Instruction Coach™ 8

Mathematics

Dr. Jerry Kaplan
Senior Mathematics Consultant

Instruction Coach, Mathematics, First Edition, Grade 8 528NASE ISBN-13: 978-1-62928-396-8
Cover Image: © Thinkstock

Printed in the United States of America. 10 9 8 7 6 5 4 3 2 1

Contents

Problem Solving   Performance Task

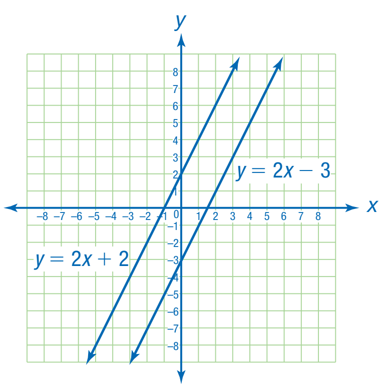
Chapter 2
Expressions and Equations

LESSON 10 Solving Systems of Two Linear Equations Graphically

UNDERSTAND You can find the solution of a system by graphing the two lines and identifying the coordinates of the point(s) of intersection. There may be no solution, one solution, or infinitely many solutions.

Find the solution(s) to $y = 2x - 3$ and $y = 2x + 2$.

Graph the equations.

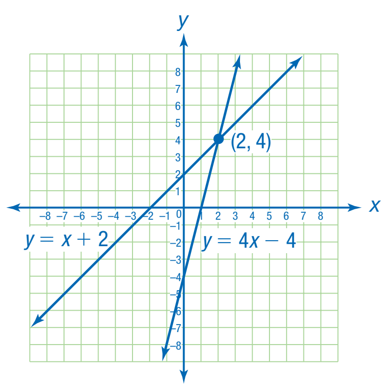


The lines do not intersect.

There is no solution.

Find the solution(s) to $y = 4x - 4$ and $y = x + 2$.

Graph the equations.

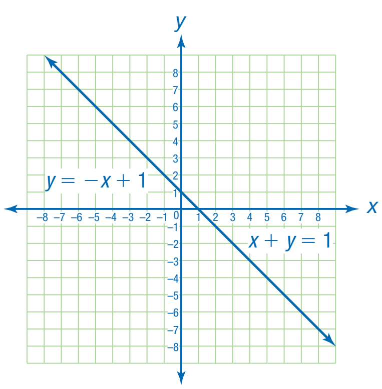


The lines intersect at (2, 4).

There is one solution, (2, 4).

Find the solution(s) to $y = -x + 1$ and $x + y = 1$.

Graph the equations.



The lines are identical. They coincide. **Coincident lines** intersect at every point.

There are infinitely many solutions.

Connect

Find the solution(s) to $y = x + 3$ and $y = 2x - 2$.

1 Find some ordered pairs for $y = x + 3$.

Create a table of values. Use any values for x. Then substitute those x-values and find the resulting y-values.

$y = x + 3$

x	y
−3	0
−1	2
1	4
3	6
5	8

2 Find some ordered pairs for $y = 2x - 2$.

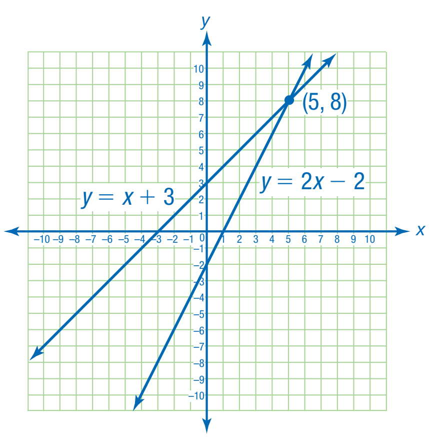
Create a table of values. Use any values for x. Then substitute those x-values and find the resulting y-values.

$y = 2x - 2$

x	y
−3	−8
−1	−4
1	0
3	4
5	8

3 Graph the system of equations.

Graph the ordered pairs for each equation and draw a line through each set of points.



The one point of intersection is at (5, 8).

▶ The solution is (5, 8).

4 Check the solution.

Substitute 5 for x and 8 for y in both equations.

$y = x + 3$	$y = 2x - 2$
$\mathbf{8} \stackrel{?}{=} \mathbf{5} + 3$	$\mathbf{8} \stackrel{?}{=} 2(\mathbf{5}) - 2$
$8 = 8$ ✓	$8 \stackrel{?}{=} 10 - 2$
	$8 = 8$ ✓

The ordered pair (5, 8) satisfies both equations, so the solution is correct.

TRY

Find the solution(s) to the system $y = -x + 2$ and $y = 2x - 1$.

EXAMPLE A Find the solution(s) to $y = \frac{1}{2}x - 6$ and $y = \frac{1}{2}x$.

1 Find some ordered pairs for $y = \frac{1}{2}x - 6$.

Create a table of values for the equation. Use any values for x. Then find the resulting y-values.

$$y = \frac{1}{2}x - 6$$

x	y
−4	−8
−2	−7
0	−6
2	−5
4	−4

2 Find some ordered pairs for $y = \frac{1}{2}x$.

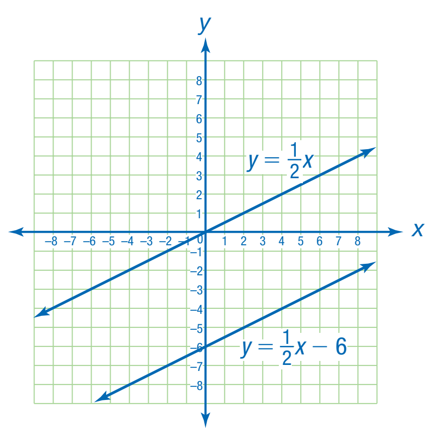
Create a table of values for the equation. Use any values for x. Then find the resulting y-values.

