Bellringer

1. Two cars are traveling in the same direction. The first car is going 40 mi/h, and the second car is going 55 mi/h. The first car left 3 hours before the second car. Which equation could you solve to find how many hours it will take for the second car to catch up to the first car?

Ⓐ $55t + 3 = 40t$

Ⓑ $55t + 165 = 40t$

Ⓒ $40t + 3 = 55t$

Ⓓ $40t + 120 = 55t$

8.1 Solving Systems of Linear Equations by Graphing

8.EE.8
Analyze and solve pairs of simultaneous linear equations

8.EE.8a
Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously

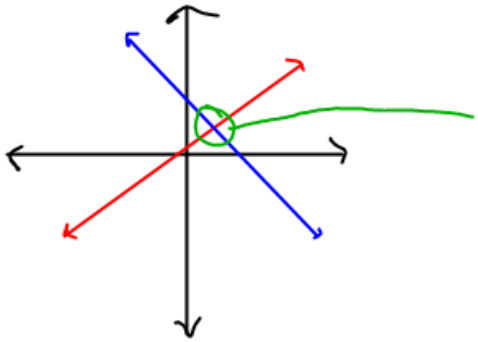
8.EE.8c
Solve real-world and mathematical problems leading to two linear equations in two variables.

Vocabulary

- ordered pair - (x, y)

- System of Equations - set of equations containing the same variables

- Solution of a System of Equations - an ordered pair that satisfies every equation



Recall:

$$y = mx + b$$

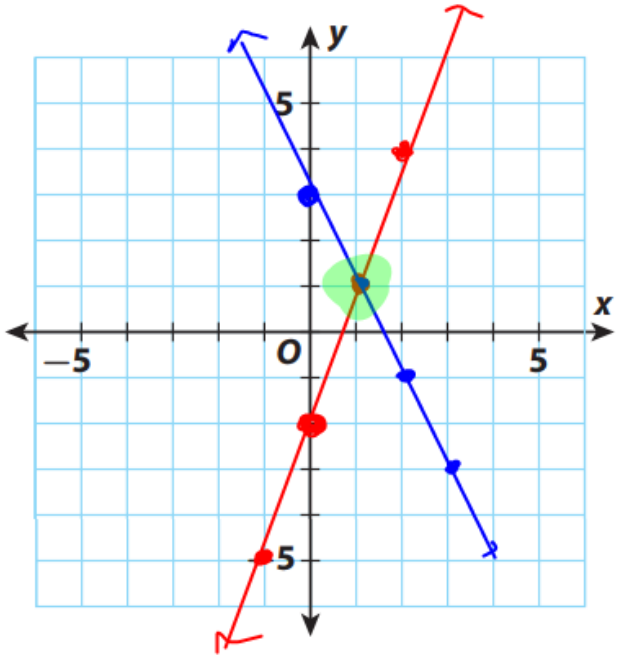
m: slope

b: y-intercept

$$\text{slope} = \frac{\text{Rise}}{\text{Run}} \qquad \frac{(+)\uparrow\ (-)\downarrow}{(+)\rightarrow\ (-)\leftarrow}$$

EXPLORE ACTIVITY

A Graph the pair of equations together: $\begin{cases} y = 3x - 2 \\ y = -2x + 3 \end{cases}$



B Explain how to tell whether (2, −1) is a solution of the equation $y = 3x - 2$ without using the graph.

Substituting (2,-1) into equation and solving results in a false statement. Not a solution

C Explain how to tell whether (2, −1) is a solution of the equation $y = -2x + 3$ without using the graph.

Substituting (2,-1) into equation and solving results in a true statement. Is a solution

D Use the graph to explain whether (2, −1) is a solution of each equation.

The O.P. (2,-1) only lands on the line for the equation $y=-2x+3$ and not for $y=3x-2$. It is not a solution for both equations. However, (1,1) is the solution

EXAMPLE 1

Solve each system by graphing.

