

Solving Multi-Step Inequalities
2.4

More than one operation is needed to solve for the variable. Simplify each side of the inequality if necessary. Then use inverse operations to isolate the variable. Be sure to reverse the inequality symbol when multiplying or dividing by a negative number!

Example 1: Solve each inequality and graph the solution.

a. $13 - 11d \geq 79$

$$\begin{array}{r} -13 \quad -13 \\ \hline -11d \geq 66 \\ -11 \quad \div -11 \\ \hline d \leq -6 \end{array}$$

b. $\frac{y}{-6} + 7 < 9$

$$\begin{array}{r} -7 \quad -7 \\ \hline \left(\frac{y}{-6}\right) < (2) \\ -6 \quad \cdot (-6) \\ \hline y > -12 \end{array}$$

Example 2: Solve each inequality with variables on both sides and graph the solution.

a. $6b - 5 < 2b + 11$

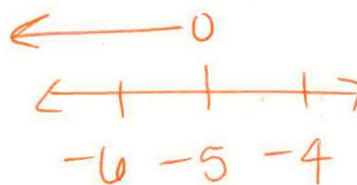
$$\begin{array}{r} -2b \quad -2b \\ \hline 4b - 5 < 11 \\ +5 \quad +5 \\ \hline 4b < 16 \\ \frac{4b}{4} < \frac{16}{4} \\ b < 4 \end{array}$$

b. $3(2a - 1) \geq 10a - 11$

$$\begin{array}{r} 6a - 3 \geq 10a - 11 \\ -6a \quad -6a \\ \hline -3 \geq 4a - 11 \\ +11 \quad +11 \\ \hline 8 \geq 4a \\ \frac{8}{4} \geq \frac{4a}{4} \\ a \leq 2 \end{array}$$

Example 3: Write an inequality for the sentence below. Then solve and graph the inequality.
"Four times a number plus twelve is less than a number minus 3"

$$\begin{array}{r} 4n + 12 < n - 3 \\ -n \quad -n \\ \hline 3n + 12 < -3 \\ -12 \quad -12 \\ \hline 3n < -15 \\ \frac{3n}{3} < \frac{-15}{3} \\ n < -5 \end{array}$$



Example 4: Solving inequalities with special solutions.

a. $8b - 3 > 4(2b + 3)$

$$\begin{array}{r} 8b - 3 > 8b + 12 \\ -8b \quad -8b \\ \hline -3 > 12 \end{array}$$

NOT a true statement!

NO SOLUTION

b. $2(5w - 1) \leq 7 + 10w$

$$\begin{array}{r} 10w - 2 \leq 7 + 10w \\ -10w \quad -10w \\ \hline -2 \leq 7 \end{array}$$

IS a true statement

All Real Numbers
 $W \in \mathbb{R}$

Example 5: You need a mean score of at least 90 points to advance to the next round of the touch-screen trivia game. What scores in the fifth game will allow you to advance?

mean is average



$$\frac{95 + 91 + 77 + 89 + x}{5} \geq 90$$

$$5 \left(\frac{352 + x}{5} \right) \geq (90) \cdot 5$$

$$352 + x \geq 450$$

$$\begin{array}{r} 352 + x = 450 \\ -352 \quad -352 \\ \hline x \geq 98 \end{array}$$

A woodworker wants to earn at least \$25 an hour making and selling cabinets. He pays \$125 for materials. Write and solve an inequality that represents how many hours the woodworker can spend building the cabinet.

$$\begin{array}{r} 25h - 125 \geq 500 \\ +125 \quad +125 \\ \hline \end{array}$$

$$\frac{25h}{25} \geq \frac{625}{25}$$

$$h \geq 25$$

