

## 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**

$$3 < 7$$

$$3 * -4 ? -4 * 7$$

$$-12 ? -28$$

$$-12 > -28 \quad \text{The direction of the inequality is changed.}$$

## ✓ 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**

$$9 < 15$$

$$9/-3 ? 15/-3$$

$$-3 ? -5$$

$$-3 > -5 \quad \text{The direction of the inequality is changed.}$$

This page titled [2.1: Properties of Inequalities](#) is shared under a [CC BY-SA 4.0](#) license and was authored, remixed, and/or curated by [Victoria Dominguez, Cristian Martinez, & Sanaa Saykali \(ASCCC Open Educational Resources Initiative\)](#).

- [10.1: Properties of Inequalities](#) by Victoria Dominguez, Cristian Martinez, & Sanaa Saykali is licensed [CC BY-SA 4.0](#).