

Solving Multi-Step Inequalities Guide Notes

SOLVING TWO-STEP INEQUALITIES

When solving inequalities that contain more than one operation, follow the order of operation

Sample Problem 1: Solve each inequality.

A.	$3x - 6 > 9$	$3x - 6 + 6 > 9 + 6$	$\frac{3x}{3} > \frac{15}{3}$	$x > 5$
B.	$2x - 5 \leq 11$	$2x - 7 + 7 \leq 11 + 7$	$\frac{2x}{2} \leq \frac{18}{2}$	$x \leq 9$
C.	$8 - x < 13$	$8 - 8 - x < 13 - 8$	$\frac{-x}{-1} > \frac{5}{-1}$	$x > -5$
D.	$-7x + 3 \geq 24$	$-7x + 3 - 3 \geq 24 - 3$	$\frac{-7x}{-7} \leq \frac{21}{-7}$	$x \leq 3$

SOLVING MULTI-STEP INEQUALITIES

A. **Use the Distributive property:** distribute then combine like terms then simplify

Sample Problem 2: Solve each inequality.

A.	$3(x - 5) \geq 9$ $3x + 3(-5) \geq 9$ $3x - 15 \geq 9$ $3x - 15 + 15 \geq 9 + 15$ $3x \geq 24$ $\frac{3x}{3} \geq \frac{24}{3}$ $x \geq 8$	B.	$-4(5 - x) < 100$ $(-4)(5) + (-4)(-x) < 100$ $-20 + 4x < 100$ $-20 + 20 + 4x < 100 + 20$ $4x < 120$ $\frac{4x}{4} < \frac{120}{4}$ $x < 30$
C.	$7(x - 1) - 2(x + 4) > 124$ $7x + 7 - 2x - 8 > 124$ $5x - 1 > 124$ $5x - 1 + 1 > 124 + 1$ $5x > 125$ $\frac{5x}{5} > \frac{125}{5}$ $x > 25$	D.	$14x - 3(9x - 10) \leq 4$ $14x - 27x - (-30) \leq 4$ $-13x + 30 - 4 \leq 4 - 4$ $-13x + 13x + 26 \leq 0 + 13x$ $26 \leq 13x$ $\frac{26}{13} \leq \frac{13x}{13}$ $2 \leq x$

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B. **Variables on both side of the inequality:** Gather the variables on one side and the Constants on the other side.

Sample Problem 3: Solve each inequality.

A.

$$\begin{aligned}
 3x - 5 &> 5x - 2 \\
 3x - 3x - 5 &> 5x - 3x - 2 \\
 -5 &> 2x - 2 \\
 -5 + 2 &> 2x - 2 + 2 \\
 -3 &> 2x \\
 \frac{-3}{2} &> \frac{2x}{2} \\
 \frac{-3}{2} &> x
 \end{aligned}$$

B.

$$\begin{aligned}
 -x + 7 &\leq -2x + 4 \\
 -x + 2x + 7 &\leq -2x + 2x + 4 \\
 x + 7 &\leq 4 \\
 x + 7 - 7 &\leq 4 - 7 \\
 x &\leq -3
 \end{aligned}$$

C.

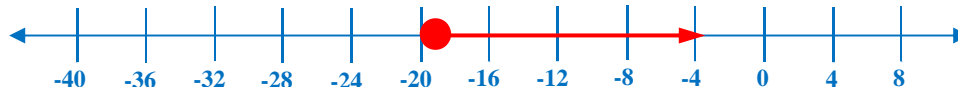
$$\begin{aligned}
 2x + 10 &\geq 7(x + 1) \\
 2x + 10 &\geq 7(x) + 7(1) \\
 2x + 10 &\geq 7x + 7 \\
 2x - 2x + 10 &\geq 7x - 2x + 7 \\
 10 &\geq 5x + 7 \\
 10 - 7 &\geq 5x + 7 - 7 \\
 3 &\geq 5x \\
 \frac{3}{5} &\geq \frac{5x}{5} \\
 \frac{3}{5} &\geq x
 \end{aligned}$$

D.

$$\begin{aligned}
 -2x + 5 &< 4(2x - 10) \\
 -2x + 5 &< 4(2x) + 4(-10) \\
 -2x + 5 &< 8x - 40 \\
 -2x + 2x + 5 &< 8x + 2x - 40 \\
 5 &< 6x - 40 \\
 5 + 40 &< 6x - 40 + 40 \\
 45 &< 6x \\
 \frac{45}{6} &< \frac{6x}{6} \\
 \frac{15}{2} &< x
 \end{aligned}$$

Sample Problem 4: Write, solve and graph each inequality.

A. Three times a number minus eighteen is at least five times the number plus twenty.



$$\begin{aligned}
 3x - 18 &\leq 5x + 20 \\
 3x - 3x - 18 &\leq 5x - 3x + 20 \\
 -18 - 20 &\leq 2x + 20 - 20 \\
 -38 &\leq 2x \\
 \frac{-38}{2} &\leq \frac{2x}{2} \\
 -19 &\leq x
 \end{aligned}$$