

5-3 Notes - Solving Multi-Step Inequalities

Solve Multi-Step Inequalities To solve linear inequalities involving more than one operation, undo the operations in reverse of the order of operations, just as you would solve an equation with more than one operation.

Example 1: Solve $6x - 4 \leq 2x + 12$.

$$\begin{array}{r}
 6x - 4 \leq 2x + 12 \\
 \underline{+4 \quad +4} \\
 6x \leq 2x + 16 \\
 \underline{-2x \quad -2x} \\
 4x \leq 16 \\
 \underline{\frac{4x}{4} \quad \frac{16}{4}} \\
 x \leq 4 \\
 \{x | x \leq 4\}
 \end{array}$$

Example 2: Solve $3a - 15 > 4 + 5a$.

$$\begin{array}{r}
 3a - 15 > 4 + 5a \\
 \underline{+15 \quad +15} \\
 3a > 19 + 5a \\
 \underline{-5a \quad -5a} \\
 -2a > 19 \\
 \underline{\frac{-2a}{-2} \quad \frac{19}{-2}} \\
 a < -\frac{19}{2} \\
 \{a | a < -\frac{19}{2}\}
 \end{array}$$

Solve Inequalities Involving the Distributive Property When solving inequalities that contain grouping symbols, first use the Distributive Property to remove the grouping symbols. Then undo the operations in reverse of the order of operations, just as you would solve an equation with more than one operation.

Example : Solve $3a - 2(6a - 4) > 4 - (4a + 6)$.

$$\begin{array}{r}
 3a - 12a + 8 > 4 - 4a - 6 \\
 -9a + 8 > -2 - 4a \\
 \underline{-8 \quad -8} \\
 -9a > -10 - 4a \\
 \underline{+4a \quad +4a} \\
 -5a > -10 \\
 \underline{-5 \quad -5} \\
 a < 2 \\
 \{a | a < 2\}
 \end{array}$$

Flip
the
inequality
symbol!

1. $9x - 5(x - 5) \leq 4(x - 3)$

$$9x - 5x + 25 \leq 4x - 12$$

$$4x + 25 \leq 4x - 12$$

$$25 \leq -12$$

no!!

no solution

2. $\frac{2x-4}{6} > -5x+2$

$$2x - 4 > -30x + 12$$

$$\begin{array}{r} +30x \quad +30x \\ \hline \end{array}$$

$$32x - 4 > 12$$

$$\begin{array}{r} -4 \quad +4 \\ \hline \end{array}$$

$$32x > 16$$

$$\begin{array}{r} 32 \quad 32 \\ \hline \end{array}$$

$$x > \frac{1}{2}$$

Solving Inequalities with LCD

3. 1. $\left[\frac{1}{3}(4x+3) \geq \frac{2}{3}x+2 \right]$

$$1(4x+3) \geq 2x+6$$

$$4x+3 \geq 2x+6$$

$$\begin{array}{r} -2x \quad -2x \\ \hline \end{array}$$

$$2x+3 \geq 6$$

$$\begin{array}{r} -3 \quad -3 \\ \hline \end{array}$$

$$2x \geq 3$$

$$x \geq \frac{3}{2}$$

10. 2. $\left[\frac{1}{2}(x+7) < \frac{1}{5}(3x+4) \right]$

$$5(x+7) < 2(3x+4)$$

$$5x+35 < 6x+8$$

$$\begin{array}{r} -35 \quad -35 \\ \hline \end{array}$$

$$5x < 6x - 27$$

$$\begin{array}{r} -6x \quad -6x \\ \hline \end{array}$$

$$-x < -27$$

$$x > 27$$