A $\begin{cases} y = -x + 4 \\ y = 3x \end{cases}$

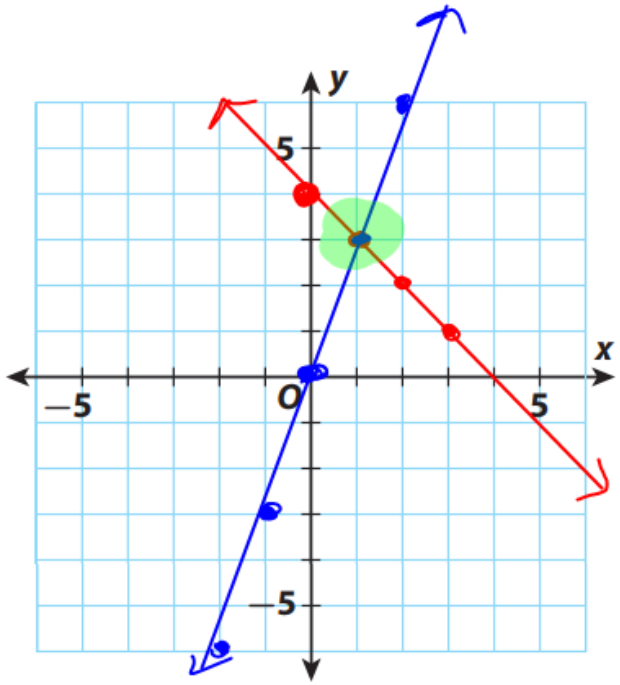
3/1 ↑→ ; −1/1 ↓→

STEP 1 Graph Equations (make sure they are in S.I.F.)

STEP 2 Find point of intersection

(1, 3)

STEP 3 Check your Solution! Plug O.P. into both equations to check for true statements



