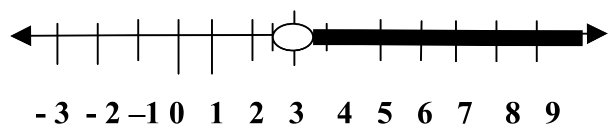
The Addition and Multiplication Properties of Inequalities

Objective A:

To solve an inequality using the Addition Property

Fact: The <u>solution set of an inequality</u> is a set of numbers, each element of which, when substituted for the variable, results in a true inequality.

The inequality at the right is true if the variable is replaced by 7, 9.3, or 15/2.	**$x + 5 > 8$** **$7 + 5 > 8$** **$9.3 + 5 > 8$** **$15/2 + 5 > 8$**
The inequality at $x + 5 > 8$ is false if the variable is replace by 2, 1.5, or ½.	**$2 + 5 \ngtr 8$** **$1.5 + 5 \ngtr 8$** **$1/2 + 5 \ngtr 8$**
At the right is the solution set of the graph: $x + 5 > 8$	
Note: There are many values of the variable x that will make the inequality $x + 5 > 8$ true. The solution set of $x + 5 > 8$ is any number greater than 3.	

<u>Addition Property of Inequalities</u>

The same term can be added to each side of an inequality without changing the solution set of the inequality. **If $a > b$, then $a + c > b + c$** **If $a < b$, then $a + c < b + c$**

Fact: The Addition Property of Inequalities holds true for an inequality containing the symbols: $\geq$ or $\leq$.

Remember: The goal of the inequality is to rewrite the inequality in the form:

Variable > Constant or Variable < Constant

The Addition Property of Inequalities.

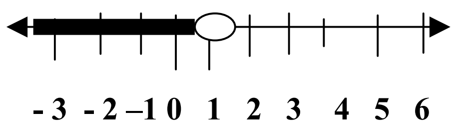
Solve: $x - 4 < -3$

$x - 4 < -3$

$x - 4 + 4 < -3 + 4$ • **add 4 to each side of the inequality**

$x < 1$ • **simplify**

Graphing the solution set.



Solve: $5x - 6 \leq 4x - 4$

$5x - 6 \leq 4x - 4$

$5x - 6 - 4x \leq 4x - 4x - 4$ • **subtract 4x from each side of the inequality**

$x - 6 \leq -4$ • **simplify**

$x - 6 + 6 \leq -4 + 6$ • **add 6 to each side of the inequality**

$x \leq 2$ • **simplify**

Objective B:

To solve an inequality using the Multiplication Property

Fact:

The Multiplication Property of Inequalities is used when, in order to rewrite an inequality in this form, we must remove the coefficient from one side of the inequality.

<u>Multiplication Property of Inequalities</u>

> **Each side of an inequality can be multiplied by the same positive number without changing the solution set of the inequality.**
>
> **If a > b and c < 0, then ac < bc.**
> **If a < b and c < 0, then ac > bc.**

Fact: The Multiplication Property of Inequalities holds true for an inequality containing the symbols: $\geq$ or $\leq$.

Example: $2x < -4$

$2x < -4$

$\frac{2x}{2} < \frac{-4}{2}$ • **divide each side of the inequality by 2**

$x < -2$ • **simplify**

Solve: $-\frac{3x}{2} \leq 6$

$-\frac{3x}{2} \leq 6$

$\left(\frac{-2}{3}\right)\left(\frac{-3x}{2}\right) \leq -\frac{2}{3}(6)$ • **multiply each side of the inequality by $-\frac{2}{3}$**

Because $-\frac{2}{3}$ is a negative number the inequality must be reversed.

$X \geq -4$ • **simplify**