

6.3: Solve Multi-Step Inequalities

Goals: *Solve Multi-Step Inequalities

*Identify when an inequality has no solution or any number can be a solution

To Solve Multi-Step Inequalities: Same as solving a multi-step equation- follow reverse PEMDAS. Just need to remember that when you multiply or divide by a negative to solve, you would still reverse the inequality sign.

Ex: $3x - 7 < 8$

$$\begin{array}{r} +7 \quad +7 \\ \hline 3x < 15 \\ 3 \quad 3 \\ \hline x < 5 \end{array}$$

Ex: $-7x + 2 < -5$

$$\begin{array}{r} -2 \quad -2 \\ \hline -7x < -7 \\ -7 \quad -7 \\ \hline x > 1 \end{array}$$

Solve:

Ex: $2x - 5 \leq 23$

$$\begin{array}{r} +5 \quad +5 \\ \hline 2x \leq 28 \\ 2 \quad 2 \\ \hline x \leq 14 \end{array}$$

Ex: $6y + 5 \geq 11$

$$\begin{array}{r} -5 \quad -5 \\ \hline 6y \geq 6 \\ 6 \quad 6 \\ \hline y \geq 1 \end{array}$$

Ex: $-6(x + 5) \leq 6$

$$\begin{array}{r} -6x - 30 \leq 6 \\ +30 \quad +30 \\ \hline -6x \leq 36 \\ -6 \quad -6 \\ \hline x \geq -6 \end{array}$$

Ex: $-4(p - 3) > 20$

$$\begin{array}{r} -4p + 12 > 20 \\ -12 \quad -12 \\ \hline -4p > 8 \\ -4 \quad -4 \\ \hline p < -2 \end{array}$$

Ex: $6x - 7 > 2x + 17$

$$\begin{array}{r} -2x \quad -2x \\ \hline 4x - 7 > 17 \\ +7 \quad +7 \\ \hline 4x > 24 \\ 4 \quad 4 \\ \hline x > 6 \end{array}$$

Ex: $5x - 12 \leq 3x - 4$

$$\begin{array}{r} -3x \quad -3x \\ \hline 2x - 12 \leq -4 \\ +12 \quad +12 \\ \hline 2x \leq 8 \\ 2 \quad 2 \\ \hline x \leq 4 \end{array}$$

RECALL from Ch. 3

Solve each equation:

Ex: $4(2x + 3) = 2(4x + 5)$

$$\begin{array}{r} 8x + 3 = 8x + 10 \\ -8x \quad -8x \\ \hline 3 = 10 \end{array}$$

No Solution

Ex: $3(4x + 6) = 2(6x + 9)$

$$\begin{array}{r} 12x + 18 = 12x + 18 \\ -12x \quad -12x \\ \hline 18 = 18 \end{array}$$

Any Number

The same principle applies with inequalities:

This means that: **if you get a**

• true statement, then “any number” is the solution. This would mean you could open ANY doors you want. Examples of true statements involving inequalities might be $5 > 3$, $3 \geq 3$, or $7 \leq 10$

• false statement, then there is “no solution”. This would mean you cannot open any doors at all.

Examples of false statements involving inequalities might be $5 < 3$, $6 > 6$, or $4 \geq 14$

Solve:

Ex: $14x + 5 < 7(2x - 3)$

$$\begin{array}{r} 14x + 5 < 14x - 21 \\ -14x \quad -14x \\ \hline 5 < -21 \end{array}$$

No Solution

Ex: $12x - 1 > 6(2x - 1)$

$$\begin{array}{r} 12x - 1 > 12x - 6 \\ -12x \quad -12x \\ \hline -1 > -6 \end{array}$$

Any Number

Ex: $5(m + 5) < 5m + 17$

$$\begin{array}{r} 5m + 25 < 5m + 17 \\ -5m \quad -5m \\ \hline 25 < 17 \end{array}$$

No Solution

Ex: $1 - 8s \leq -4(2s - 1)$

$$\begin{array}{r} 1 - 8s \leq -8s + 4 \\ +8s \quad +8s \\ \hline 1 \leq 4 \end{array}$$

All Real Numbers

Ex: A gas station charges \$0.10 less per gallon if a customer purchases a car wash. What are the possible amounts of gallons of gasoline you can buy if you want to spend at most \$20?

Let x be the number of gallons.

$$1.99x + 8 \leq 20$$

$$x \leq 6.03$$

About 6 gallons or less



Ex: You are saving money for a summer camp that costs \$1800. You have \$500 saved so far and 14 more weeks to save. What are the possible average amounts you need to save per week to have the total needed for camp?

$$500 + 14x \geq 1800$$

$$x \geq 92.86$$

At least \$92.86 each week.