$3 = -(1) + 4$

$3 = -1 + 4$

$3 = 3$ ✓

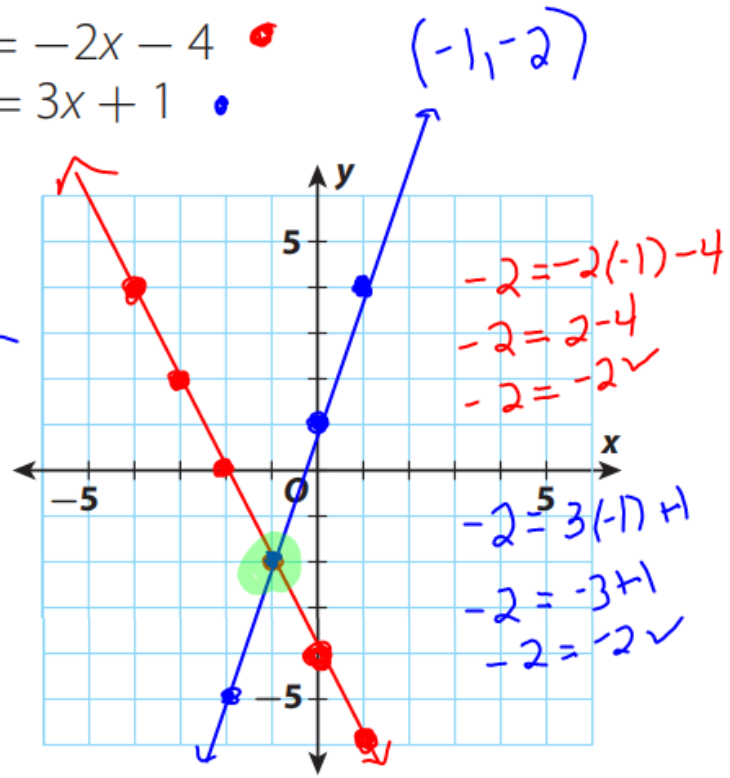
$3 = 3(1)$

$3 = 3$ ✓

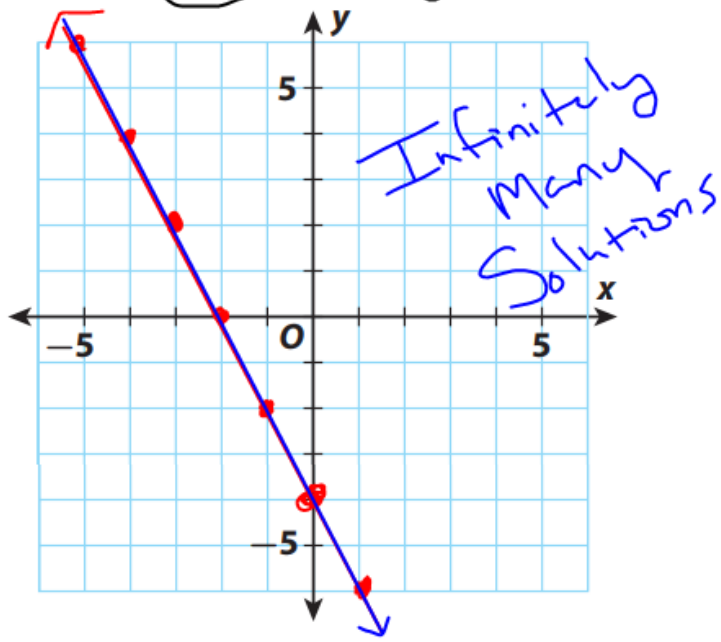
ADDITIONAL EXAMPLE 1

Solve each system by graphing.

A $\begin{cases} y = -2x - 4 \\ y = 3x + 1 \end{cases}$



B $\begin{cases} y = -2x + -4 \\ y = -2(x + 2) \end{cases}$ $y = -2x + -4$



If...

- Answer is an O.P. that satisfies both equation
  - ↳ lines cross in 1 spot on graph → one solution

- The equations are identical (same slope & y-intercept), then any O.P. on the line satisfies the equations
  - ↳ lines lay on top of each other → Infinitely Many Solutions

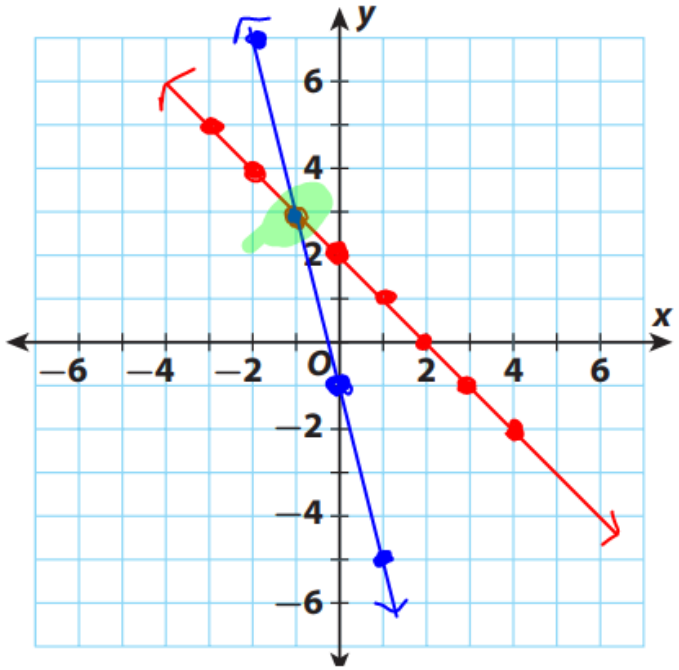
- The equations have the same slope but different y-intercepts, they are parrallel
  - ↳ lines do not cross → No Solution

YOUR TURN

Solve each system by graphing. Check by substitution.

