

Your Name

Mrs. Theo

9/28/21

Notes

# Solving Linear Inequalities

Objective: To be able to solve inequalities using addition or subtraction of constants. To be able to graph inequality solutions found. To understand what the solutions are.

Virtue/Skill: When we graph inequalities we might need to solve for a variable in order to graph it. With two variables on a coordinate plane, we need to be able to check our solutions to understand how to shade.

Graphing on a number line is similar to graphing on a coordinate plane.

Graphing Solutions

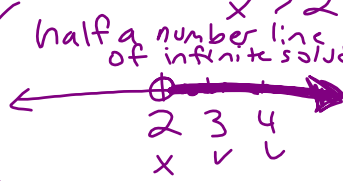
one variable

Equality  $3x = 6$   
 Answer:  $x = 2$   
 one answer



one variable Inequality

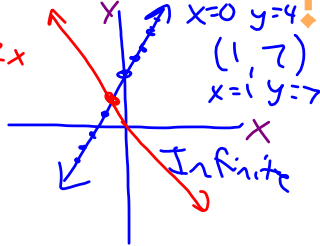
$3x > 6$   
 $x > 2$   
 half a number line of infinite solutions



two variable

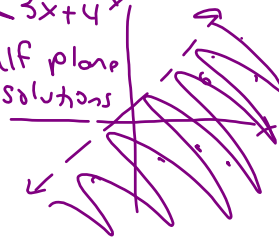
Equality

$y = 3x + 4$   
 Answer:  $(0, 4)$   
 $(1, 7)$   
 Every point on the line is a solution



two variable Inequality

$y < 3x + 4$   
 half plane of solutions



Graphing Inequality Signs

We only shade solutions

Remember:

bigger

$<$  Strictly less than

open circle on number line at value compared to

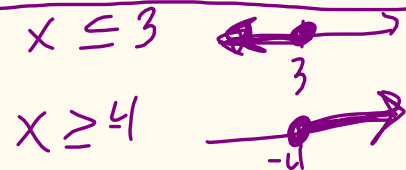
$>$  Strictly greater than



$\leq$  Less than or Equal to

closed circle on the number line

$\geq$  Greater than or Equal to



# Solving Addition/ Subtraction Inequalities

To solve: pretend like it is an = sign

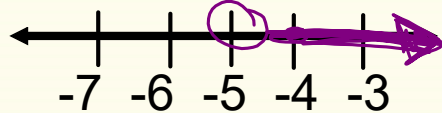
1. Pretend like it is an = sign
  - undo addition with subtraction
  - undo subtraction with addition
2. graph your solution set on the number line

Remember: closed (filled in) circle if =

open (not fill in) circle if not =

ex 1.  $k + 3 > -2$

$$\begin{array}{r} \textcircled{-3} \quad \textcircled{-3} \\ \hline k > -5 \end{array}$$



only shade solutions (#s that work)

X X # compared to goes in middle

# Solving Multiplication/ Division Inequalities

To solve: pretend like it is an = sign

- undo multiplication with division
- undo division with multiplication

★ One Catch...

if you have to multiply or divide by a negative number on both sides to isolate the variable....you must flip the inequality sign.

FLIP

$$5 \cdot \left(-\frac{x}{5}\right) > (-2) \cdot -5$$

multiplied by negative number

$$x < 10$$

Flipped sign

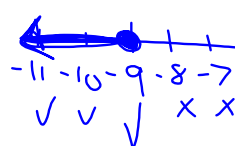
DON'T FLIP

$$\frac{9x}{a} \leq \frac{-81}{a}$$

divided by a positive number

$$x \leq -9$$

~~what if  $x > 10$  doesn't work~~



When the variable is on the right side

\*\*\* Your inequality sign will not match the arrow  
1st rewrite with variable on left  
Solve and graph

$$-6 > n - 5$$

rewrite variable on same side of sign

$$n - 5 < -6$$

$$+5 \quad +5$$

$$n < -1$$

not equal open circle

$$0.5 < 2 - a$$

$$-2 \quad -2$$

$$-1.5 < -a$$

by a negative Flip

$$1.5 > a$$

rewrite at the end

$$a < 1.5$$



If the variable is on the right

Rewrite it (before you start or at the end) keeping the expression on the lesser end still on the lesser end.

rewrite before you start

$$40 \geq -4x$$

$$-4 \cdot x \leq 40$$

$$\frac{-4}{-4} \quad \frac{-4}{-4}$$

$$x \geq -10$$

Flip sign b/c we multiplied by a negative

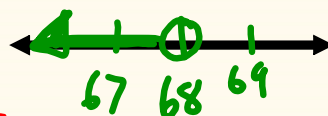
$$-2 \cdot (-34) < \left(\frac{p}{-2}\right) \cdot -2$$

Flip

$$68 > p$$

rewrite

$$p < 68$$



# Decimal Inequalities

$$x - 2.7 \geq -5.2$$

$$\begin{array}{r} x - 2.7 \geq -5.2 \\ +2.7 \quad +2.7 \\ \hline x \geq -2.5 \end{array}$$

