

Lesson 6-2

Example 1 Multiply by a Positive Number

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

$$\frac{3}{4}r \leq 12$$

Original inequality

$$\left(\frac{4}{3}\right)\frac{3}{4}r \leq \left(\frac{4}{3}\right)12$$

Multiply each side by $\frac{4}{3}$. 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.

Let $r = 16$

$$\frac{3}{4}(16) \stackrel{?}{<} 12$$

$$12 \leq 12$$

Let $r = 12$

$$\frac{3}{4}(12) \stackrel{?}{<} 12$$

$$9 \leq 12$$

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

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

Original inequality

$$\left(-\frac{6}{1}\right)\left(-\frac{a}{6}\right) \leq \left(-\frac{6}{1}\right)(3)$$

Multiply each side by $-\frac{6}{1}$ and change \geq 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.

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

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

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 NumberSolve $2.3m \leq 6.9$.

$$2.3m \leq 6.9$$

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 $m = 3$

$$2.3m \leq 6.9$$

$$2.3(3) \stackrel{?}{\leq} 6.9$$

$$6.9 \leq 6.9$$

Let $m = 2$

$$2.3m \leq 6.9$$

$$2.3(2) \stackrel{?}{\leq} 6.9$$

$$4.6 \leq 6.9$$

Let $m = 4$

$$2.3m \leq 6.9$$

$$2.3(4) \stackrel{?}{\leq} 6.9$$

$$9.2 \not\leq 6.9$$

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

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

$$a > 3 \quad \checkmark$$