

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

**5-1**


### Solving Systems by Graphing

**Going Deeper**

**Essential question:** How do you approximate the solution of a system of linear equations by graphing?

A **system of linear equations** consists of two or more linear equations that have the same variables. A **solution of a system of linear equations** with two variables is an ordered pair that satisfies both equations in the system. The values of the variables in the ordered pair make each equation in the system true.

Systems of linear equations can be solved by graphing and by using algebra. In this lesson you will learn to solve linear systems by graphing the equations of the system and analyzing how those graphs are related.



Video Tutor

**1 EXAMPLE** Solving a Linear System by Graphing

Solve the system of equations below by graphing. Check your answer.

**A** Graph each equation.

**Step 1:** Find the intercepts for  $-x + y = 3$ , plus a third point for a check. Graph the line.

**x-intercept:**  $(-3, 0)$     **y-intercept:**  $(0, 3)$

**Check:** The  $y$ -value for  $x = 2$  is  $y = 5$ .  
Is that point  $(x, y)$  on the line?  $y = 5$

**Step 2:** Find the intercepts for  $2x + y = 6$  and graph the line.

**x-intercept:**  $(3, 0)$     **y-intercept:**  $(0, 6)$

**Check:** The  $y$ -value for  $x = 2$  is  $y = 2$ .  
Is that point  $(x, y)$  on the line?  $y = 2$

**B** Find the point of intersection.  $(1, 4)$

The two lines appear to intersect at \_\_\_\_\_.

How is the point of intersection related to the solution of the linear system?  
\_\_\_\_\_

**Handwritten work:**

$-x + y = 3$   
 $-x + 0 = 3$   
 $-x = 3$   
 $x = -3$   
 $y - 0 = 3$   
 $y = 3$   
 $x = 2$   
 $-2 + y = 3$   
 $+2 + y = 3$   
 $y = 5$   
 $(2, 5)$

$2x + y = 6$   
 $2x + 0 = 6$   
 $\frac{2x}{2} = \frac{6}{2}$   
 $x = 3$   
 $y - 0 = 6$   
 $y = 6$   
 $2(2) + y = 6$   
 $4 + y = 6$   
 $-4 \quad -4$   
 $\hline$   
 $y = 2$

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**C** Check if the ordered pair is a solution.

The solution of the system appears to be  $(4, 4)$ .

To check, substitute the ordered pair  $(x, y)$  into each equation.

$-x + y = 3$	
$-1 + 4$	$3$
$3$	$3 \checkmark$

$2x + y = 6$	
$2(4) + 4$	$6$
$8 + 4$	$6$
$12$	$6 \checkmark$

The ordered pair  $(4, 4)$  makes both equations **true**.  
So,  $(4, 4)$  is a solution of the system.

**REFLECT**

**1a.** How is the graph of each equation related to the solutions of the equation?

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**1b.** Explain why the solution of a linear system with two equations is represented by the point where the graphs of the two equations intersect.

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**1c.** Describe the graphs of  $x = 4$  and  $y = 2$ . Explain how to solve the linear system by graphing.

$$\begin{cases} x = 4 \\ y = 2 \end{cases}$$

What would the graph look like? What is the solution of the linear system? Can systems of this type be solved by examining the equations without graphing them?

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**2 EXAMPLE** Estimating a Solution by Graphing

Estimate the solution for the linear system by graphing.

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

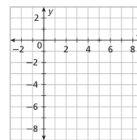
**A.** Graph each equation by finding intercepts.

$x + 2y = 2$

$2x - 3y = 12$

**x-intercept:** \_\_\_\_\_ **x-intercept:** \_\_\_\_\_

**y-intercept:** \_\_\_\_\_ **y-intercept:** \_\_\_\_\_



**B.** Find the point of intersection.

The two lines appear to intersect at \_\_\_\_\_.

**C.** Check if the ordered pair is an approximate solution.

$x + 2y = 2$	
$+ 2(\quad)$	$2$
$+$	$2$
	$2 \checkmark$

$2x - 3y = 12$	
$2(\quad) - 3(\quad)$	$12$
$-$	$12$
	$12 \checkmark$

Does the approximate solution make both equations true? If not, explain why not and whether the approximate solution is acceptable.

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**REFLECT**

**2a.** How could you adjust the graph to make your estimate more accurate?

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**2b.** Can an approximate solution make both equations true? Explain.

