Section 9.3

Solving Multi-Step Inequalities

Day 2

Learning Targets:

1. Apply strategies for solving multi-step equations to solving multi-step inequalities, including:
   a) Using the distributive property
   b) Eliminating fractions
   c) Collecting and combining like terms

2. Recognizing when the inequality symbol needs to be changed.

3. Verifying solutions to inequalities.

Examples:

Solve and verify the solutions for the following inequalities

1) $4\left(\frac{3}{2}x\right) - 4(5) \leq 4\left(-\frac{11}{4}\right)$

$6x - 20 \leq -11$

$+20 \qquad +20$

$\frac{6x}{6} \leq \frac{9}{6}$

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

Verify:

Boundary $x = 3/2$

$\frac{3}{2}\left(\frac{3}{2}\right) - 5 = -\frac{11}{4}$

$\frac{9}{4} - \frac{20}{4} = -\frac{11}{4}$

$-\frac{11}{4} = -\frac{11}{4}$ ✓

Inequality $x = 1/2$

$$\frac{3}{2}\left(\frac{1}{2}\right) - 5 \leq -\frac{11}{4}$$

$$\frac{3}{4} - \frac{20}{4} \leq -\frac{11}{4}$$

$$-\frac{17}{4} \leq -\frac{11}{4} \quad \checkmark$$

2) $-3x - 10 \leq 5x + 38$

$-5x \qquad -5x$

$-8x - 10 \leq 38$

$+10 \qquad +10$

$\frac{-8x}{-8} \leq \frac{48}{-8}$ flip

$x \geq -6$

Verify:

Boundary $x = -6$

$-3(-6) - 10 = 5(-6) + 38$

$18 - 10 = -30 + 38$

$8 = 8$ ✓

Inequality $x = 0$

$-3(0) - 10 \leq 5(0) + 38$

$-10 \leq 38$ ✓

3) $-2(x+3) \leq 10x+18$

$-2x-6 \leq 10x+18$

$-10x \qquad -10x$

$-12x-6 \leq 18$

$+6 \qquad +6$

$\frac{-12x}{-12} \leq \frac{24}{-12}$

flip

$x \geq -2$

Verify:

Boundary $x=-2$

$-2(-2+3)=10(-2)+18$

$-2(1)=-20+18$

$-2=-2$ ✓

Inequality $x=1$

$-2(1+3) \leq 10(1)+18$

$-2(4) \leq 10+18$

$-8 \leq 28$ ✓

You Try:

Solve and verify the following inequality:

$$5 - 3x > 2(x - 10)$$

You Try:

Solve and verify the following inequality:

$$5 - 3x > 2(x - 10)$$

$x < 5$

or

$5 > x$

4) $10\left(\frac{3}{5}(2x+11)\right) < 10\left(\frac{1}{2}(x+9)\right)$

$6(2x+11) < 5(x+9)$

$12x + 66 < 5x + 45$

$-5x \qquad -5x$

$7x + 66 < 45$

$-66 \qquad -66$

$\frac{7x}{7} < \frac{-21}{7}$

$x < -3$

Verify:

Boundary $x = -3$

$\frac{3}{5}(2(-3)+11) = \frac{1}{2}(-3+9)$

$\frac{3}{5}(5) = \frac{1}{2}(6)$

$3 = 3$ ✓

Inequality $x = -5$

$\frac{3}{5}(2(-5)+11) < \frac{1}{2}(-5+9)$

$\frac{3}{5} < 2$ ✓

Example: Double inequality

If $2x - 3 > -15$ and $3x + 1 \leq 13$, determine the possible values of x. Show your solution on a number line.

$2x - 3 > -15$

$+3 \quad +3$

$\frac{2x}{2} > \frac{-12}{2}$

$x > -6$

$-6 < x$

$3x + 1 \leq 13$

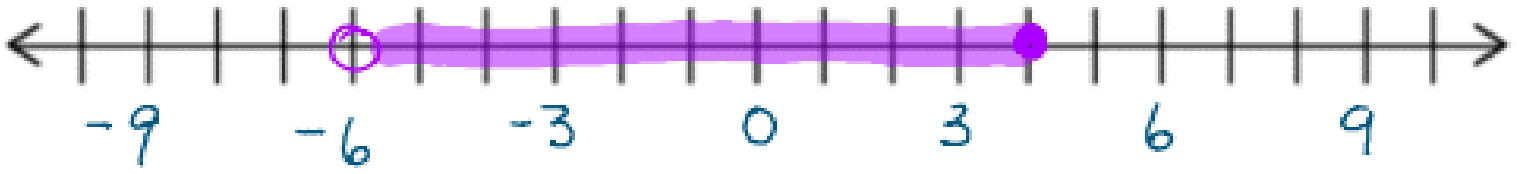
$-1 \quad -1$

$\frac{3x}{3} \leq \frac{12}{3}$

$x \leq 4$

$-6 < x \leq 4$

$$-6 < x \leq 4$$



Check your understanding:

Pg. 365-367 #3, 4, 6, 7, 17, 18, 21