Warm-Up

CAHSEE/CCSS: 7 AF 1.1/ A–REI.17

Which system of equations represents the statements below?

The sum of two numbers is ten.
One number is five times the other.

A $\begin{cases} xy = 10 \\ y = 5x \end{cases}$

C $\begin{cases} x + y = 10 \\ y = 5x \end{cases}$

B $\begin{cases} xy = 10 \\ y = x + 5 \end{cases}$

D $\begin{cases} x + y = 10 \\ y = x + 5 \end{cases}$

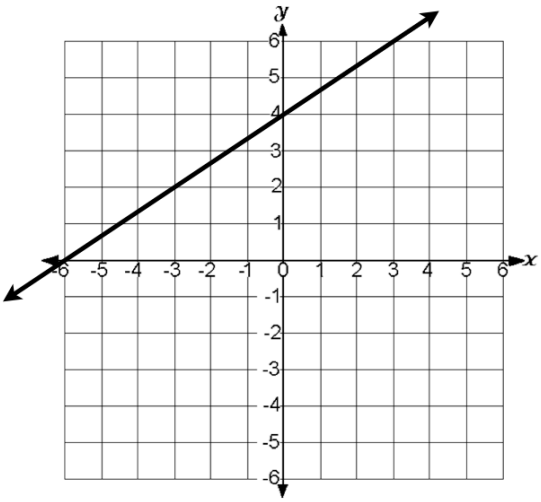
Review/CCSS: ALG 6.0/ 8.EE.5

Graph the following linear equation in two ways.

$$-2x + 3y = 8$$

Current/CCSS: ALG 6.0/ 8.F.4

What equation best represents the line shown in the graph below? Write the equation in two different ways.



Other/CCSS: ALG 5.0/ 8.EE.7a

Solve the following equation in three different ways.

$$3(x + 5) = 2x + 35$$

I. Definition

- Define system of equations as "a set of 2 or more equations with the same variables."

II. Introduction to New Material

Ex. 1

- Graph $x + y = -4$ by finding the x and y intercepts
- Graph $-2x + y = 2$ on the same axes
- Ask students,
    - "How many times do the lines intersect?" [One!]
    - "The number of times that the lines intersect is the number of solutions this system has. How many solutions does this system have?" [One!]
    - "Where is this solution (The point where the lines intersect)?" (–2, –2)
- In the solutions column (in student notes) have students write:
    - One solution
    - Lines only intersect one time
- Ask students,
    - "What do we know about the slopes of these two lines? Are they the same or different?" [Different]
    - "What about the y-intercepts?" [Different]
- Add this information to the "solutions" column
    - One solution
    - Lines only intersect one time
    - Slopes are different
    - y-intercepts are different

Ex. 2 and 3 – Follow the above process.

III. Think, Pair, Share

- Give students time to graph the system of equations and answer the questions about the graph independently.
- Afterwards, instruct students to compare their work with their partner's.
    - "Turn to your partner and check if your graphs looks the same. If not, see who made a mistake. Tell your partner how you answered the 3 questions and explain how you got those answers."
- Have pairs of students come up to the document camera to share graphs and answers.

IV. "Your Turns" – Independent Practice Match

- Give each student (or pair of students) an envelope of the 18 pre-cut matching pieces.
- Instructions: "Match system number with graph letter and the system's correct solution. Provide justification as to why the three cards belong together."
    - Example: "System 3 (1st column) might match up with graph F (2nd column) which could have no solution (3rd column). Then provide the explanation."

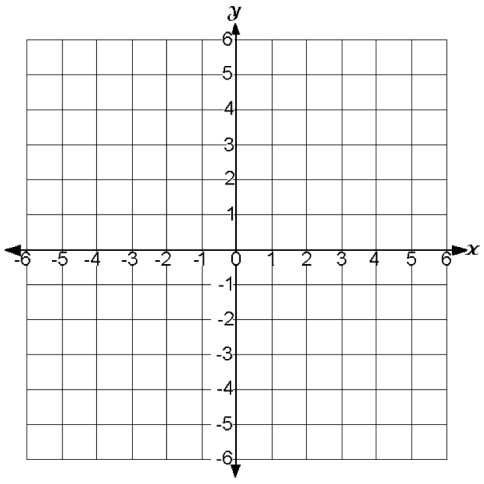
Solving a System by Graphing

I. System of Equations:

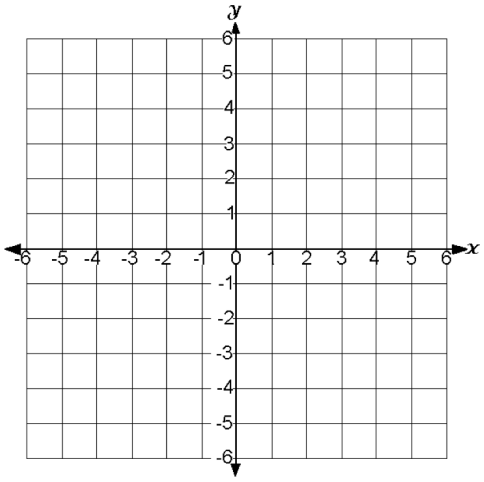
II. A system of equations can have 3 types of solutions.

