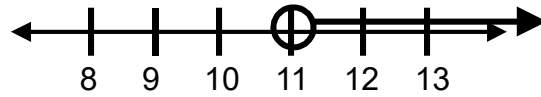## Math-2A Lesson 1-4 (Linear Inequalities)

x > 11   "all the numbers that are greater than 11"
                (shade all #'s that are solutions)
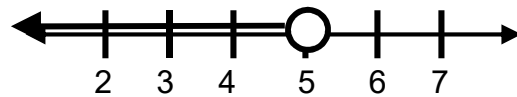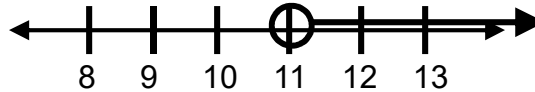 Number line equivalent:

What does the following inequality mean?

x ≤ 5   "all the number that are less than or equal to 5"

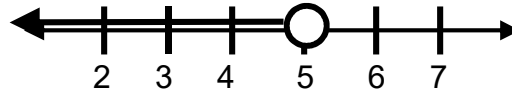What is the number line equivalent of x ≤ 5   ?

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x > 11

 11 > 11   is a *false statement*

 x = 11   is NOT a solution. We DO NOT shade 11.

x ≤ 5

  x = 5   IS a solution. We shade 5.

Start with the following:

5 > 3   True or false?

+2 +2   Add 2 left and right (of the ">" symbol) and rewrite

7 > 5   True or false?

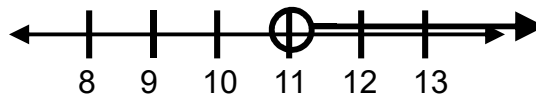This will always work for addition.

<u>Addition Property of Inequality</u>: adding the same number left and right of the "<, >, ≤, or ≥" symbol will result in an equivalent inequality.

$x - 4 > 7$ Number line:

  +4 +4

  $x > 11$

8 9 10 11 12 13

Start with the following:

2 < 6   True or false?

-1   -1   Subtract "1" left and right (of the "<" symbol) and rewrite

1 < 5   True or false?

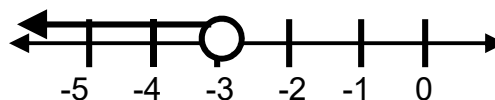This will always work for subtraction.

<u>Subtraction Property of Inequality</u>: subtracting the same number left and right of the "<, >, ≤, or ≥" symbol will result in an equivalent inequality.

$x + 5 \leq 2$ Number line:

  -5 -5

  $x \leq -3$

-5 -4 -3 -2 -1 0

Start with the following:

$3 < 5$ True or false?

*2   *2   Multiply by "2" left and right (of the "<" symbol), rewrite

$6 < 10$ True or false?

This <u>works</u> for <u>multiplication</u> of <u>positive numbers</u>, BUT…..

Start with the following:

$6 < 8$ True or false?

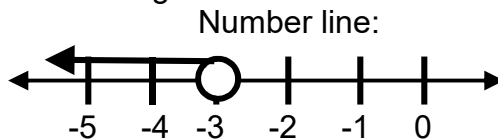-1   -1   Multiply by "-1" left and right (of the "<" symbol), rewrite

$-6 < -8$ True or false? $-6 > -8$

This <u>will work </u>for <u>multiplication of negative numbers</u> if we <u>reverse the direction</u> of the inequality.

<u>Multiplication Property of Inequality</u>: multiplying the same <u>positive</u> number left and right of the "<, >, ≤, or ≥" symbol will result in an equivalent inequality. We reverse the direction of <, >, ≥, and ≤ if the factor is negative.

$$-2x \geq 6$$
$$* (\div -2) \quad *(-\tfrac{1}{2})$$
$$x \leq -3$$

Number line:

Your turn: Solve the inequalities (one step-rewrite)

$2x + 2 \leq 6$ $2(x - 3) \geq 8$

$-14 < -5x + 6$

Draw the equivalent number line for each solution.

Solving inequalities (variable on both sides of a single inequality symbol)

$3x + 1 \leq 2x + 6$ (Subtraction Property Of Inequality

$\underline{-2x \qquad -2x}$

$x + 1 \leq \qquad 6$

$\underline{\quad -1 \qquad \quad -1}$ (Subtraction Property Of Inequality

$x \leq 5$

Solving inequalities requiring the Distributive Property

Review:

(Distributive Property of Multiplication "over" Addition

$2(x + 4) \rightarrow$ $2x + 2(4)$ $\rightarrow$ $2x + 8$

$2(x - 4) < 4x + 6$ $- 14 < 2x$

$2x - 8 < 4x + 6$ $(\div 2)$ $(\div 2)$

-2x   -2x $- 7 < x$

$- 8 < 2x + 6$

-6   -6 $x > -7$

$- 14 < 2x$

Your turn: Solve the inequality

$2x - 6 \leq 3 - x$ $18 + 2x \geq 9x + 4$

$5(x - 2) < 5x + 6$

Draw the equivalent number line for each solution.