



# Solving Equations Using Multiplication or Division

**Goal:** Solve equations using multiplication and division.

## Multiplication Property of Equality

**Words** Multiplying each side of an equation by the same nonzero number produces an equivalent equation.

**Numbers** If  $\frac{x}{4} = 6$ , then  $\frac{x}{4} \cdot 4 = \boxed{6} \cdot 4$ .

**Algebra** If  $\frac{x}{a} = b$  and  $a \neq 0$ , then  $\frac{x}{a} \cdot a = \boxed{b} \cdot a$ , or  $x = \boxed{ab}$ .

### EXAMPLE 1

## Solving an Equation Using Multiplication

Remember to check your answer by substituting it in the original equation.

$$\frac{t}{8} = 6$$

Original equation.

$$\frac{t}{8} \cdot \boxed{8} = 6 \cdot \boxed{8}$$

Multiply each side by  $\boxed{8}$ . (Multiplication property of equality)

$$t = \boxed{48}$$

Simplify.

✓ **Check**  $\frac{\boxed{48}}{8} = 6$

Substitute  $\boxed{48}$  for  $t$  in original equation.

$$6 = 6 \checkmark$$

Solution checks.

## Division Property of Equality

**Words** Dividing each side of an equation by the same nonzero number produces an equivalent equation.

**Numbers** If  $3x = 21$ , then  $\frac{3x}{3} = \frac{21}{\boxed{3}}$ , or  $x = \boxed{7}$ .

**Algebra** If  $ax = b$  and  $a \neq 0$ , then  $\frac{ax}{a} = \frac{b}{a}$ , or  $x = \frac{b}{a}$ .

**EXAMPLE 2 Solving an Equation Using Division**

$$-3.4y = 17 \quad \text{Original equation.}$$

$$\frac{-3.4y}{-3.4} = \frac{17}{-3.4} \quad \text{Divide each side by } \boxed{-3.4}. \text{ (Division property of equality)}$$

$$y = \boxed{-5} \quad \text{Simplify.}$$

**Guided Practice Solve the equation. Check your solution.**

|                       |                         |                 |              |
|-----------------------|-------------------------|-----------------|--------------|
| 1. $14 = \frac{x}{8}$ | 2. $\frac{x}{4.5} = 12$ | 3. $56 = -3.5x$ | 4. $8x = 72$ |
|-----------------------|-------------------------|-----------------|--------------|

**EXAMPLE 3 Writing and Solving an Equation**

**Pizza** Three people equally share the cost of a pizza. The total cost of the pizza is \$14.67. Write and solve an equation to find each person's cost.

**Solution**

Let  $c$  represent each person's cost.

$$\boxed{\text{Total Cost}} = \boxed{\text{Number of people}} \cdot \boxed{\text{Each person's cost}}$$

$$\boxed{14.67} = 3 \cdot \boxed{c} \quad \text{Write an algebraic model.}$$

$$\frac{\boxed{14.67}}{3} = \frac{\boxed{3c}}{3} \quad \text{Divide each side by } \boxed{3}.$$

$$\boxed{4.89} = \boxed{c} \quad \text{Simplify.}$$

**Answer:** Each person's cost is  $\boxed{\$4.89}$ .

**EXAMPLE 4** Writing a Repeating Decimal as a FractionWrite  $0.\overline{56}$  as a fraction.**Solution****Step 1** Let  $x = 0.\overline{56}$ , or  $0.565656\dots$ **Step 2** Multiply each side of the equation by  $10^2$ , or  $100$ , because thedecimal has  $2$  repeating digits:  $100x = \overline{56.56}$ ,or  $\overline{56.565656\dots}$ .**Step 3** Subtract  $x$  from  $100x$ .

$$100x = \overline{56.565656\dots}$$

$$- x = 0.565656\dots$$

$$99x = 56.000000\dots$$

**Step 4** Solve for  $x$  and simplify.

$$x = \frac{56}{99}$$

**Answer:** The decimal  $0.\overline{56}$  is equivalent to the fraction  $\frac{56}{99}$ .**Guided Practice** Write the decimal as a fraction.**Homework**

5.  $0.\overline{2}$

6.  $0.\overline{6}$

7.  $0.\overline{82}$