6-1 Solve Systems of Linear Equations Graphically

Name _____ Date _____

Solve the system by graphing: $\begin{cases} y = 3x - 1 \\ 2x - y = -1 \end{cases}$

Graph each line.

$y = 3x - 1$ ← The slope is 3, and the y-intercept is -1.

$2x - y = -1$ ← Solve for y to put the equation in slope-intercept form.

$y = 2x + 1$ ← The slope is 2, and the y-intercept is 1.

Locate the point of intersection.

$(2, 5)$ ← This is the point where the two lines appear to intersect.

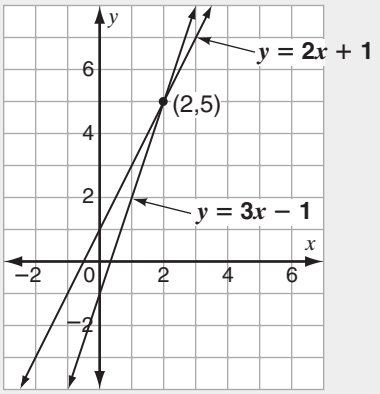
Check the solution in each of the original equations.

$y = 3x - 1$ $\quad$ $2x - y = -1$

$5 \stackrel{?}{=} 3(2) - 1$ $\quad$ $2(2) - 5 \stackrel{?}{=} -1$

$5 \stackrel{?}{=} 6 - 1$ $\quad$ $4 - 5 \stackrel{?}{=} -1$

$5 = 5$ **True** $\quad$ $-1 = -1$ **True**

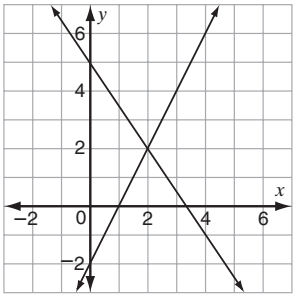


Remember: A *consistent* system has at least one solution. An *independent* system describes two different lines that share a solution.

Graph each system of equations and check the solution on a separate sheet of paper. Find the number of solutions and describe the system.

1. $\begin{cases} 4x - 2y = 4 \\ 3x + 2y = 10 \end{cases}$

$4x - 2y = 4$ is $y = 2x - 2$.
$3x + 2y = 10$ is $y = -\frac{3}{2}x + 5$.
intersecting lines
1 solution: (2, 2); consistent and independent system



2. $\begin{cases} 10x + 5y = -20 \\ 6x - 3y = 12 \end{cases}$

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3. $\begin{cases} 4x + 5y = -20 \\ 8x + 10y = 40 \end{cases}$

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4. $\begin{cases} 7x + 3y = -21 \\ 14x + 6y = 36 \end{cases}$

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5. $\begin{cases} x - 2y = 11 \\ 2x + y = 2 \end{cases}$

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6. $\begin{cases} 2x - y = -7 \\ 3x + 4y = 6 \end{cases}$

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7. $\begin{cases} y = -\frac{2}{3}x + 7 \\ 2x + 3y = 21 \end{cases}$

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8. $\begin{cases} y = \frac{3}{5}x + 2 \\ 3x - 5y = -10 \end{cases}$

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Graph each system of equations and check the solution on a separate sheet of paper. Find the number of solutions and describe the system.

9. $\begin{cases} 4x + 2y = 18 \\ x + 2y = 3 \end{cases}$

10. $\begin{cases} 6x + y = -14 \\ 4x + 5y = 8 \end{cases}$

11. $\begin{cases} 2x - 4y = -34 \\ -2x + 7y = 52 \end{cases}$

12. $\begin{cases} 3x - 5y = 31 \\ -3x + 8y = -37 \end{cases}$

13. $\begin{cases} 3y = -4x + 5 \\ 8x + 6y = 10 \end{cases}$

14. $\begin{cases} 5y = -2x + 3 \\ 6x + 15y = 9 \end{cases}$

15. $\begin{cases} 3x = 5y + 16 \\ x - 16 = 7y \end{cases}$

16. $\begin{cases} 5x = 4y - 19 \\ x + 17 = 14y \end{cases}$

17. $\begin{cases} 9y = 2y - 14 \\ y + 8 = 4 \end{cases}$

18. $\begin{cases} 8x = 4x + 24 \\ x + 9 = 2 \end{cases}$

19. $\begin{cases} 4x = 3y - 1 \\ x - 8 = -6 \end{cases}$

20. $\begin{cases} 5x = 2y + 10 \\ x - 6 = -2 \end{cases}$

21. $\begin{cases} 3x + 7y = 5y + 3x - 8 \\ 2x - 6y = -2 - 6y \end{cases}$

22. $\begin{cases} 5x + 2y = 2y + 3x - 6 \\ 4y - 3x = -4 - 3x \end{cases}$

23. $\begin{cases} \frac{1}{2}y = \frac{2}{3}y - \frac{1}{4} \\ 8x - 18 = 6y \end{cases}$

