

Solving Inequalities

Properties of Inequality

Addition (Subtraction): if $a > b$, then $a + c > b + c$

Multiplication (Division): if $a > b$ and $c > 0$, then $ac > bc$

if $a > b$ and $c < 0$, then $ac < bc$ (if $b < a$ and $c < 0$, then $bc > ac$)

An example for why you must change direction when multiplying by a negative number: $3 > 2$ multiply both sides by (-1) & you have $-3 > -2$, not true, so you must change it to $-3 < -2$.

Steps for Solving Inequalities

- 1) If it is a compound inequality (covered more in Chapter 9) break it into 2 inequalities.
- 2) If the inequality involves a fraction, multiply both sides by the LCD.
- 3) Use the Distributive property to get rid of any parenthesis.
- 4) Simplify each side, combine like terms.
- 5) Get all the variable terms to one side and all non-variable(constants) to the other side & simplify
- 6) Get variables alone using the multiplication property.
- 7) Check solution by substituting back into original, does it makes sense?

Graphing

- 1.) Use '(' or ')' on the endpoint(s) not included in the solution, strict inequality, see the Interval Notation File or below.
- 2.) Use '[' or ']' on the endpoint(s) included in the solution,
- 3.) Pick a point on each side of the endpoint(s) to check which way the line goes.

Examples:

1) $x \geq -6$
 $-6 \leq x$

A number line from -10 to 10 with tick marks at every integer. A green bracket is drawn at -6, and a green arrow points to the right from -6, indicating the solution set $x \geq -6$.

2) $x - 4 > 2 - x$

$$\begin{array}{r} x - 4 > 2 - x \\ + x + 4 \quad + 4 + x \\ \hline 2x > 6 \end{array}$$

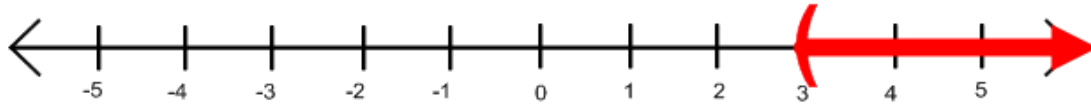
With this problem, we start at step 5, move the x to the left and the 4 to the right.

Now we just divide both sides by 2.

$x > 3$

Interval Notation: $(3, \infty)$

Graph:



3) $3(t + 4) \leq t + 10$

$$\begin{array}{r} 3t + 12 \leq t + 10 \\ -t - 12 \quad -t - 12 \\ \hline 2t \leq -2 \end{array}$$

First we need to use the distributive property.

Next subtract t and 12 from each side.

$$\begin{array}{r} \frac{2t}{2} \leq \frac{-2}{2} \\ t \leq -1 \end{array}$$

Divide each side by 2, to find t .

Interval Notation: $(-\infty, -1]$

Graph:

