

## Solving Inequalities Using Multiplication or Division

As shown below, when each side of the inequality  $2 < 8$  is multiplied by a positive number, the inequality remains true. When each side is multiplied by a negative number, the inequality sign must be reversed.

$$\begin{aligned} 2 &< 8 \\ 4 \bullet 2 &< 4 \bullet 8 \\ 8 &< 32 \end{aligned}$$

$$\begin{aligned} 2 &< 8 \\ -4 \bullet 2 &< -4 \bullet 8 \\ -8 &> -32 \end{aligned}$$

Reverse inequality sign.

### Multiplication Property 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  $a < b$ , and  $c > 0$ , then  $ac < bc$ .

If  $a < b$ , and  $c < 0$ , then  $ac > bc$ .

These examples suggest the following rules for solving inequalities.

**Example 1:** Solve the inequality  $\frac{m}{-3} > 3$

$$\frac{m}{-3} > 3 \quad \text{Original inequality.}$$

$$-3 \bullet \frac{m}{-3} < -3 \bullet 3 \quad \text{Multiply each side by } -3. \text{ Reverse inequality symbol.}$$

$$m < -9 \quad \text{Simplify.}$$

**Addition Property** Just as you can use the subtraction property of equality to solve an equation involving addition, you can use the addition property of equality to solve an equation involving subtraction.

### Division Property of Equality

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

**Algebra:** If  $a < b$ , and  $c > 0$ , then  $\frac{a}{c} < \frac{b}{c}$ .

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

**Algebra:** If  $a < b$ , and  $c < 0$ , then  $\frac{a}{c} > \frac{b}{c}$ .

**Example 2:** Solve the inequality  $-10t \geq 34$

$$-10t \geq 34 \quad \text{Original inequality.}$$

$$\frac{-10t}{-10} \leq \frac{34}{-10} \quad \text{Divide each side by } -10.$$

$$t \leq -3.4 \quad \text{Simplify.}$$