

VOLUME 2




enVision[®] Mathematics

SAVVAS

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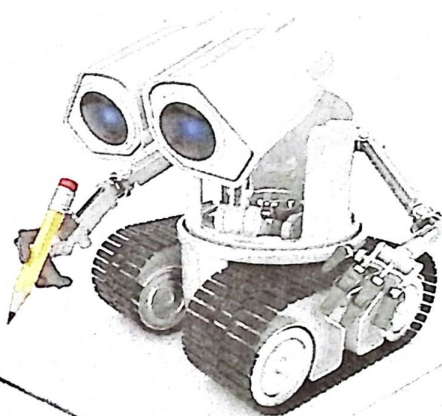


Solve & Discuss It!



ACTIVITY

Draw three pairs of lines, each showing a different way that two lines can intersect or not intersect. How are these pairs of lines related?



Lesson 5-1

Estimate Solutions by Inspection



Go Online

I can...

find the number of solutions of a system of equations by inspecting the equations.

Focus on math practices

Look for Relationships Is it possible for any of the pairs of lines drawn to have exactly two points in common? Explain.

Essential Question How are slopes and y-intercepts related to the number of solutions of a system of linear equations?



EXAMPLE 1



Relate Solutions of Linear Systems

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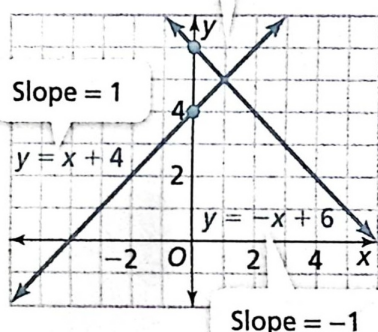


Deanna drew the pairs of lines below.
Each pair of lines represents a *system of linear equations*.
A **system of linear equations** is formed by two or more linear equations that use the same variables.

How can you use the graphs to determine the number of solutions of each system?

Look for Relationships How do the points of intersection of the graphed lines relate to the solutions of the systems of linear equations?

The lines intersect at 1 point.
This system has 1 solution.



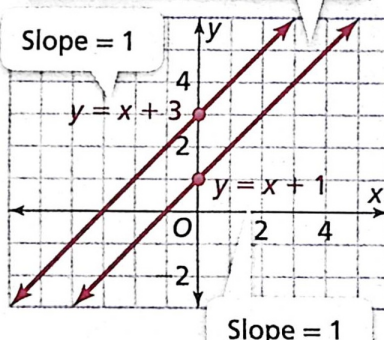
The equations of the linear system
 $y = x + 4$
 $y = -x + 6$

have different slopes.

The system has 1 solution (1, 5).

A solution of a system of linear equations is any ordered pair that makes all equations in the system true.

The lines do not intersect;
they are parallel. This
system has no solution.

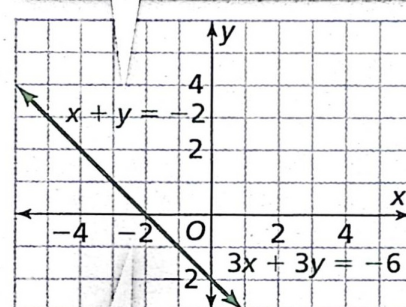


The equations of the linear system
 $y = x + 3$
 $y = x + 1$

have the same slopes and
different y-intercepts.

The system has no solution.

The lines intersect at every point;
they are the same line. This system
has infinitely many solutions.



Slope = -1
y-intercepts = -2

The equations of the linear system
 $x + y = -2$
 $3x + 3y = -6$

have the same slopes and the same
y-intercepts. They represent the
same line.

The system has infinitely many solutions.

Try It!

How many solutions does this system of equations have? Explain.

The system of equations has solution. The equations have

slopes, so the lines intersect at point.

Convince Me! The equations of a system have the same slopes.
What can you determine about the solution of the system of equations?

$$y = x + 1$$

$$y = 2x + 2$$

EXAMPLE 2



Estimate Solutions of Systems by Inspection



ACTIVITY



ASSESS

Harrison and Pia each buy x comic books. Harrison also buys an action figure for \$15, while Pia buys a different action figure for \$12. Could they each spend the same amount, y , and buy the same number of comic books? Explain.

The system of equations represents the situation.

$$y = 5x + 15$$

$$y = 5x + 12$$

The slopes are the same.

The y -intercepts are different.

The system has *no solution*.

Harrison and Pia could not spend the same amount of money and buy the same number of comic books.



Model with Math How does the graph of this system of linear equations represent the solution?

EXAMPLE 3



Estimate More Solutions of Systems by Inspection

Corey and Winnie each bought x pounds of cheddar cheese and y pounds of tomatoes. Corey spent \$12 at the supermarket. Winnie spent \$24 at the farmer's market. Could they have bought the same amount, by weight, of cheddar cheese and tomatoes? Explain.

