Name _____

3-3 Solving Inequalities Using Multiplication or Division

OBJECTIVE: **I can use multiplication or division to solve inequalities**

Warm-Up

Consider the inequality $4 > 1$. Copy and complete each statement at the right by replacing each ■ with < or >. What happens to the inequality symbol when you multiply each side by a positive number? What happens to the inequality symbol when you multiply each side by a negative number? Justify your reasoning.

$4 \cdot 3 \blacksquare 1 \cdot 3$
$4 \cdot 2 \blacksquare 1 \cdot 2$
$4 \cdot 1 \blacksquare 1 \cdot 1$
$4 \cdot -1 \blacksquare 1 \cdot -1$
$4 \cdot -2 \blacksquare 1 \cdot -2$
$4 \cdot -3 \blacksquare 1 \cdot -3$

Essential Understanding

Essential Understanding Just as you used multiplication and division to solve equations in Topic 2, you can use multiplication and division to solve inequalities.

Key Concept:

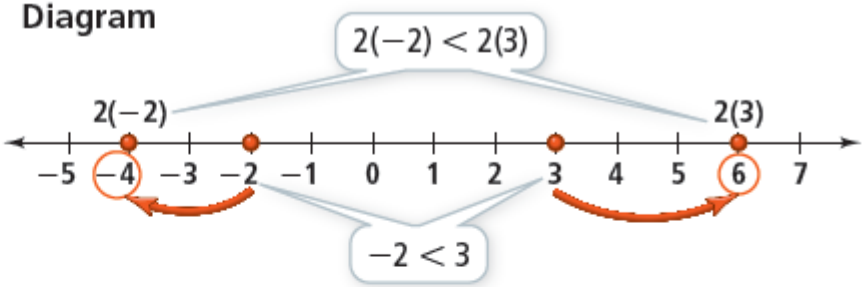
Words

Let a, b, and c be real numbers with $c > 0$.

If $a > b$, then $ac > bc$.

If $a < b$, then $ac < bc$.

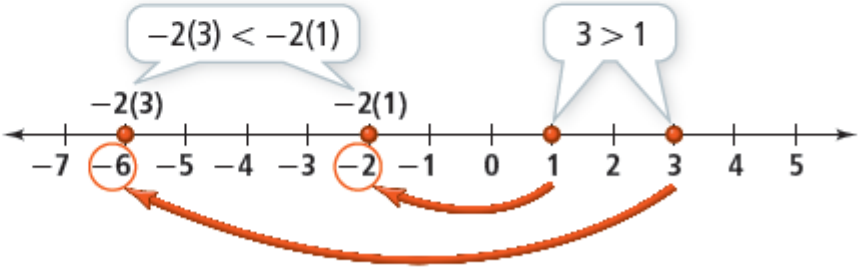
Diagram



Let a, b, and c be real numbers with $c < 0$.

If $a > b$, then $ac < bc$.

If $a < b$, then $ac > bc$.



These properties are also true for inequalities using ≥ and ≤.

Example

#1 Multiplying by a Positive Number

What are the solutions of $\frac{x}{3} < -2$? Graph the solutions.

Your Turn to Work it Out

1. What are the solutions of $\frac{c}{8} > \frac{1}{4}$? Graph the solutions.

Example

#2 Multiplying by a Negative Number

What are the solutions of $-\frac{3}{4}w \geq 3$? Graph and check the solutions.

Your Turn to Work it Out

2. What are the solutions of $-\frac{n}{3} < -1$? Graph and check.

Concept Understanding

Key Concept:

Let a, b, and c be real numbers with $c > 0$.

If $a > b$, then $\frac{a}{c} > \frac{b}{c}$.

If $a < b$, then $\frac{a}{c} < \frac{b}{c}$.

Let a, b, and c be real numbers with $c < 0$.

If $a > b$, then $\frac{a}{c} < \frac{b}{c}$.

If $a < b$, then $\frac{a}{c} > \frac{b}{c}$.

Examples

$6 > 3$, so $\frac{6}{3} > \frac{3}{3}$.

$9 < 12$, so $\frac{9}{3} < \frac{12}{3}$.

$6 > 3$, so $\frac{6}{-3} < \frac{3}{-3}$.

$9 < 12$, so $\frac{9}{-3} > \frac{12}{-3}$.

These properties are also true for inequalities using $\geq$ and $\leq$.

Example #3 Dividing by a Positive Number

Part-Time Job You walk dogs in your neighborhood after school. You earn $4.50 per dog. How many dogs do you need to walk to earn at least $75?

Your Turn to Work it Out

3. A student club plans to buy food for a soup kitchen. A case of vegetables costs $10.68. The club can spend at most $50 for this project. What are the possible numbers of cases the club can buy?

Example #4 Dividing by a Negative Number

What are the solutions of $-9y \leq 63$? Graph the solutions.

Your Turn to Work it Out

4. What are the solutions of $-5x > -10$? Graph the solutions.