$\begin{array}{r} 4 \overline{) 5.2} \\ -2.7 \\ \hline 2.5 \end{array}$

$\uparrow$   
*x is equal to -2.5*

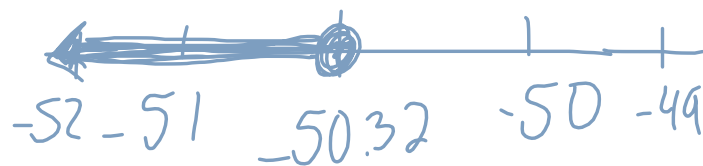
Take a  
 Step to  
 rewrite or simplify  
 before solving!

$$w - (-.32) \leq -50$$

$$w + 0.32 \leq -50$$

$$\begin{array}{r} w + 0.32 \leq -50 \\ -0.32 \quad -0.32 \\ \hline w \leq -50.32 \end{array}$$

$$\begin{array}{r} 50.00 \\ + 00.32 \\ \hline 50.32 \end{array}$$



Solving  
Inequalities  
with  
Fractions

To "divide" by the fraction, multiply by the reciprocal (multiply by the flipped fraction)

$$-\frac{3}{2} \left( \frac{-2x}{3} \right) > \left( \frac{9}{1} \right) \cdot \frac{2}{2} \quad \frac{2}{1} \left( \frac{-36}{1} \right) < \left( \frac{1p}{2} \right) \cdot \frac{2}{1}$$

Flip

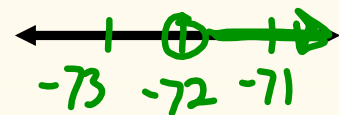
$$x < -\frac{27}{2}$$

$$x < -13.5$$

$$-72 < p$$

rewrite

$$p > -72$$



Write  
Multiplication  
and Division  
Inequalities

A number <sup>x</sup> divided by fifteen <sup>15</sup> is greater than or equal to sixty <sup>60</sup>.

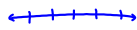
$$\frac{x}{15} \geq 60$$

A number <sup>x</sup> multiplied by negative two thirds <sup>-2/3</sup> is less than zero.

$$x < 0$$

Solve and graph the solutions

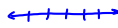
1.  $w + 7 \leq 12$



2.  $3x - 9 > 15$



3.  $-8 - 2y < 20$

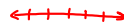


4.  $11 - a \geq 1$



Notice: the variable is not on the left

5.)  $x + 7 < -2x - 12$



6.  $15 \geq x + 35 + 3x$

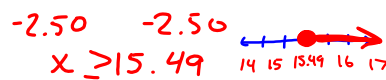


7.  $21 \leq x - (-5)$



Notice: Numbers here are decimals.  
Write out the work but use  
a calculator to help you  
add and subtract the amounts.

8.  $2.50 + x \geq 17.99$



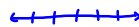
9.  $x + 2 \geq 5$



10.  $x + 2x \geq 5$



11.  $-3x - 2x < 5$



12.  $-(2+2m) - 2 > 6$



13.  $-9 \geq -8(1+6v) - 1$



14.  $8(1-4x) > 40$

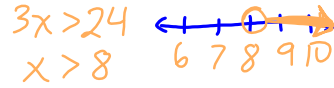


# Homework key

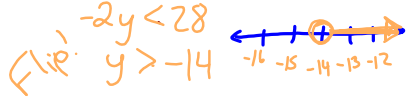
1.  $w + 7 \leq 12$



2.  $3x - 9 > 15$



3.  $-8 - 2y < 20$



4.  $|a| \geq 10$



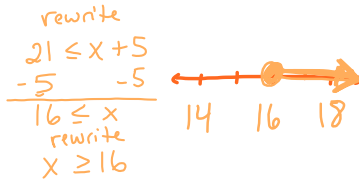
5.  $x + 7 < -2x - 12$



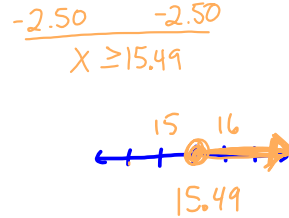
6.  $15 \geq x + 35 + 3x$



7.  $21 \leq x - (-5)$

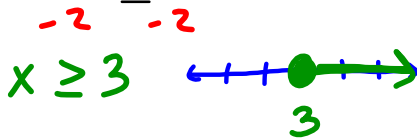


8.  $2.50 + x \geq 17.99$

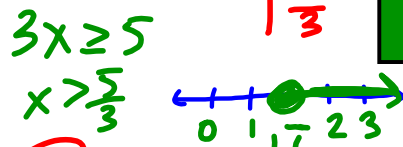


# Homework key

9.  $x + 2 \geq 5$



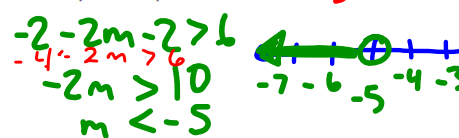
10.  $x + 2x \geq 5$



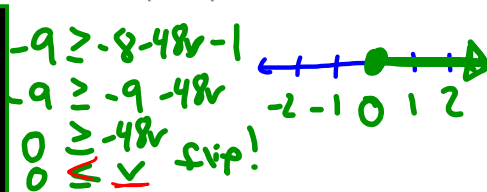
11.  $-3x - 2x < 5$



12.  $-(2 + 2m) - 2 > 6$



13.  $-9 \geq -8(1 + 6v) - 1$



14.  $8(1 - 4x) > 40$

