

Warm-up

Solve each equation.

$$1. \frac{3}{4}x - 7 = 5$$

$$\frac{3}{4}x - 7 = 5$$

$$\frac{3}{4}x = 12$$

$$\frac{3}{4}x \cdot \frac{4}{3} = \frac{48}{3}$$

$$x = 16$$

$$3. 6 - 4x = 2$$

$$6 - 4x = 2$$

$$-4x = -4$$

$$x = 1$$

$$2. 9x - 6 - 7x = 26$$

$$9x - 6 - 7x = 26$$

$$2x - 6 = 26$$

$$2x = 32$$

$$x = 16$$

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2.4 Solve Equations with Variables on Both Sides

1.) Solve equations with variables on both sides.

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2.4 Solve Equations with Variables on Both Sides

Steps for Solving Linear Equations**Step 1:** Use the distributive property to remove any grouping symbols.**Step 2:** Simplify the expression of each side of the equation. (Combine Like Terms)**Step 3:** Use the properties of equality to collect the variable terms on one side of the equation and the constant terms on the other side of the equation.**Step 4:** Use the properties of equality to solve for the variable.**Step 5:** Check your solution in the original equation.

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2.4 Solve Equations with Variables on Both Sides

Example 1: Solve an equation with variables on both sides.

$$a. 15 + 4a = 9a - 5$$

$$15 + 4a = 9a - 5$$

$$-9a$$

$$-9a$$

$$15 - 5a = -5$$

$$-5a = -20$$

$$a = 4$$

$$b. 5p - 14 = 8p + 4$$

$$5p - 14 = 8p + 4$$

$$-8p$$

$$-8p$$

$$-3p - 14 = 4$$

$$+14$$

$$-3p = 18$$

$$p = -6$$

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2.4 Solve Equations with Variables on Both Sides

Example 2: Solve an equation with grouping symbols.

$$a. 4t - 12 = 6(t + 3)$$

$$4t - 12 = 6(t + 3)$$

$$4t - 12 = 6t + 18$$

$$-6t$$

$$-6t$$

$$-2t - 12 = 18$$

$$+12$$

$$-2t = 30$$

$$t = -15$$

$$b. 2(4x - 3) - 8 = 4 + 2x$$

$$2(4x - 3) - 8 = 4 + 2x$$

$$8x - 6 - 8 = 4 + 2x$$

$$8x - 14 = 4 + 2x$$

$$-2x$$

$$-2x$$

$$6x - 14 = 4$$

$$+14$$

$$6x = 18$$

$$x = 3$$

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2.4 Solve Equations with Variables on Both Sides

Partner Check: Solve each equation.

$$1. -3b + 7 = -8b + 2$$

$$-3b + 7 = -8b + 2$$

$$+8b$$

$$+8b$$

$$5b + 7 = 2$$

$$-7$$

$$-7$$

$$5b = -5$$

$$b = -1$$

$$2. 3n - 3 = -3(6 + 4n)$$

$$3n - 3 = -3(6 + 4n)$$

$$3n - 3 = -18 - 12n$$

$$+3$$

$$+3$$

$$3n = -15 - 12n$$

$$+12n$$

$$+12n$$

$$15n = -15$$

$$n = -1$$

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2.4 Solve Equations with Variables on Both Sides

So far, whenever we have solved an equation, we have found one solution. However, equations do not always just have one solution.

Determining the Number of Solutions

One Solution	Infinitely Many Solutions (True Statement)	No Solution (False Statement)
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2.4 Solve Equations with Variables on Both Sides

Example 3: Identify the number of solutions of an equation. Solve the equation if possible.

a. $4x + 5 = 4(x + 5)$
 $4x + 5 = 4x + 20$
 $-4x$
 $5 = 20$
false
no solution

b. $6x - 3 = 3(2x - 1)$
 $6x - 3 = 6x - 3$
 $-6x$
 $-3 = -3$
true
inf. soln.

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2.4 Solve Equations with Variables on Both Sides

Example 4: Write an equation for the situation and then solve.
The membership fee for joining a camping association is \$45. A local campground charges members of the camping association \$35 per night for a campsite and nonmembers \$40 per night for a campsite. After how many nights of camping is the total cost for members, including the membership fee, the same as the total cost for nonmembers?

member: $45 + 35x$
nonmember: $40x$
 $45 + 35x = 40x$
 $-35x$
 $45 = 5x$
 $\frac{45}{5} = \frac{5x}{5}$
 $x = 9$ nights

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2.4 Solve Equations with Variables on Both Sides

Example 5: Find the perimeter of the square.

Diagram of a square with side length $6x$. The perimeter is labeled 130 . The side length is also labeled 30 . The perimeter is also labeled $8x - 10$.

$6x = 8x - 10$
 $-8x$
 $-2x = -10$
 $\frac{-2x}{-2} = \frac{-10}{-2}$
 $x = 5$
 $p = 4(30) = 120$

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