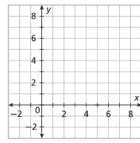
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## PRACTICE

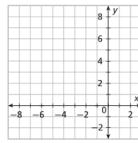
Solve each system by graphing. Check your answer.

1.  $\begin{cases} x - y = -2 \\ 2x + y = 8 \end{cases}$



Solution: \_\_\_\_\_

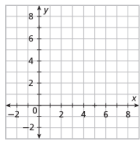
2.  $\begin{cases} x - y = -5 \\ 2x + 4y = -4 \end{cases}$



Solution: \_\_\_\_\_

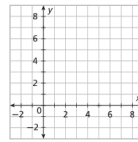
Estimate the solution for the linear system by graphing. Check your answer.

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



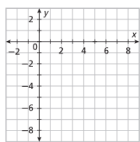
Approximate solution: \_\_\_\_\_

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



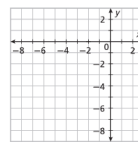
Approximate solution: \_\_\_\_\_

5.  $\begin{cases} 3x - 2y = 12 \\ 2x - 6y = 9 \end{cases}$



Approximate solution: \_\_\_\_\_

6.  $\begin{cases} x + 2y = -6 \\ 2x + y = -4 \end{cases}$



Approximate solution: \_\_\_\_\_

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## Additional Practice

Tell whether the ordered pair is a solution of the given system.

1.  $(3, 1); \begin{cases} x + 3y = 6 \\ 4x - 5y = 7 \end{cases}$  \_\_\_\_\_

2.  $(6, -2); \begin{cases} 3x - 2y = 14 \\ 5x - y = 32 \end{cases}$  \_\_\_\_\_

$x + 3y = 6$

$4x - 5y = 7$

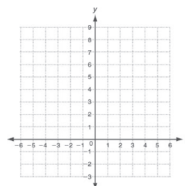
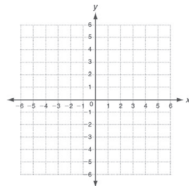
$3x - 2y = 14$

$5x - y = 32$

Solve each system by graphing. Check your answer.

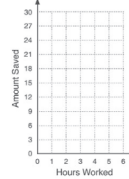
3.  $\begin{cases} y = x + 4 \\ y = -2x + 1 \end{cases}$  Solution: \_\_\_\_\_

4.  $\begin{cases} y = x + 6 \\ y = -3x + 6 \end{cases}$  Solution: \_\_\_\_\_



5. Maryann and Carlos are each saving for new scooters. So far, Maryann has \$9 saved, and can earn \$9 per hour babysitting. Carlos has \$3 saved, and can earn \$9 per hour working at his family's restaurant. After how many hours of work will Maryann and Carlos have saved the same amount? What will that amount be?

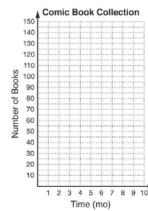
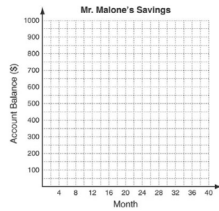
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## Problem Solving

Write the correct answer.

- Mr. Malone is putting money in two savings accounts. Account A started with \$200 and Account B started with \$300. Mr. Malone deposits \$15 in Account A and \$10 in Account B each month. In how many months will the accounts have the same balance? What will that balance be?
- Tom currently has 5 comic books in his collection and has subscribed to receive 5 new comic books each month. His uncle has 145 comic books, but sends 5 to each of his 3 nieces each month. In how many months will they have the same number of comic books? How many books will that be?



The graph below compares the heights of two trees. Use the graph to answer questions 3–6. Select the best answer.

- How many years after planting will the trees be the same height?
  - A 1 years      C 4 years
  - B 2 years      D 6 years
- Which system of equations is represented by the graph?

F	$y = x + 2$	H	$y = 2x + 4$
	$y = 0.5x + 2$		$y = x + 4$
G	$y = x + 2$	J	$y = 4x - 2$
	$y = 0.5x + 4$		$y = 2x + 2$

- How fast does the tree that started at 2 feet tall grow?
  - A 0.5 ft/yr      C 1.5 ft/yr
  - B 1 ft/yr        D 2 ft/yr
- How fast does the tree that started at 4 feet tall grow?
  - F 0.5 ft/yr      H 1.5 ft/yr
  - G 1 ft/yr        J 2 ft/yr



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Homework  
 Reflect 1a-c  
 Pg 142 # 11-19 all  
 Practice # 1