System	Graph	Solution

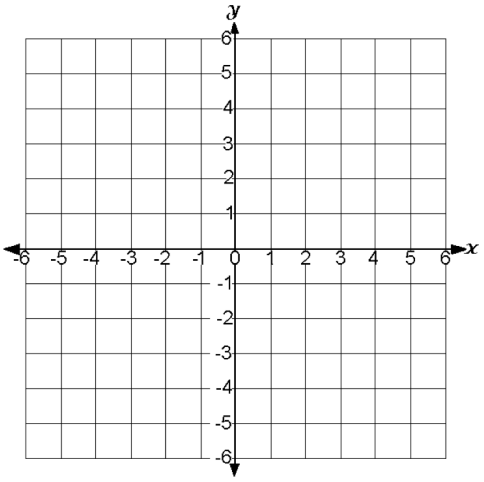
Ex 1. $\begin{cases} x + y = -4 \\ -2x + y = 2 \end{cases}$



Ex 2. $\begin{cases} -x + 2y = 2 \\ 3x - 6y = 12 \end{cases}$



Ex 3. $\begin{cases} -8x + 2y = 8 \\ 4x - y = -4 \end{cases}$

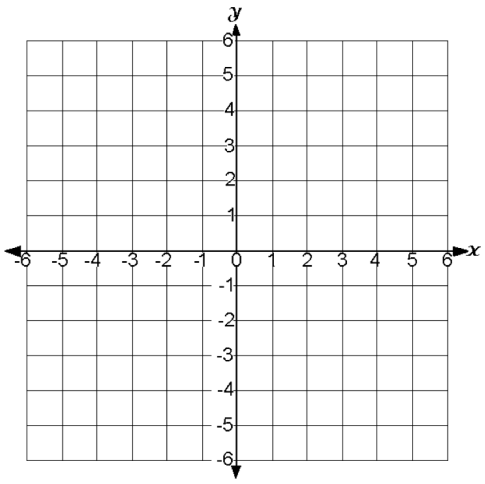


III. Graph the following system and answer the questions about its solution.

System

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

Graph



Solution

How many times do these lines intersect?

Where do they intersect?

What is the solution to the system?

IV. Matching

System of Equations (Write the number)	Graph (Write the letter)	Solution	Justification

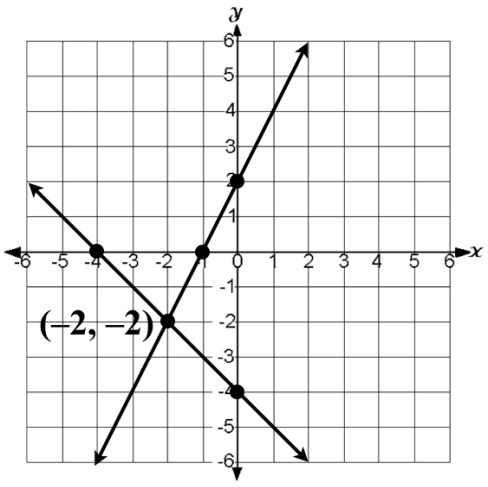
Solving a System by Graphing

I. System of Equations: a set of 2 or more equations with the same variables.

II. A system of equations can have 3 types of solutions.

Ex 1. $\begin{cases} x + y = -4 \\ -2x + y = 2 \end{cases}$

$x + y = -4$	$-2x + y = 2$
$0 + y = -4$	$-2(0) + y = 2$
$y = -4$ $(0, -4)$	$y = 2$ $(0, 2)$
$x + y = -4$	$-2x + y = 2$
$x + 0 = -4$	$-2x + 0 = 2$
$x = -4$ $(-4, 0)$	$-2x = 2$
	$x = -1$ $(-1, 0)$

