Solve Multi-Step Inequalities

45-minute instructional plan | Minnesota 2007 standards: 7.2.2.4; 7.2.3.1 (equivalent expressions)

Learning objectives

• Distribute and combine like terms in inequalities.

• Solve inequalities with rational coefficients and variables on both sides.

• Reverse the sign correctly when a negative divisor is used.

• Graph, test, and interpret solutions.

Suggested 45-minute sequence

0–5 min	Review and quick check
5–8 min	Why the lesson matters / real-life launch
8–11 min	Read the learning objectives
11–18 min	Explore model and vocabulary
18–30 min	Guided examples and error analysis
30–38 min	Independent practice
38–43 min	Group reasoning
43–45 min	Independent exit ticket

Core concept

Distribute, collect like terms, move variable terms, then solve and check.

$$3(x-2)+5 \le 20 \Rightarrow x \le 7$$

Teaching prompts

• Ask students to name the unknown and units before manipulating the equation or inequality.

• Ask: Which steps preserve the solution set, and why?

• Distinguish open/closed circles, the direction of the number line, and discrete contextual solutions when relevant.

Common misconception / correction

A student expands –3(x–4) as –3x–12. What is the correct distribution?

$$-3(x-4) = -3x+12$$

The product of two negatives is positive.

Differentiation and assessment

Support: pre-label the variable, highlight fixed versus repeated quantities, and provide an annotated example. Extension: require a second representation or a reasoned equivalence argument.

Assessment: Use the exit ticket to identify areas for cumulative Topic 5 review. Address errors with a short model and follow-up problem.

Worked answer key

1. Solve $2(x + 4) – 3 \geq 11$.

$$x \geq 3$$

2. Solve $–3(x – 2) + 5 < 14$.

$$x > -1$$

3. Solve $4x – (x + 6) \leq 12$.

$$x \leq 6$$

4. Solve $5(2p – 1) – 3p > 30$.

$$p > 5$$

5. Solve $3(x + 2) – 4 \geq 2x + 5$.

$$x \geq 3$$

Group challenge

Five groups each contribute twice the variable amount s minus $1, and a one-time $12 fee must keep the cost at most $52. Solve and interpret s.

$$5(2s - 1) + 12 \leq 52 \Rightarrow s \leq 4.5$$

Additional practice — if time allows

Solve $2(x – 3) + 5 \geq 3x – 4$.

$$2x - 1 \geq 3x - 4 \Rightarrow x \leq 3$$

Exit ticket

Solve $–2(3x – 4) + x \geq 18$ and identify which direction to graph.

$$-2(3x - 4) + x \geq 18 \Rightarrow x \leq -2$$

Teaching note

Ask students to justify their methods. Use incorrect answers to identify the next instructional step.