

When you solve an equation, you use reasoning to select properties of equality that produce simpler equivalent equations until you find a solution. The steps below provide a general guideline for solving equations.

take note

Concept Summary Solving Equations

- Step 1** Use the Distributive Property to remove any grouping symbols. Use properties of equality to clear decimals and fractions.
- Step 2** Combine like terms on each side of the equation.
- Step 3** Use the properties of equality to get the variable terms on one side of the equation and the constants on the other.
- Step 4** Use the properties of equality to solve for the variable.
- Step 5** Check your solution in the original equation.



Lesson Check

Do you know HOW?

Solve each equation. Check your answer.

1. $3x + 4 = 5x - 10$
2. $5(y - 4) = 7(2y + 1)$
3. $2a + 3 = \frac{1}{2}(6 + 4a)$
4. $4x - 5 = 2(2x + 1)$

5. **Printing** Pristine Printing will print business cards for \$.10 each plus a setup charge of \$15. The Printing Place offers business cards for \$.15 each with a setup charge of \$10. What number of business cards costs the same from either printer?

Do you UNDERSTAND?



6. **Vocabulary** Match each equation with the appropriate number of solutions.

- | | |
|--------------------------|--------------------|
| 6. $3y - 5 = y + 2y - 9$ | A. infinitely many |
| 7. $2y + 4 = 2(y + 2)$ | B. one solution |
| 8. $2y - 4 = 3y - 5$ | C. no solution |

9. **Writing** A student solved an equation and found that the variable was eliminated in the process of solving the equation. How would the student know whether the equation is an identity or an equation with no solution?



Practice and Problem-Solving Exercises



Solve each equation. Check your answer.

See Problem 1.

- | | | |
|-------------------------|-------------------------|------------------------|
| 10. $5x - 1 = x + 15$ | 11. $4p + 2 = 3p - 7$ | 12. $6m - 2 = 2m + 6$ |
| 13. $3 + 5q = 9 + 4q$ | 14. $8 - 2y = 3y - 2$ | 15. $3n - 5 = 7n + 11$ |
| 16. $2b + 4 = -18 - 9b$ | 17. $-3c - 12 = -5 + c$ | 18. $-n - 24 = 5 - n$ |

Write and solve an equation for each situation. Check your solution.

See Problem 2.

- STEM** 19. **Architecture** An architect is designing a rectangular greenhouse. Along one wall is a 7-ft storage area and 5 sections for different kinds of plants. On the opposite wall is a 4-ft storage area and 6 sections for plants. All of the sections for plants are of equal length. What is the length of each wall?



20. **Business** A hairdresser is deciding where to open her own studio. If the hairdresser chooses Location A, she will pay \$1200 per month in rent and will charge \$45 per haircut. If she chooses Location B, she will pay \$1800 per month in rent and will charge \$60 per haircut. How many haircuts would she have to give in one month to make the same profit at either location?

Solve each equation. Check your answer.

See Problem 3.

21. $3(q - 5) = 2(q + 5)$ 22. $8 - (3 + b) = b - 9$
 23. $7(6 - 2a) = 5(-3a + 1)$ 24. $(g + 4) - 3g = 1 + g$
 25. $2r - (5 - r) = 13 + 2r$ 26. $5g + 4(-5 + 3g) = 1 - g$

Determine whether each equation is an *identity* or whether it has *no solution*.

See Problem 4.

27. $2(a - 4) = 4a - (2a + 4)$ 28. $5y + 2 = \frac{1}{2}(10y + 4)$
 29. $k - 3k = 6k + 5 - 8k$ 30. $2(2k - 1) = 4(k - 2)$
 31. $-6a + 3 = -3(2a - 1)$ 32. $4 - d = -(d - 4)$

B Apply

Solve each equation. If the equation is an identity, write *identity*. If it has no solution, write *no solution*.

33. $3.2 - 4d = 2.3d + 3$ 34. $3d + 4 = 2 + 3d - \frac{1}{2}$
 35. $2.25(4x - 4) = -2 + 10x + 12$ 36. $3a + 1 = -3.6(a - 1)$
 37. $\frac{1}{2}h + \frac{1}{3}(h - 6) = \frac{5}{6}h + 2$ 38. $0.5b + 4 = 2(b + 2)$
 39. $-2(-c - 12) = -2c - 12$ 40. $3(m + 1.5) = 1.5(2m + 3)$

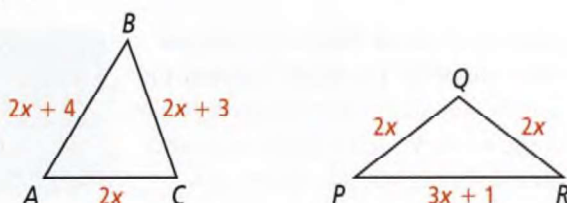
41. **Travel** Suppose a family drives at an average rate of 60 mi/h on the way to visit relatives and then at an average rate of 40 mi/h on the way back. The return trip takes 1 h longer than the trip there.
- Let d be the distance in miles the family traveled to visit their relatives. How many hours did it take to drive there?
 - In terms of d , how many hours did it take to make the return trip?
 - Write and solve an equation to determine the distance the family drove to see their relatives. What was the average rate for the entire trip?

42. **Think About a Plan** Each morning, a deli worker has to make several pies and peel a bucket of potatoes. On Monday, it took the worker 2 h to make the pies and an average of 1.5 min to peel each potato. On Tuesday, the worker finished the work in the same amount of time, but it took 2.5 h to make the pies and an average of 1 min to peel each potato. About how many potatoes are in a bucket?
- What quantities do you know and how are they related to each other?
 - How can you use the known and unknown quantities to write an equation for this situation?

43. **Error Analysis** Describe and correct the error in finding the solution of the equation $2x = 6x$.

$$\begin{array}{l}
 2x = 6x \\
 \frac{2x}{x} = \frac{6x}{x} \\
 2 = 6 \\
 \text{The equation has no solution.}
 \end{array}$$

44. **Skiing** A skier is trying to decide whether or not to buy a season ski pass. A daily pass costs \$67. A season ski pass costs \$350. The skier would have to rent skis with either pass for \$25 per day. How many days would the skier have to go skiing in order to make the season pass less expensive than daily passes?
45. **Health Clubs** One health club charges a \$50 sign-up fee and \$65 per month. Another club charges a \$90 sign-up fee and \$45 per month. For what number of months is the cost of the clubs equal?
46. **Geometry** The perimeters of the triangles shown are equal. Find the side lengths of each triangle.



47. **Business** A small juice company spends \$1200 per day on business expenses plus \$1.10 per bottle of juice they make. They charge \$2.50 for each bottle of juice they produce. How many bottles of juice must the company sell in one day in order to equal its daily costs?
48. **Spreadsheet** You set up a spreadsheet to solve $7(x + 1) = 3(x - 1)$.
- Does your spreadsheet show the solution of the equation?
 - Between which two values of x is the solution of the equation? How do you know?
 - For what spreadsheet values of x is $7(x + 1)$ less than $3(x - 1)$?

	A	B	C
1	x	$7(x + 1)$	$3(x - 1)$
2	-5	-28	-18
3	-3	-14	-12
4	-1	0	-6
5	1	14	0
6	3	28	6