2.1: Properties of Inequalities

Here are some important properties of inequalities:

Properties of Inequalities

If a, b, and c are real numbers, then:

Transitive Property if $a < b$ and $b < c$ then $a < c$

Addition Property if $a < b$ then $a + c < b + c$

Subtraction Property if $a < b$ then $a - c < b - c$

Multiplication Property (Multiplying by a positive number) if $a < b$ and $c > 0$ then $ac < bc$

Multiplication Property (Multiplying by a negative number) if $a < b$ and $c < 0$ then $ac > bc$

Division Property (Dividing by a positive number) if $a < b$ and $c > 0$ then $\frac{a}{c} < \frac{b}{c}$

Division Property (Dividing by a negative number) if $a < b$ and $c < 0$ then $\frac{a}{c} > \frac{b}{c}$

Example 2.1.1

Transitive Property

If 3 < 7 and 7 < 14 then...

Solution

3 < 14

Example 2.1.2

Addition Property

If 3 < 7, then add 4 to both sides.

Solution

3 + 4 < 7 + 4

7 < 11

Example 2.1.3

Subtraction Property

If 3 < 7, subtract 6 on both sides

Solution

3 < 7

3 - 6 < 7 - 6

-3 < 1

Example 2.1.4

Multiplication Property (Multiplying by a positive number)

If 3 < 7, multiply both sides by 5.

Solution

3 < 7

3 * 5 < 5 * 7

15 < 35

Example 2.1.5

Multiplication Property (Multiplying by a negative number)

If 3 < 7, multiply both sides by -4.

Solution

3 < 7

3 * -4 ? -4 * 7

-12 ? -28

-12 > -28 **The direction of the inequality is changed.**

Example 2.1.6

Division Property (Dividing by a positive number)

If 6 < 8, divide both sides by 2.

Solution

6/2 < 8/2

3 < 4

Example 2.1.7

Division Property (Dividing by a negative number)

If 9 < 15, divide both sides by -3.

Solution

9 < 15

9/-3 ? 15/-3

-3 ? -5

-3 > -5 **The direction of the inequality is changed.**