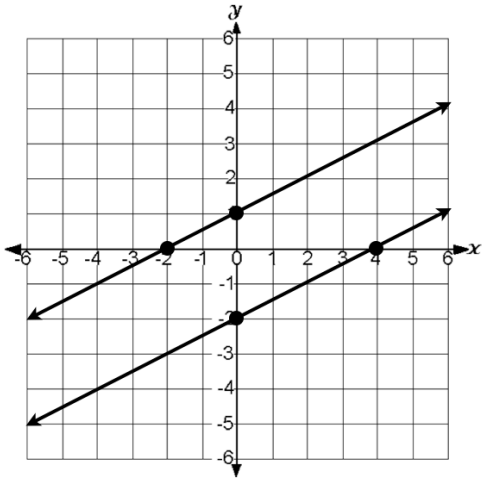


One Solution

- Lines only intersect once (–2, –2)
- Slopes are different
- *y*-intercepts are different

Ex 2. $\begin{cases} -x + 2y = 2 \\ 3x - 6y = 12 \end{cases}$

$-x + 2y = 2$	$3x - 6y = 12$
$0 + y = 2$	$3(0) - 6y = 12$
$y = 1$ $(0, 1)$	$-6y = 12$
	$y = -2$ $(0, -2)$
$-x + 2y = 2$	$3x - 6y = 12$
$-x + 2(0) = 2$	$3x - 6(0) = 12$
$-x = 2$	$3x = 12$
$x = -2$ $(-2, 0)$	$x = 4$ $(4, 0)$

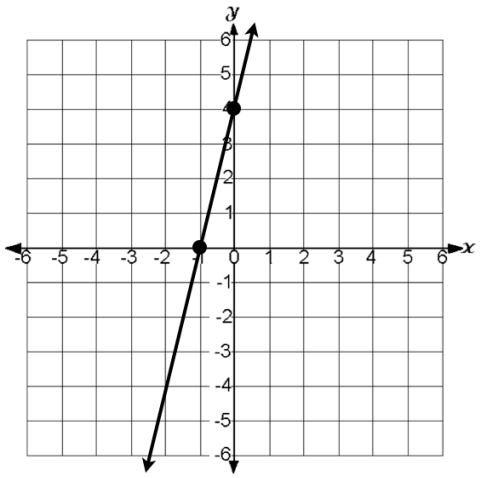


No Solution

- Lines never intersect (parallel lines)
- Slopes are the same
- *y*-intercepts are different

Ex 3. $\begin{cases} -8x + 2y = 8 \\ 4x - y = -4 \end{cases}$

$-8x + 2y = 8$	$4x - y = -4$
$-8(0) + 2y = 8$	$4(0) - y = -4$
$2y = 8$	$-y = -4$
$y = 4$ $(0, 4)$	$y = 4$ $(0, 4)$
$-8x + 2y = 8$	$4x - y = -4$
$-8x + 2(0) = 8$	$4x - 0 = -4$
$-8x = 8$	$4x = -4$
$x = -1$ $(-1, 0)$	$x = -1$ $(-1, 0)$



Infinite Solutions

- Lines intersect at every point (coinciding lines)
- Slopes are the same
- *y*-intercepts are the same

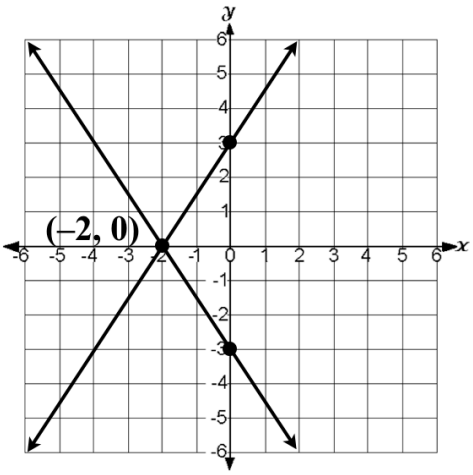
III. Graph the following system and answer the questions about its solution.

System

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

$3x + 2y = -6$	$-3x + 2y = 6$
$3(0) + 2y = -6$	$-3(0) + 2y = 6$
$2y = -6$	$2y = 6$
$y = -3$ $(0, -3)$	$y = 3$ $(0, 3)$
$3x + 2y = -6$	$-3x + 2y = 6$
$3x + 2(0) = -6$	$-3x + 2(0) = 6$
$3x = -6$	$-3x = 6$
$x = -2$ $(-2, 0)$	$x = -2$ $(-2, 0)$