The system of equations $\begin{cases} 6x + 2y = 12 \\ 12x + 4y = 24 \end{cases}$ represents the situation.

Write each equation in slope-intercept form.

$$6x + 2y = 12$$

$$12x + 4y = 24$$

$$2y = -6x + 12$$

$$4y = -12x + 24$$

$$y = -3x + 6$$

$$y = -3x + 6$$

The equations represent the same line. Every (x, y) pair on the line is a solution.



Generalize If one linear equation is a multiple of another, the equations represent the same line and the system of equations has infinitely many solutions.

Corey and Winnie bought the same amount of cheese and tomatoes.



Try It!

How many solutions does each system of equations have? Explain.

a. $y = -3x + 5$
 $y = -3x - 5$

b. $y = 3x + 4$
 $5y - 15x - 20 = 0$



You can inspect the slopes and y-intercepts of the equations in a system of linear equations in order to determine the number of solutions of the system.

One Solution

$$y = 2x + 4$$

$$y = 3x - 1$$

The slopes are different.
The lines intersect at
1 point.

No Solution

$$y = 3x + 4$$

$$y = 3x + 5$$

The slopes are the same,
and the y-intercepts are
different. The lines are
parallel.

Infinitely Many Solutions

$$y = 3x + 4$$

$$y = 4 + 3x$$

The slopes are the same,
and the y-intercepts are
the same. The lines are
the same.

Do You Understand?

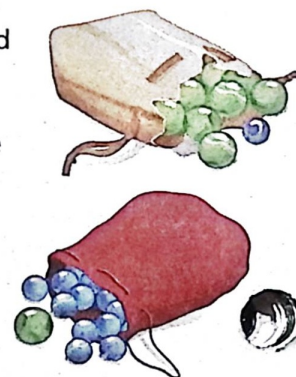
1. **Essential Question** How are slopes and y-intercepts related to the number of solutions of a system of linear equations?

2. **Construct Arguments** Macy says that any time the equations in a system have the same y-intercept, the system has infinitely many solutions. Is Macy correct? Explain.

3. **Use Structure** How can you determine the number of solutions of a system of linear equations by inspecting its equations?

Do You Know How?

4. Kyle has x 3-ounce blue marbles and a 5-ounce green marble. Lara has x 5-ounce green marbles and a 3-ounce blue marble. Is it possible for Kyle and Lara to have the same number of green marbles and the same total bag weight, y ? Explain.



5. How many solutions does this system of linear equations have? Explain.

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

$$y = \frac{1}{2}x + 3$$

6. How many solutions does this system of linear equations have? Explain.

$$3y + 6x = 12$$

$$8x + 4y = 16$$

Name: _____



PRACTICE



TUTORIAL

Practice & Problem Solving



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- 7. Leveled Practice** Two rovers are exploring a planet. The system of equations below shows each rover's elevation, y , at time x . What conclusion can you reach about the system of equations?

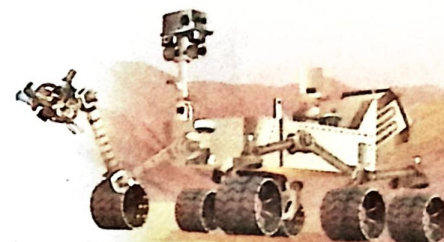
Rover A: $y = 1.9x - 8$

Rover B: $7y = 13.3x - 56$

The slope for the Rover A equation is the slope for the Rover B equation.

The y -intercepts of the equations are .

The system of equations has solution(s).



- 8. How many solutions does this system have?**

$$\begin{aligned} y &= x - 3 \\ 4x - 10y &= 6 \end{aligned}$$

- 9. How many solutions does this system have?**

$$\begin{aligned} x + 3y &= 0 \\ 12y &= -4x \end{aligned}$$

- 10. What can you determine about the solution(s) of this system?**

$$\begin{aligned} -64x + 96y &= 176 \\ 56x - 84y &= -147 \end{aligned}$$

- 11. Determine whether this system of equations has one solution, no solution, or infinitely many solutions.**

$$\begin{aligned} y &= 8x + 2 \\ y &= -8x + 2 \end{aligned}$$

- 12. Construct Arguments** Maia says that the two lines in this system of linear equations are parallel. Is she correct? Explain.

$$\begin{aligned} 2x + y &= 14 \\ 2y + 4x &= 14 \end{aligned}$$

- 13. Reasoning** Describe a situation that can be represented by using this system of equations. Inspect the system to determine the number of solutions and interpret the solution within the context of your situation.

$$\begin{aligned} y &= 2x + 10 \\ y &= x + 15 \end{aligned}$$