3. $\begin{cases} y = -x + 2 \\ y = -4x - 1 \end{cases}$ $(-1, 3)$

$-\frac{1}{1}$ $-\frac{4}{1}$



$3 = -1(-1) + 2$

$3 = 1 + 2$

$3 = 3$ ✓

$3 = -4(-1) - 1$

$3 = 4 - 1$

$3 = 3$ ✓

YOUR TURN

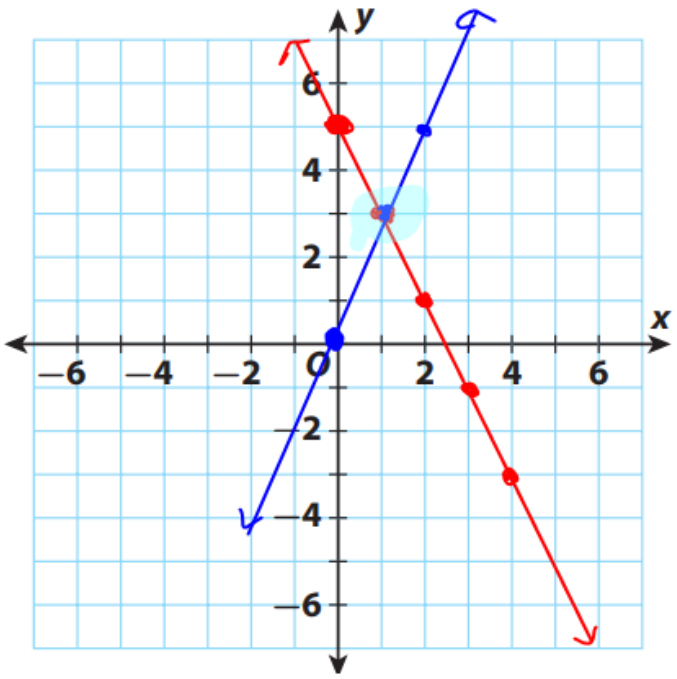
Solve each system by graphing. Check by substitution.

4. $\begin{cases} y = -2x + 5 \\ y = 3x \end{cases}$

$\frac{+2}{-1}$

$\frac{3}{1}$

(1, 3)



$3 = -2(1) + 5$

$3 = -2 + 5$

$3 = 3$ ✓

$3 = 3(1)$

$3 = 3$ ✓

Solving Problems Using Systems of Equations

Always write equations in Slope-intercept form to graph

$y = mx + b$

EXAMPLE 2

HD = x Drinks = y

Keisha and her friends visit the concession stand at a football game. The stand charges $2 for a hot dog and $1 for a drink. The friends buy a total of 8 items for $11. Tell how many hot dogs and how many drinks they bought.

STEP 1 Assign Variables

$x + y = 8$

$2x + 1y = 11$

STEP 2 SIF/Graph

$y = -x + 8$

$y = -2x + 11$

STEP 3 • When do they cross?

(3, 5)

STEP 4 Interpret

3 HD &

5 Drinks

YOUR TURN

6. During school vacation, Marquis wants to go bowling and to play laser tag. He wants to play 6 total games but needs to figure out how many of each he can play if he spends exactly $20. Each game of bowling is $2 and each game of laser tag is $4.

a. Let x represent the number of games Marquis bowls and let y represent the number of games of laser tag Marquis plays. Write a system of equations that describes the situation. Then write the equations in slope-intercept form.

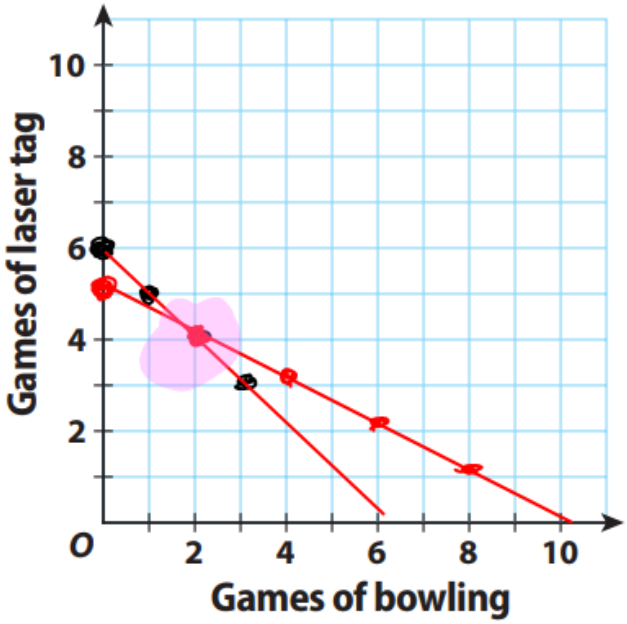
$x + y = 6 \Rightarrow y = -x + 6$

$2x + 4y = 20 \Rightarrow y = -\frac{1}{2}x + 5$

b. Graph the solutions of both equations.