Graph



Solution

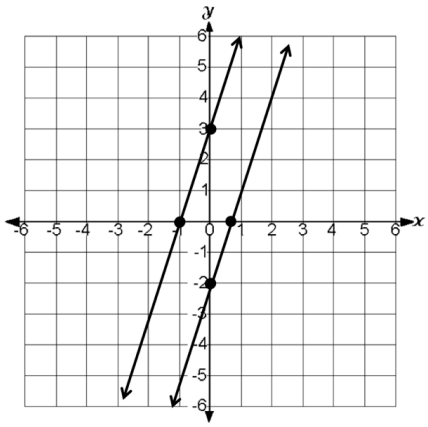
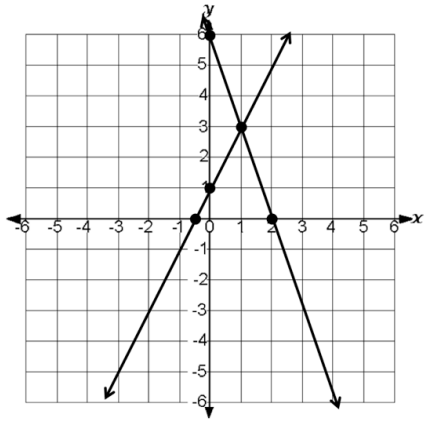
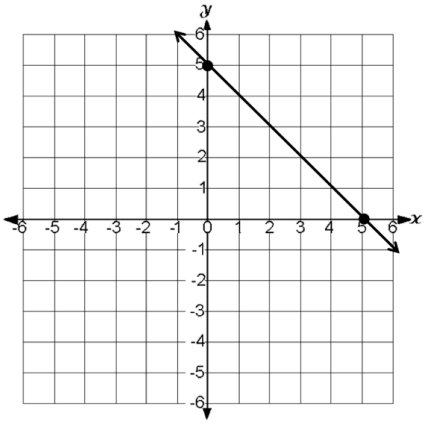
How many times do these lines intersect?

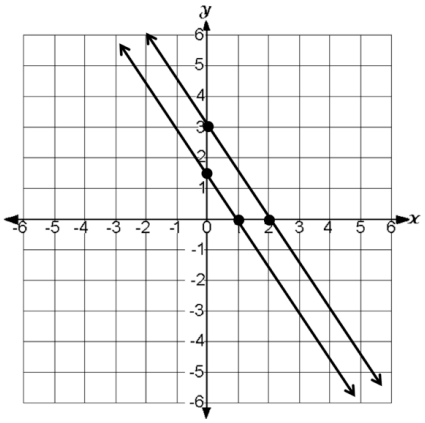
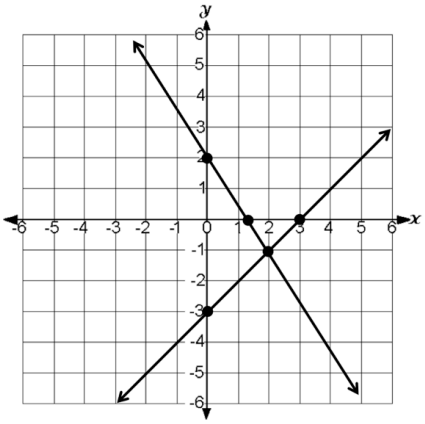
Where do they intersect?

What is the solution to the system?

IV. Matching

System of Equations (Write the number)	Graph (Write the letter)	Solution	Justification
1	C	No Solution	The graphs are parallel lines and never intersect, therefore they have no solution.
2	D	One Solution (1, 3)	The graphs intersect at one point, the point (1,3). Therefore, they have one solution.
3	A	Infinite Solutions	The graphs are the same line and intersect at every point. Therefore, they have ∞ solutions.
4	F	No Solution	The graphs are parallel lines and never intersect, therefore they have no solution.
5	B	One Solution (2, -1)	The graphs intersect at one point, the point (2, -1). Therefore, they have one solution.
6	E	Infinite Solutions	The graphs are the same line and intersect at every point. Therefore, they have ∞ solutions.

1 $\begin{cases} 3x - y = 2 \\ -6x + 2y = 6 \end{cases}$	C 	No Solution
2 $\begin{cases} 2x - y = -1 \\ 3x + y = 6 \end{cases}$	D 	One Solution (1, 3)
3 $\begin{cases} x + y = 5 \\ -2x - 2y = -10 \end{cases}$	A 	Infinite Solutions

4	F	No Solution
$\begin{cases} 3x+2y=6 \\ 6x+4y=6 \end{cases}$		
5	B	One Solution (2, -1)
$\begin{cases} 3x+2y=4 \\ -x+y=-3 \end{cases}$		
6	E	Infinite Solutions
$\begin{cases} 3x+2y=6 \\ -6x-4y=-12 \end{cases}$