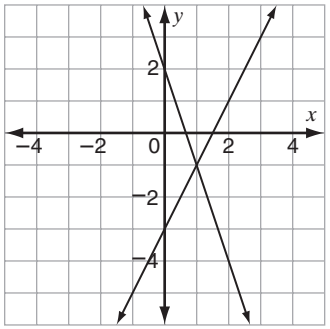
24. $\begin{cases} \frac{1}{4}y = \frac{1}{5}x - \frac{1}{3} \\ 15y = 12x - 30 \end{cases}$

25. $\begin{cases} 1.2y = 3.6x + 6 \\ 4.6x + 13.8 = 2.3y \end{cases}$

26. $\begin{cases} 1.8y = 5.4x - 3.6 \\ 17.5x - 21 = 3.5y \end{cases}$

Write the system of equations that is shown by each graph. Describe each system as consistent or inconsistent and as dependent or independent.

27.



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

consistent and independent

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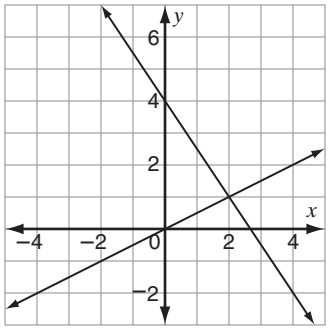

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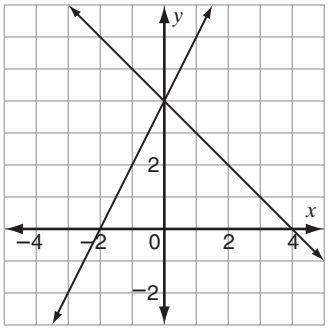

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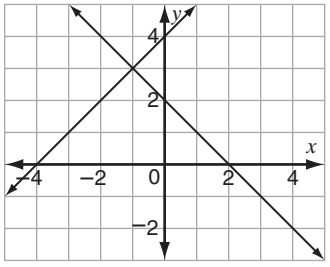

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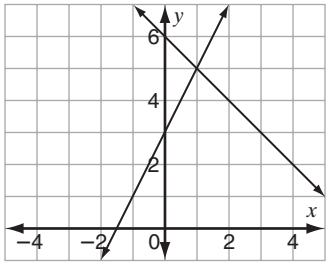

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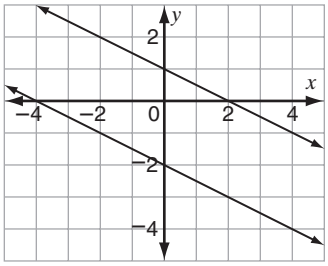

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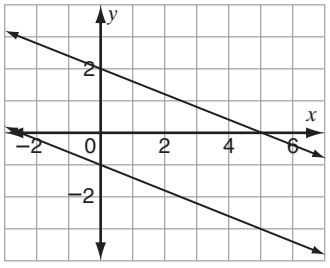

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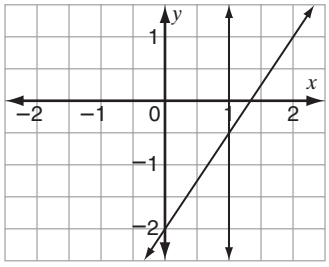

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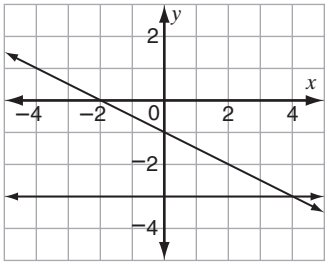

Solve. Show your work.
Use a separate sheet of paper to graph all systems of equations.

36. The sum of two numbers is 55. Their difference is 7. Find the numbers.

37. The sum of two numbers is 6. One number is 18 more than the other number. Find the numbers.

Solve. Use a separate sheet of paper to graph all systems of equations.

38. The perimeter of isosceles triangle ABC is 52 cm. Sides AB and BC are congruent. The length of side CA is 12 cm less than twice the length of AB. Find the lengths of sides AB, BC, and CA.

39. The perimeter of a rectangle is 30 cm. The length is 3 cm more than twice the width. What are the length and width of the rectangle?

40. Chiara has a can that contains 100 nickels and dimes. The number of dimes is 10 more than twice the number of nickels. How many nickels and how many dimes does Chiara have?

41. Carlos has 20 coins in his pocket. He has only quarters and dimes. The number of quarters is 1 less than half the number of dimes. How many dimes and quarters does Carlos have?

Problem Solving

42. Roger's skating rink charges \$4 for skates and \$2 per hour. Lisa's skating rink charges \$8 for skates and \$1 per hour.

a. When is the total cost the same for both skating rinks? What is that total cost?

b. If Nicole wants to skate for 2 hours, which rink has the better deal?

c. If Pia has only \$20, which rink will give her the greater number of hours?

CRITICAL THINKING

43. For what values of a and b does the system of equations have no solution?

$$\begin{cases} y = \frac{3}{4}x + 2 \\ ax + y = b \end{cases}$$