

Section 11 Solving Inequalities

Definition: An **inequality** is a statement about the relationship between two expressions. These symbols are used to represent the idea that there is a relationship between the expressions but that the two expressions are *not* identical. We will use the following symbols to represent inequalities.

$a > b$	a is greater than b
$a < b$	a is less than b
$a \geq b$	a is greater than <i>or equal to</i> b
$a \leq b$	a is less than <i>or equal to</i> b
$a \neq b$	a is not equal to b

Definition: A **solution** of an inequality is the set of numbers that makes the inequality true.

Example 1: Verifying a solution

Is the given number a solution of the inequality $x < -2$?

a) -1

b) -2

Graphs of Inequalities

Example 2: Graphing Inequalities

Sketch the graphs of the following inequalities and write using set-builder notation.

a) $x > 4$

b) $x \geq 4$

c) $x < 4$

d) $x \leq 4$


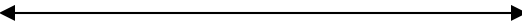


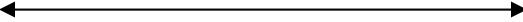
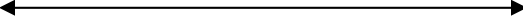

e) $-1 < x < 4$

f) $-1 \leq x < 4$

g) $-1 \leq x \leq 4$

Notation: Interval Notation

It is convenient throughout mathematics to use symbols to represent ideas in a concise manner. It keeps us from having to write out verbal descriptions of the ideas we are trying to represent. Throughout this course, we will use interval notation to represent certain infinite sets of real numbers.

$x > 4$		$(4, \infty)$
$x \geq 4$		$[4, \infty)$
$x < 4$		$(-\infty, 4)$
$x \leq 4$		$(-\infty, 4]$
$-1 < x < 4$		$(-1, 4)$
$-1 \leq x < 4$		$[-1, 4)$
$-1 \leq x \leq 4$		$[-1, 4]$

Solving Inequalities

The Properties of Inequalities

Each of these rules is still true when $<$ is replaced by \leq , $>$, or \geq . Let a , b , and c be real numbers. Then, the following properties hold:

The Addition Property of Inequality: If $a < b$, then $a + c < b + c$.

The Multiplication Properties of Inequality: If $a < b$ and $c > 0$, then $a \cdot c < b \cdot c$.
If $a < b$ and $c < 0$, then $a \cdot c > b \cdot c$.

Example 3: Solving Inequalities

Solve. Graph the solution and express using interval notation.

$$-2x + 5 > 7$$

Example 4: Solving Inequalities

Solve $3x - 2 \leq 7x + 4$.

Example 5: Solving Inequalities

Solve $15.2 - 3.1x \geq -4.7$.

Example 6: Solving Inequalities

Solve $-5(x - 2) + 1 < 2(x - 1) - 2$.

Example 7: Solving Inequalities

Solve $\frac{1}{3}(6x + 24) - 20 > -\frac{1}{4}(12x - 72)$.