

## Lesson 6-2

### Example 1 Multiply by a Positive Number

Solve  $\frac{3}{4}r \leq 12$ . Then check your solution.

$$\frac{3}{4}r \leq 12 \quad \text{Original inequality}$$

$$\left(\frac{4}{3}\right)\frac{3}{4}r \leq \left(\frac{4}{3}\right)12 \quad \text{Multiply each side by } \frac{4}{3}. \text{ Since we multiplied by a positive number,}$$

the inequality symbol stays the same.

$$r \leq 16$$

**Check:** To check this solution, substitute 16, a number less than 16, and a number greater than 16 into the inequality.

$$\text{Let } r = 16$$
$$\frac{3}{4}(16) \stackrel{?}{<} 12$$

$$12 \leq 12$$

$$\text{Let } r = 12$$
$$\frac{3}{4}(12) \stackrel{?}{<} 12$$

$$9 \leq 12$$

$$\text{Let } r = 20$$
$$\frac{3}{4}(20) \stackrel{?}{<} 12$$

$$15 \not\leq 12$$

The solution set is  $\{r \mid r \leq 16\}$ .

### Example 2 Multiply by a Negative Number

Solve  $-\frac{a}{6} \geq 3$ .

$$-\frac{a}{6} \geq 3 \quad \text{Original inequality}$$

$$\left(-\frac{6}{1}\right)\left(-\frac{a}{6}\right) \leq \left(-\frac{6}{1}\right)(3) \quad \text{Multiply each side by } -\frac{6}{1} \text{ and change } \geq \text{ to } \leq.$$

$$a \leq -18$$

The solution set is  $\{a \mid a \leq -18\}$ .

**Example 3 Write and Solve an Inequality**

Write an inequality for the sentence below. Then solve the inequality.

*Four is greater than negative two thirds of a number.*

$$\underbrace{\text{four}} \quad \underbrace{\text{is greater than}} \quad \underbrace{\text{negative two thirds}} \quad \underbrace{\text{of}} \quad \underbrace{\text{a number}}$$

$$4 > -\frac{2}{3} \times n$$

$$4 > -\frac{2}{3}n$$

Original inequality

$$\left(-\frac{3}{2}\right)4 < \left(-\frac{3}{2}\right)\left(-\frac{2}{3}n\right)$$

Multiply each side by  $-\frac{3}{2}$  and change  $>$  to  $<$ .

$$-6 < n$$

The solution set is  $\{n \mid n > -6\}$ .

**Example 4 Divide by a Positive Number**Solve  $2.3m \leq 6.9$ .

$$2.3m \leq 6.9$$

Original inequality

$$\frac{2.3m}{2.3} \leq \frac{6.9}{2.3}$$

Divide each side by 2.3 and do not change the direction of the inequality.

$$m \leq 3$$

**Check:** To check this solution, substitute 3, a number less than 3, and a number greater than 3 into the inequality.

|                                 |                                 |                                 |
|---------------------------------|---------------------------------|---------------------------------|
| Let $m = 3$                     | Let $m = 2$                     | Let $m = 4$                     |
| $2.3m \leq 6.9$                 | $2.3m \leq 6.9$                 | $2.3m \leq 6.9$                 |
| $2.3(3) \stackrel{?}{\leq} 6.9$ | $2.3(2) \stackrel{?}{\leq} 6.9$ | $2.3(4) \stackrel{?}{\leq} 6.9$ |
| $6.9 \leq 6.9$                  | $4.6 \leq 6.9$                  | $9.2 \not\leq 6.9$              |

The solution set is  $\{m \mid m \leq 3\}$ .**Example 5 Divide by a Negative Number**Solve  $-3y \leq -4.5$  using two methods.**Method 1** Divide.

$$-3y \leq -4.5$$

Original inequality

$$\frac{-3y}{-3} \geq \frac{-4.5}{-3}$$

Divide each side by  $-3$  and change  $\leq$  to  $\geq$ .

$$y \geq 1.5$$

Simplify.

**Method 2** Multiply by the multiplicative inverse.

$$-3y \leq -4.5$$

Original inequality

$$\left(-\frac{1}{3}\right)(-3y) \geq \left(-\frac{1}{3}\right)(-4.5)$$

Multiply each side by  $-\frac{1}{3}$  and change  $\leq$  to  $\geq$ .

$$y \geq 1.5$$

Simplify.

The solution set is  $\{y \mid y \geq 1.5\}$ .

**Example 6 The Word “Not”****Multiple-Choice Test Item**

Which inequality does *not* have the solution  $\{a \mid a > 3\}$ ?

- A.  $\frac{2}{3}a > 2$                       B.  $-2a > -6$                       C.  $4a > 12$                       D.  $-\frac{a}{8} < -\frac{3}{8}$

**Read the Test Item**

You want to find the inequality that does *not* have the solution set  $\{a \mid a > 3\}$ .

**Solve the Test Item**

Consider each possible choice.

A.  $\frac{2}{3}a > 2$

$$\left(\frac{3}{2}\right)\frac{2}{3}a > \left(\frac{3}{2}\right)(2)$$

$$a > 3 \quad \checkmark$$

B.  $-2a > -6$

$$\frac{-2a}{-2} < \frac{-6}{-2}$$

$$a < 3$$

C.  $4a > 12$

$$\frac{4a}{4} > \frac{12}{4}$$

$$a > 3 \quad \checkmark$$

D.  $-\frac{a}{8} < -\frac{3}{8}$

$$(-8) \cdot -\frac{a}{8} > (-8) \cdot -\frac{3}{8}$$

$$a > 3 \quad \checkmark$$

The answer is B.