

3-2

Solving Inequalities Using Addition or Subtraction

OBJECTIVE: I can write algebraic expressions



With the person sitting next to you, discuss the problem provided and document your response

In a U.S. presidential election, a candidate must win at least 270 out of 538 total electoral votes to be declared the winner. Suppose a candidate has earned 238 electoral votes in states outside the southeastern U.S.

What is the least number of states in the southeastern U.S. that the candidate could win and still become president?
What are these states? Justify your reasoning.

FL 27 you have to have Florida's 27 votes, plus any other state with the exception of Washington D.C and Delaware



Essential Understanding

Essential Understanding Just as you used properties of equality to solve equations in Topic 2, you can use properties of inequality to solve inequalities. The Addition Property of Inequality is shown below. Applying this property to an inequality produces an equivalent inequality. Equivalent inequalities are inequalities that have the same solutions.



Key Concept:

Words

Let a , b , and c be real numbers.

If $a > b$, then $a + c > b + c$.

If $a < b$, then $a + c < b + c$.

This property is also true for \geq and \leq .

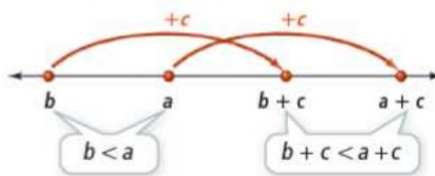
Examples

$5 > 4$, so $5 + 3 > 4 + 3$.

$-2 < 0$, so $-2 + 1 < 0 + 1$.

Diagram

The diagram below illustrates one way to think about this rule.



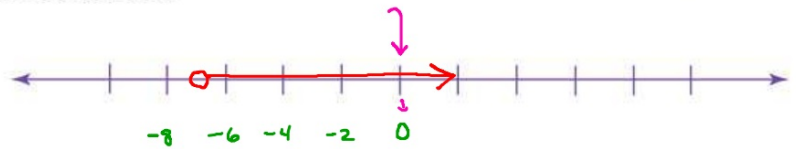
Example

#1 Using the Addition Property of Inequality



What are the solutions of $x - 5 > -12$? Graph the solutions.

$$\begin{array}{r} x - 5 > -12 \\ + 5 \quad + 5 \\ \hline x > -7 \end{array}$$



Check your graph

$$\begin{array}{l} x > -7 \\ (0) > -7 \\ 0 > -7 \end{array}$$

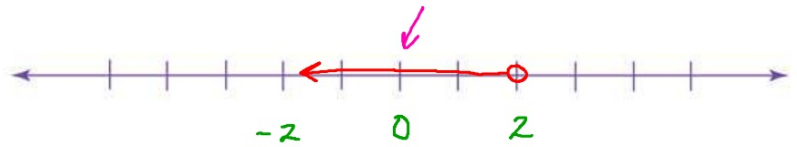
Select a value on the graph

Your Turn to Work it Out



1. What are the solutions of $n - 5 < -3$? Graph the solutions.

$$\begin{array}{r} n - 5 < -3 \\ +5 \quad +5 \\ \hline n < 2 \end{array}$$



check your graph

$$n - 5 < -3$$

$$(0) - 5 < -3$$

$$-5 < -3$$

Example

#2 Solving an Inequality and Checking Solutions

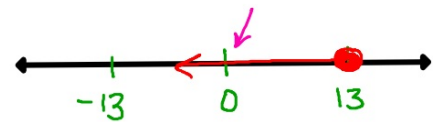


What are the solutions of $10 \geq x - 3$? Graph and check the solutions.

