

# Solving Inequalities Using Multiplication or Division

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

## Multiplication Properties of Inequality

### Words

Multiplying each side of an inequality by a *positive* number produces an equivalent inequality.

Multiplying each side of an inequality by a *negative* number and *reversing the direction of the inequality symbol* produces an equivalent inequality.

### Algebra

If  $6x < 14$ , then

$$\left(\frac{1}{6}\right)(6x) < \left(\frac{1}{6}\right)(14).$$

If  $-3x < 15$ , then

$$\left(-\frac{1}{3}\right)(-3x) > \left(-\frac{1}{3}\right)(15).$$

## EXAMPLE 1 Solving an Inequality Using Multiplication

$$-\frac{1}{4}m \geq 6$$

Original inequality

$$-4 \cdot \left(-\frac{1}{4}\right)m \leq -4 \cdot 6$$

Multiply each side by  $-4$ .

**Reverse** inequality symbol.

(Multiplication property of inequality)

$$m \leq -24$$

Simplify.

## Division Properties of Inequality

### Words

Dividing each side of an inequality by a *positive* number produces an equivalent inequality.

Dividing each side of an inequality by a *negative* number and *reversing the direction of the inequality symbol* produces an equivalent inequality.

### Algebra

If  $7x < 14$ , then

$$\frac{7x}{7} < \frac{14}{7}$$

If  $-2x < 8$ , then

$$\frac{-2x}{-2} > \frac{8}{-2}$$

## EXAMPLE 2 Solving an Inequality Using Division

$$\frac{45}{-9} < \frac{-9x}{-9}$$

$$-5 < x$$

Original inequality

Divide each side by  $-9$ . **Reverse** inequality symbol. (Division property of inequality)

Simplify.

### Guided Practice Solve the inequality.

1. $\frac{n}{7} > 7$	2. $-\frac{1}{5}y \leq 20$	3. $26 < -2x$	4. $8t < 64$

## EXAMPLE 3 Using the Division Property of Inequality

When solving real world problems involving inequalities, look for key phrases, such as *no more than* to determine what inequality symbol to use.

**Stock Market** You want to buy shares of stock in a company. Each share of stock costs \$12.50. You can spend no more than \$325. Write and solve an inequality to find how many shares you can buy.

### Solution

Let  $s$  represent the number of shares you can buy.

$$\text{Cost per share} \cdot \text{Number of shares} \leq \text{Amount can spend}$$

$$12.5s \leq 325$$

Write an algebraic model.

$$\frac{12.5s}{12.5} \leq \frac{325}{12.5}$$

Divide each side by  $12.5$ .

$$s \leq 26$$

Simplify.

**Answer** You can buy no more than  $26$  shares.

### Homework