Activity

4-1 Solving Systems of Equations by Graphing

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EXPLORE & REASON

Juan and Leo were supposed to meet and drive ATVs on a trail together. Juan is late so Leo started without him.

Not drawn to scale

A. Write an equation for Leo's distance from the starting point after riding for x hours. Write an equation for Juan's distance from the starting point if he starts h hours after Leo.

B. **Model With Mathematics** Suppose $h = 1$. How can you use graphs of the two equations to determine who finishes the trail first? MP.4

C. How much of a head start must Leo have to finish the trail at the same time as Juan?

HABITS OF MIND

Make Sense and Persevere Suppose Leo got a 10-mile head start. About how long would he be waiting at the end of the trail before Juan got there? MP.1

slope-intercept form

$y = mx + b$

slope: m — y-intercept: b

Standard form → intercepts

$Ax + By = C$

x-int: set $y = 0$ — y-int: set $x = 0$

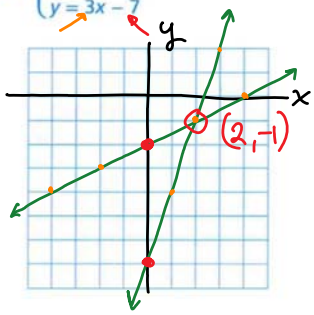
Notes

Assess

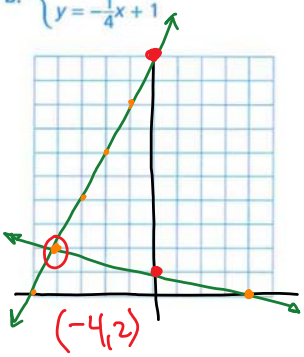
EXAMPLE 1 **Try It! Solve a System of Equations by Graphing**

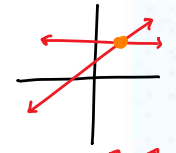
1. Use a graph to solve each system of equations.

a. $\begin{cases} y = \frac{1}{2}x - 2 \\ y = 3x - 7 \end{cases}$ (m, y-int)

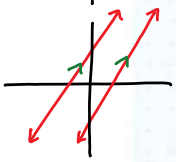


b. $\begin{cases} y = 2x + 10 \\ y = -\frac{1}{4}x + 1 \end{cases}$

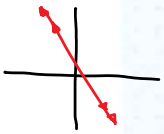




one solution



no solution
- same slope
- diff y-ints
- parallel



∞ solutions
- same line

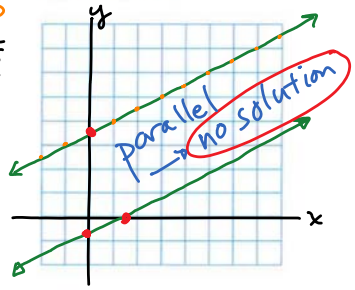
EXAMPLE 2 **Try It! Graph Systems of Equations With Infinitely Many or No Solutions**

2. Use a graph to solve each system of equations.

a. $\begin{cases} y = \frac{1}{2}x + 7 \\ 4x - 8y = 12 \end{cases}$

x-int: set $y = 0$: $\frac{4x}{4} = \frac{12}{4}$, $x = 3$

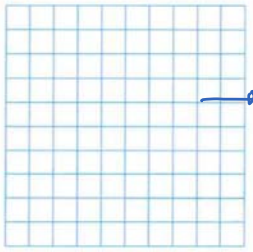
y-int: set $x = 0$: $\frac{-8y}{-8} = \frac{12}{-8}$, $y = -\frac{3}{2}$



b. $\begin{cases} \frac{3x}{3} + \frac{2y}{3} = \frac{9}{3} \\ \frac{2}{3}y = 3 - x \end{cases}$ → $x + \frac{2}{3}y = 3$

$\frac{2}{3}y = 3 - x$

- same line



∞ solutions

HABITS OF MIND

Reason Other than graphing, how else could you determine that an equation has infinitely many solutions? MP.2

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Notes

Assess

EXAMPLE 3 **Try It! Write a System of Equations**

3. Suppose Monisha reads 10 pages each day instead.
   a. How will that change the length of time it takes for Holly to catch up with Monisha?

   b. Will Holly still finish the novel first? Explain.

EXAMPLE 4 **Try It! Solve a System of Equations Approximately**

4. What solution do you obtain for the system of equations by graphing? What is the exact solution?

   $y = 5x - 4$
   $y = -6x + 14$

HABITS OF MIND

Use Appropriate Tools Holly and Monisha's classmate, Chris, is also finishing the novel. Chris has read 64 pages of the novel and plans to read 13 pages each day. When does Holly catch up to Chris? Does Chris finish the novel before Monisha? MP.5

Assess

Do You UNDERSTAND?

1. **ESSENTIAL QUESTION** How can you use a graph to illustrate the solution to a system of linear equations?

2. **Model With Mathematics** How does the graph of a system of equations with one solution differ from the graph of a system of equations with infinitely many solutions or no solution? MP.4

3. **Reason** Why is the point of intersection for a system of equations considered its solution? MP.2

4. **Error Analysis** Reese states that the system of equations has no solution because the slopes are the same. Describe Reese's error. MP.8

$y = -3x - 1$

$3x + y = -1$

Do You KNOW HOW?

$y = mx + b$

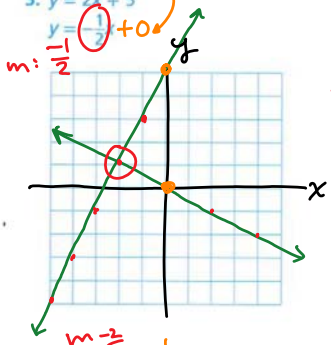
Solve each system of equations by graphing.

5. $y = 2x + 5$

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

m: $\frac{2}{1}$ b

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

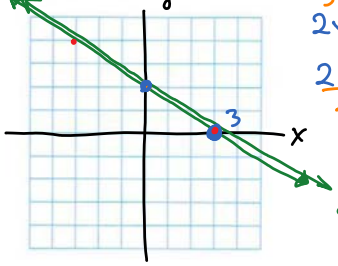


1 solution → (−2, 1)

6. $y = -\frac{2}{3}x + 2$

$2x + 3y = 6$

m: $-\frac{2}{3}$ b



x-int: Set $y = 0$

$2x + 3(0) = 6$

$\frac{2x}{2} = \frac{6}{2}$

$x = 3$

y-int: Set $x = 0$

$2(0) + 3y = 6$

$\frac{3y}{3} = \frac{6}{3}$

$y = 2$

Same line → ∞ solutions

7. Juanita is painting her house. She can either buy Brand A paint and a paint roller tray or Brand B paint and a grid for the paint roller. For how many gallons of paint would the price for both options be the same? If Juanita needs 15 gallons of paint, which is the better option?

1-gallon can: $27/gallon	1 paint roller tray: $3	1-gallon can: $25/gallon	1 grid for paint roller: $5

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