

Practice and Problem Solving

Practice by Example

Example 1
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Mental Math Match each system with its solution at the right.

1. $y = x + 1$

$y = 2x - 1$

3. $2y = x + 3$

$x = y$

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

$2y + 2x = 2$

4. $x - y = 1$

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

A. (3, 2)

B. (3, 3)

C. (-2, 3)

D. (2, 3)

Solve each system using substitution. Check your solution.

$$\begin{aligned} 5. \quad & y = 4x - 8 \\ & y = 2x + 10 \end{aligned}$$

$$8. \quad y = -4x + 12\frac{1}{2}$$

$$y = \frac{1}{4}x + 4$$

$$\begin{aligned} 11. \quad & y = x - 2 \\ & 2x + 2y = 4 \end{aligned}$$

$$\begin{aligned} 14. \quad & m = 4n + 11 \\ & -6n + 8m = 36 \end{aligned}$$

$$\begin{aligned} 6. \quad & C(n) = -3n - 6 \\ & C(n) = n - 4 \end{aligned}$$

$$\begin{aligned} 9. \quad & h = 6g - 4 \\ & h = -2g + 28 \end{aligned}$$

$$\begin{aligned} 12. \quad & c = (3d - 27) \\ & 4d + 10c = 120 \end{aligned}$$

$$\begin{aligned} 15. \quad & 7x - 8y = 112 \\ & y = -2x + 9 \end{aligned}$$

$$\begin{aligned} 7. \quad & m = 5p + 8 \\ & m = -10p + 3 \end{aligned}$$

$$\begin{aligned} 10. \quad & a = \frac{2}{5}b - 3 \\ & a = 2b - 18 \end{aligned}$$

$$\begin{aligned} 13. \quad & 3x - 6y = 30 \\ & y = -6x + 34 \end{aligned}$$

$$\begin{aligned} 16. \quad & t = 0.2s + 10 \\ & 4s + 5t = 35 \end{aligned}$$

Example 2
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Example 3
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17. Geometry The length of a rectangle is 5 cm more than twice the width. The perimeter of the rectangle is 34 cm. Find the dimensions of the rectangle.

18. Suppose you have \$28.00 in your bank account and start saving \$18.25 every week. Your friend has \$161.00 in his account and is withdrawing \$15 every week. When will your account balances be the same?

B Apply Your Skills

Solve each system by substitution. Check your solution.

$$\begin{aligned} 19. \quad & a - 1.2b = -3 \\ & 0.2b + 0.6a = 12 \end{aligned}$$

$$\begin{aligned} 20. \quad & 0.5x + 0.25y = 36 \\ & y + 18 = 16x \end{aligned}$$

$$\begin{aligned} 21. \quad & y = 0.8x + 7.2 \\ & 20x + 32y = 48 \end{aligned}$$

For Exercises 22–24, define variables and write a system of equations for each situation. Solve using substitution.

22. Renting Videos Suppose you want to join a video store. Big Video offers a special discount card that costs \$9.99 for one year. With the discount card, each video rental costs \$2.49. A discount card from Main Street Video costs \$20.49 for one year. With the Main Street Video discount card, each video rental costs \$1.79. After how many video rentals is the cost the same?

23. Agriculture A farmer grows only sunflowers and flax on his 240-acre farm. This year he wants to plant 80 more acres of sunflowers than of flax. How many acres of each crop does the farmer need to plant?

24. Buying a Car Suppose you are thinking about buying one of two cars. Car A will cost \$17,655. You can expect to pay an average of \$1230 per year for fuel, maintenance, and repairs. Car B will cost about \$15,900. Fuel, maintenance, and repairs for it will average about \$1425 per year. After how many years are the total costs for the cars the same?



Real-World Connection

Sunflower seeds are sold as snacks and as bird food, and they are a source of cooking oil.

Estimation Graph each system to estimate the solution. Then use substitution to find the exact solution of the system.

$$\begin{aligned} 25. \quad & y = 2x \\ & y = -6x + 4 \end{aligned}$$

$$\begin{aligned} 26. \quad & y = \frac{1}{2}x + 4 \\ & y = -4x - 5 \end{aligned}$$

$$\begin{aligned} 27. \quad & x + y = 0 \\ & 5x + 2y = -3 \end{aligned}$$

$$\begin{aligned} 28. \quad & y = 2x + 3 \\ & y = 0.5x - 2 \end{aligned}$$

$$\begin{aligned} 29. \quad & y = -x + 4 \\ & y = 2x + 6 \end{aligned}$$

$$\begin{aligned} 30. \quad & y = 0.7x + 3 \\ & y = -1.5x - 7 \end{aligned}$$

31. a. You have 28 coins that are all nickels and dimes. The value of the coins is \$2.05. Define variables and write a system of equations for this situation.

b. Writing Explain the steps necessary to solve the system in part (a).

c. Solve the system.

32. Open-Ended Write a system of linear equations with exactly one solution. Use substitution to solve your system.

33. a. Solve the system below using substitution.

$$y = 0.5x + 4$$

$$-x + 2y = 8$$

- b. Solve the system by graphing.

- c. **Critical Thinking** Make a general statement about the solutions you get when solving by graphing and the results you get when solving by substitution.

34. a. Solve the system below using substitution.

$$6x - 2y = 10$$

$$y = 3x + 1$$

- b. Solve by graphing.

- c. **Critical Thinking** Make a general statement about the solutions you get when solving by graphing and the results you get when solving by substitution.

Solve each system using substitution.

35. $y = 2x$

$$6x - y = 8$$

36. $y = 3x + 1$

$$x = 3y + 1$$

37. $x - 3y = 14$

$$x - 2 = 0$$

38. $2x + 2y = 5$

$$y = \frac{1}{4}x$$

39. $4x + y = -2$

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

40. $3x + 5y = 2$

$$x + 4y = -4$$

Challenge

For Exercises 41–43, suppose you are solving a system of linear equations and get the given result. How many solutions must the system have?

41. a true statement, such as $2 = 2$ 42. a false statement, such as $10 = 1$
 43. a statement such as $x = 4$

44. There are 1170 students in a school. The ratio of girls to boys is 23 : 22. The system below describes relationships between the number of girls and the number of boys.

$$g + b = 1170 \quad \frac{g}{b} = \frac{23}{22}$$

- a. Solve the proportion for g .
 b. Solve the system.
 c. How many more girls are there than boys?

45. **Sprinting** The graph at the left represents the start of a 100-meter race between Joetta and Gail. The red line and blue line represent Joetta's and Gail's time and distance. Joetta averages 8.8 m/s. Gail averages 9 m/s but started 0.2 s after Joetta. At time 0.2, Gail's distance is 0 m. You can use point-slope form to write an equation that relates Gail's time t to her distance d .

$$y - y_1 = m(x - x_1)$$

$$d - 0 = 9(t - 0.2)$$

$$d = 9t - 1.8$$

Since Joetta started at $t = 0$, the equation $d = 8.8t$ relates her time and distance.

- a. Solve the system using substitution.
 b. Will Gail overtake Joetta before the finish line?

46. Use substitution to solve the following system.

$$t + r + s = 20$$

$$r = t + 3$$

$$t + 5r + 10s = 129$$

