An inequality is similar to an equation except instead of an = sign you will find <, > or ≤, ≥.

<,> are strict inequalities and ≤, ≥ are greater or lesser than or equal to. The solutions will be different because a linear equation has one, none or many solutions. A linear inequality has a solution that is over an interval and the answers are in what is called interval notation. This insures that you have the complete answer. In this section we will only be concerned with real number solutions.

Interval Notation:

$-\infty < x < A$	$(-\infty, A)$	rounded bracket means that A is not included
$-\infty \le x \le A$	$(-\infty, A]$	square bracket means that A is included
$B < x < \infty$	(B, ∞)	
$B \le x \le \infty$	$[B, \infty)$	
$A < x < B$	(A, B)	
$A \le x \le B$	$[A, B]$	

- **Note: if you multiply or divide a inequality by a negative number you have to reverse the inequality sign for the solution to be correct**

$$-4x \ge 12$$

$$\frac{-4x}{-4} \ge \frac{12}{-4}$$ **If we don't reverse the sign the answer will be incorrect.**

$$x \ge -3$$

Check the answer by testing −1 and you get

$$-4(-1) \ge 12$$

$$4 \ge 12$$

Gives you the Wrong Answer!

Reverse the inequality and

$x \le -3$ Check the answer by testing -5 and you get

Yes a true statement, so the answer is correct.

$x = -5$ $\quad -4x \ge 12$

$-4(-5) \ge 12$

$20 \ge 12$ true

$(-\infty, 3]$

Example 1:

Express the solution of the inequality in interval notation.

$-4x < 8$

$\frac{-4x}{-4} > \frac{8}{-4}$

$x > -2$

or

$-2 < x$

test $0 > -2$ yes

$(-2, \infty)$

Example 2:

Express the solution of the inequality in interval notation.

$5x - 1 \leq 7x + 5$

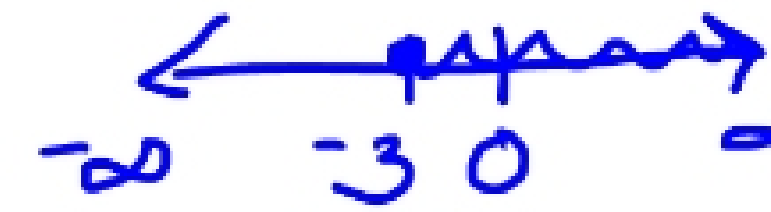
$-5x \quad -5x$

$-1 \leq 2x + 5$

$-5 \quad -5$

$\frac{-6}{2} \leq \frac{2x}{2}$

$-3 \leq x \leftrightarrow x \geq -3$



$-3 \leq 0$ true

$[-3, \infty)$

Example 3:

Express the solution of the inequality in interval notation.

$2 < x + 4 < 5$

$-4 \quad -4 \quad -4$

$-2 < x < 1$

$(-2, 1)$

Example 4:

Express the solution of the inequality in interval notation.

$$5 < 5 - 2x \leq 11$$

$-5 \quad -5 \quad -5$

$0 < -2x \leq 6$

$\frac{0}{-2} > \frac{-2x}{-2} \geq \frac{6}{-2}$

$0 > x \geq -3$ or $-3 \leq x < 0$

$[-3, 0)$

Example 5:

Express the solution of the inequality in interval notation.

$$5x - 3(x - 2) < 2x + 9$$

$5x - 3x + 6 < 2x + 9$

$2x + 6 < 2x + 9$

$-2x \quad -2x$

$6 < 9$ true

All real numbers $(-\infty, \infty)$

Example 6:

Express the solution of the inequality in interval notation.

$$-3 \leq 2x + 1 < 7$$

$-1 \quad -1 \quad -1$

$\frac{-4}{2} \leq \frac{2x}{2} < \frac{6}{2}$

$-2 \leq x < 3$

$[-2, 3)$