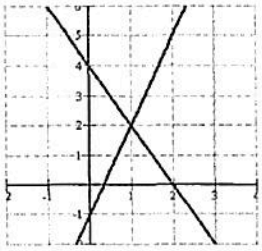
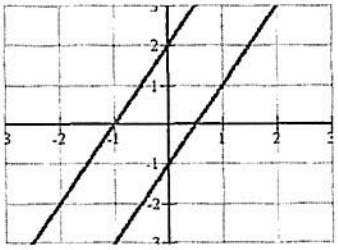
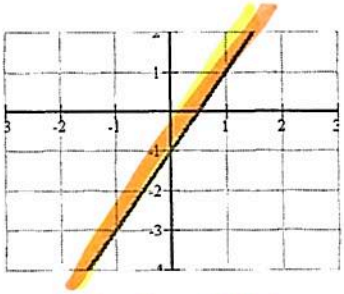
What is a System of Linear Equations?

- A system of equations is two or more equations using the same variables.
- The solution to the system is the point that satisfies ALL of the equations. This point will be an ordered pair (x, y).

Example: What is the solution of the linear system graphed below?



- When graphing, you will encounter three possibilities.

Intersecting Lines	Parallel Lines	Coinciding Lines
		
1 solution	0 solution	infinitely many solutions

Remember: Parallel lines have the same slope and different* y-intercepts.

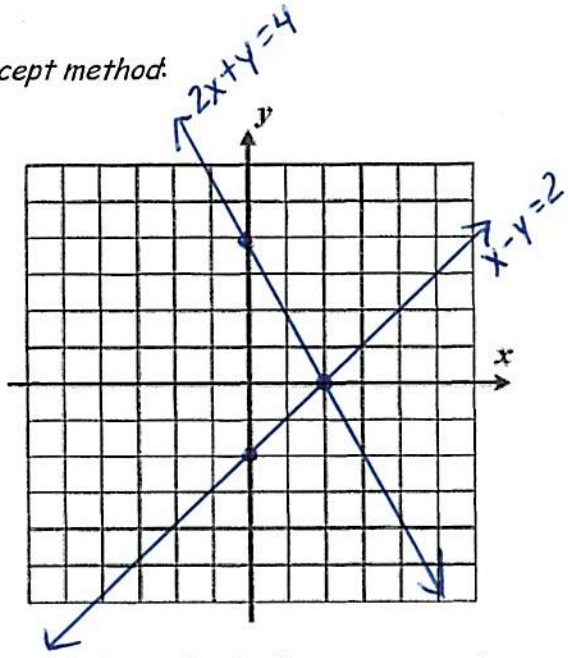
Coinciding lines have same slopes and the same y-intercepts.

1) Find the solution to the following system using the *intercept method*:

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

$x = \frac{C}{A}$ $\quad y = \frac{C}{B}$

x-intercept	y-intercept
$2x + y = 4$ $\frac{4}{2} = 2$	$2x + y = 4$ $\frac{4}{1} = 4$
$x - y = 2$ $\frac{2}{1} = 2$	$x - y = 2$ $\frac{2}{-1} = -2$



Where do the lines intersect?

(2,0)

Check:

$2x + y = 4$	$x - y = 2$
$2(2) + 0 = 4$ $4 = 4$ ✓	$2 - 0 = 2$ $2 = 2$ ✓

2) Find the solution to the following system:

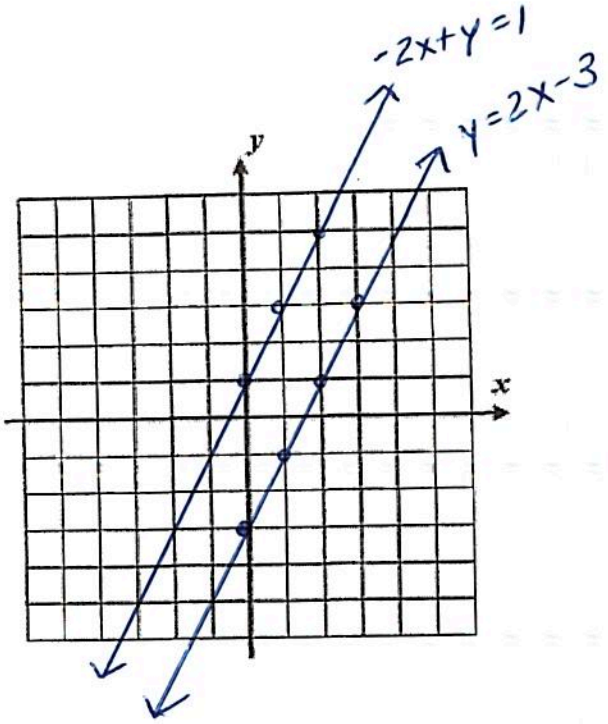
$y = 2x - 3$ $\qquad -2x + y = 1$

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

y int = −3 $\qquad$ slope = $\frac{2}{1}$

$\qquad\qquad$ y int = 1

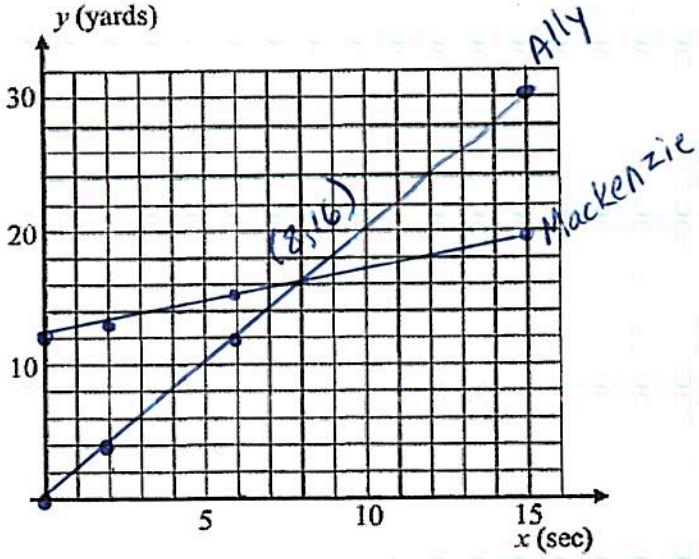
no solution



3) Ally is racing her little sister McKenzie. They are running a total of 30 yards and Ally gives McKenzie a 12 yard head start. Ally runs 2 yards every second but McKenzie only runs 1 yard every 2 seconds. Let x represent the number of seconds they have been racing and y represent the distance from the start line.

(a) Fill out the table below for various distances that Ally and McKenzie are from the start line at the given times.

x (sec)	Ally's Distance (yds)	McKenzie's Distance (yds)
0	0.	12
2	4	13
6	12	15



(b) Based on your calculations for (a) write equations for both Ally's distance and McKenzie's distance from the start line as a function of the time, x.

Ally's Distance: $y = 2x$ McKenzie's Distance: $y = \frac{1}{2}x + 12$

(c) Graph both of these equations on the grid above and determine the number of seconds it takes for Ally to catch up to McKenzie. How far are they from the finish line at that point?

8 seconds

30 − 16

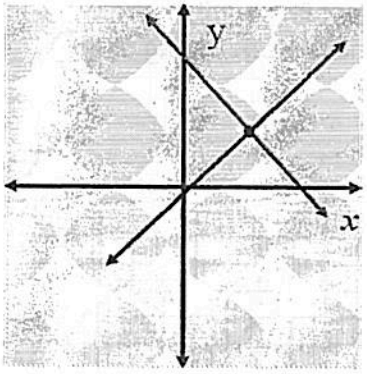
14 yards

The TAKE AWAY

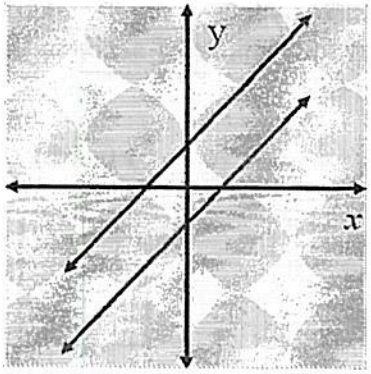
1. Fill in the blanks.

1. To solve a system of equations graphically, find the intersection of the two graphs.
2. This works because any point of intersection must lie on both graphs.
3. Because intersection points lie on both graphs, they must make both equations true.
4. Because the intersection point(s) make both equations true, they are solution(s) to the system of equations.

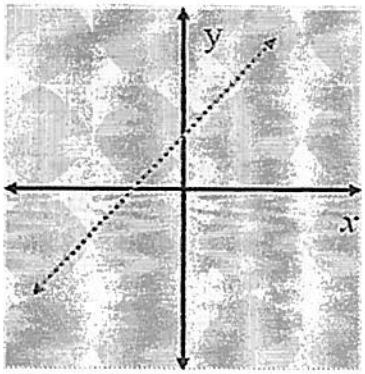
2. State the number of solutions for each of the following systems of linear equations.



one solution



no solutions



infinite solutions

PIPS

The two lines $y = 6x + 15$ and $y = mx - 4$ intersect at $x = -2$.

(a) What is the y-coordinate of their intersection point?

$y = 6(-2) + 15$
$y = -12 + 15$
$y = 3$

(b) What is the value of m?

$3 = m(-2) - 4$
$3 = -2m - 4$
$7 = -2m$ $m = -\frac{7}{2}$

I love Pips!

Perseverance!