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

x	y
−4	−2
−2	−1
0	0
2	1
4	2

3 Graph the system of equations.

Graph the ordered pairs for each equation and draw a line through each set of points.



▶ There is no point of intersection. The system of equations has no solution.

DISCUSS

Compare the slopes and y-intercepts of the two equations. Make a conjecture about the solution of any system of equations in which the slopes are the same but the y-intercepts are different. How could you test your conjecture?

EXAMPLE B Find the solution(s) to $3x + y = 2$ and $6x + 2y = 4$.

1 Convert $3x + y = 2$ to slope-intercept form: $y = mx + b$.

$3x + y = 2$ ← Subtract $3x$ from each side.

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

$y = -3x + 2$

2 Convert $6x + 2y = 4$ to slope-intercept form: $y = mx + b$.

$6x + 2y = 4$ ← Subtract $6x$ from each side.

$6x + 2y - 6x = 4 - 6x$

$2y = -6x + 4$ ← Divide both sides by 2.

$y = -3x + 2$

3 Compare the slopes and y-intercepts of the equations.

$y = -3x + 2$ slope $= -3$, y-intercept $= 2$

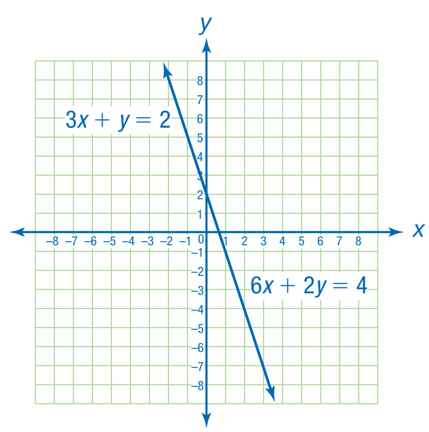
$y = -3x + 2$ slope $= -3$, y-intercept $= 2$

The equations are identical. Because the equations have the same slope and y-intercept, their graphs will intersect at every point.

▶ The lines coincide and have infinitely many solutions.

4 Check your answer.

You can graph the equations to check that they are coincident.



TRY

Determine whether or not the system $2y = 8x + 6$ and $y = 4x + 3$ has infinitely many solutions. Explain how you know.

Practice

Solve each system of linear equations graphically. Use *Math Tool: Coordinate Plane*.

1. $y = x + 6$

$y = 2x + 3$

____

2. $y = x + 2$

$y = -x$

____

REMEMBER An equation in slope-intercept form that does not have a *b*-value intersects the *y*-axis at 0.

3. $y = \frac{1}{2}x - 4$

$y = x - 7$

____

4. $y = 2x + 2$

$y = -x - 4$

____

Convert each equation to slope-intercept form.

5. $4x + y = 0$

$y =$ __________

6. $-3x + y = -3$

$y =$ __________

7. $6x + 3y = 18$

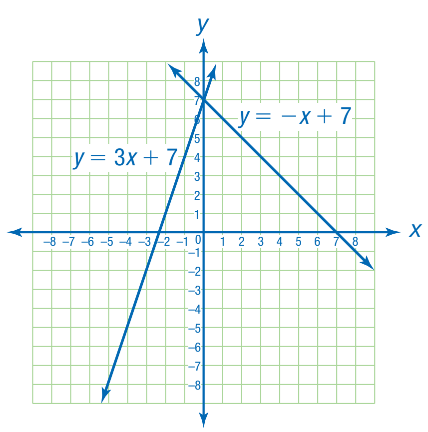
$y =$ __________

8. $15x - 5y = -10$

$y =$ __________

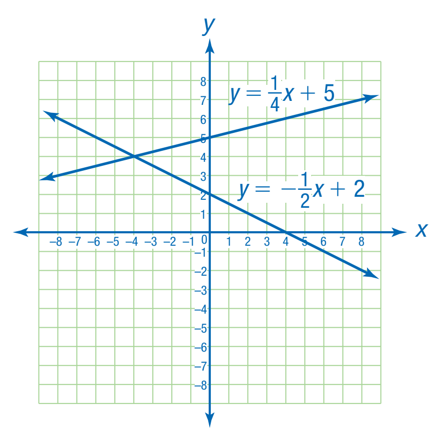
Determine the solution for each system of linear equations.

9.



____

10.



____

Solve each system of linear equations graphically. Use *Math Tool: Coordinate Plane*.

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

$y = \frac{3}{2}x - 4\frac{1}{2}$

____

12. $-2x + y = -5$

$4x - 2y = 10$

____

13. $y = -2.5x - 6.5$

$y = 0.5x - 9.5$

____

14. $y = \frac{1}{2}x - 5$

$\frac{1}{5}x - y = 2$

____

15. $y = -4x + 1$

$8x + 2y = 3$

____

16. $3x + y = 10$

$-9x - 3y = -30$

____

Without graphing, determine whether each system of equations will have no solution, one solution, or infinitely many solutions. Explain your answer.

17. $y = \frac{3}{5}x + 2$

$y = \frac{3}{5}x$

____

____

18. $y = 6x + 2$

$-12x + 2y = 4$

____

____

Solve.

19. APPLY One day, a toy store sells 3 xylophones and 3 yo-yos for $33. Another day, it sells 2 xylophones and 1 yo-yo for $19. Equations that represent the sales for the two days are $3x + 3y = 33$ and $2x + y = 19$, where x is the number of xylophones sold and y is the number of yo-yos sold. Solve the system of equations graphically to determine the value of one xylophone and one yo-yo. Use *Math Tool: Coordinate Plane*, and explain your answer.

____

____