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

$$13 \geq x \quad \text{Rotate the entire inequality}$$

$$x \leq 13 \quad \leftarrow \text{Graphing is easier}$$



Check the solution

$$10 \geq x - 3$$

$$10 \geq (0) - 3$$

$$10 \geq -3 \quad \text{Solution checks}$$

Your Turn to Work it Out



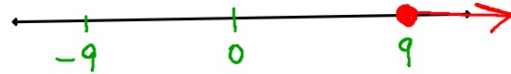
2. What are the solutions of $m - 11 \geq -2$? Graph and check the solutions.

$$\begin{array}{r} m - 11 \geq -2 \\ \hline +11 \quad +11 \end{array}$$

$$m \geq 9$$

↑

The variable is to be
on the left side for
proper graphing



Check my solution

$$m - 11 \geq -2$$

$$(10) - 11 \geq -2$$

$$-1 \geq -2$$

Concept Understanding



Key Concept:

Words

Let a , b , and c be real numbers.

If $a > b$, then $a - c > b - c$.

If $a < b$, then $a - c < b - c$.

This property is also true for \geq and \leq .

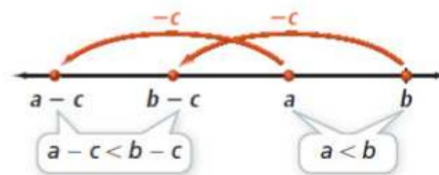
Examples

$-3 < 5$, so $-3 - 2 < 5 - 2$.

$3 > -4$, so $3 - 1 > -4 - 1$.

Diagram

The diagram below illustrates one way to think about this rule.



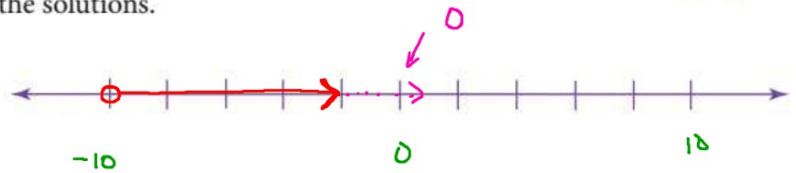
Example

#3 Using the Subtraction Property of Inequality



What are the solutions of $t + 6 > -4$? Graph the solutions.

$$\begin{array}{r} t + 6 > -4 \\ -6 \quad -6 \\ \hline t > -10 \end{array}$$



check my solution

$$t + 6 > -4$$

$$(0) + 6 > -4$$

$$6 > -4$$

Your Turn to Work it Out

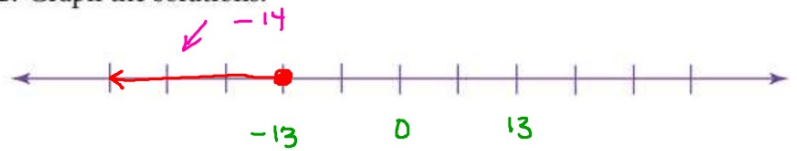


3. What are the solutions of $-1 \geq y + 12$? Graph the solutions.

$$\begin{array}{r} -1 \geq y + 12 \\ \underline{-12 \quad -12} \end{array}$$

$$-13 \geq y \quad \text{Restate the inequality}$$

$$y \leq -13$$



Check your solution

$$-1 \geq y + 12$$

$$-1 \geq (-14) + 12$$

$$-1 \geq -2$$

Example

#4 Writing and Solving an Inequality



Computers The hard drive on your computer has a capacity of 120 gigabytes (GB). You have used 85 GB. You want to save some home videos to your hard drive. What are the possible sizes of the home video collection you can save?



Current available space	plus	size of videos	is at most	hard drive Capacity
85	+	v	\leq	120

$$\begin{array}{r} 85 + v \leq 120 \\ -85 \quad \quad -85 \\ \hline v \leq 35 \end{array}$$

The home video collection can be any size less than or equal to 35 GB

Your Turn to Work it Out



4. A club has a goal to sell at least 25 plants for a fundraiser. Club members sell 8 plants on Wednesday and 9 plants on Thursday. What are the possible numbers of plants the club can sell on Friday to meet their goal?

$$8 + 9 + p \geq 25$$

$$\begin{array}{r} 17 + p \geq 25 \\ -17 \quad \quad -17 \\ \hline p \geq 8 \end{array}$$

They can sell at least 8 plants by Friday's goal.