$\frac{4y}{4} = \frac{-2x + 20}{4}$

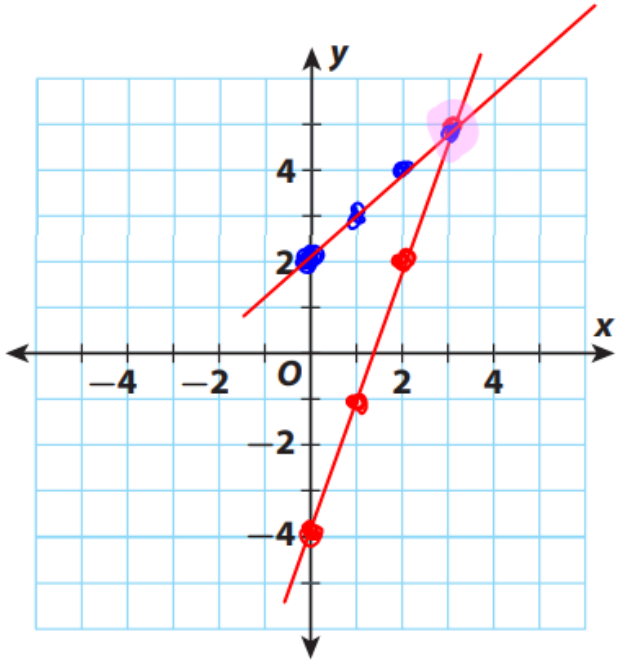
2 bowling
4 L.T.



Guided Practice

Solve each system by graphing. (Example 1)

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



(3, 5)

$5 = 3(3) - 4$

$5 = 9 - 4$

$5 = 5$ ✓

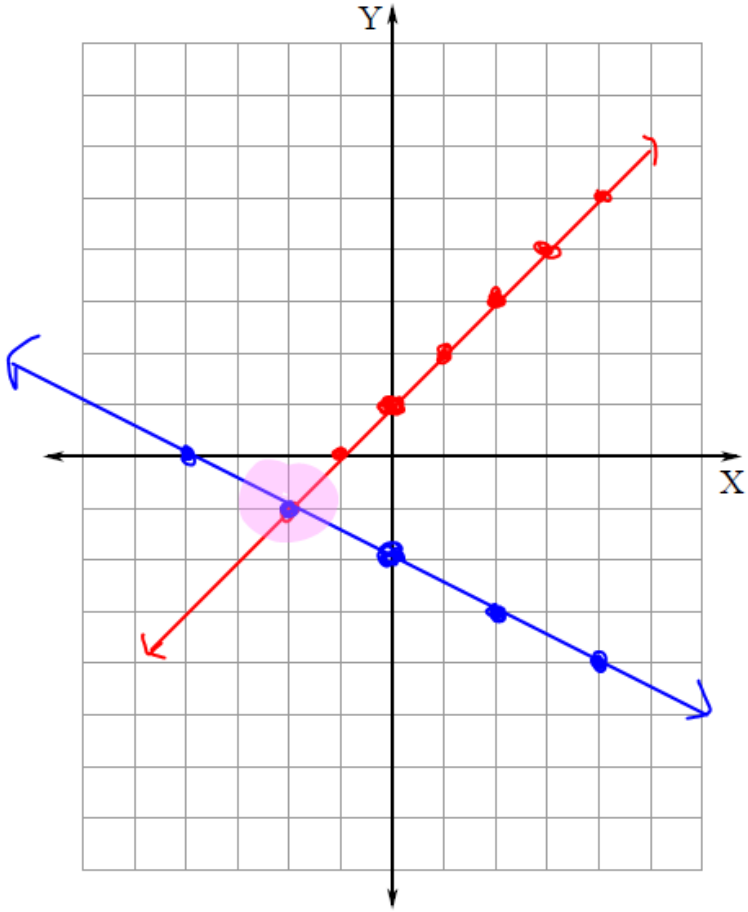
$5 = 3 + 2$

$5 = 5$ ✓

① $y = x + 1$

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

$(-2, -1)$



* Check *

$-1 = -2 + 1$

$-1 = -1$ ✓

$-1 = \frac{-1}{2}(-2) - 2$

$-1 = 1 - 2$

$-1 = -1$ ✓