Graphing and Solving Inequalities – NOTES

What is an inequality?

An inequality is... a comparative expression.

Symbol	Meaning
$<$	Less than
$>$	Greater than
$\leq$	less than or equal to
$\geq$	Greater than or equal to
$\neq$	not equal to

*Hint: Read the symbols from left to right

Graphing Inequalities

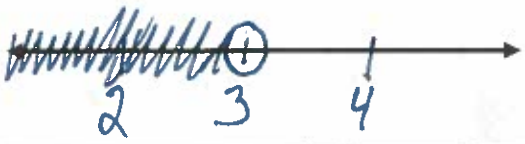
The graph of an inequality with one variable is the total of points that represent the solution set of the inequality.

Inequalities with one variable are graphed on a number line

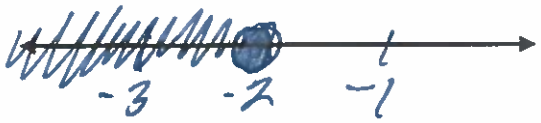
To graph the solution to an inequality with one variable:

- Use an open circle *o* for $<$ or $>$
- Use a closed circle • for $\leq$ or $\geq$
- Remember to number your number line (label UNDER the line)

Examples

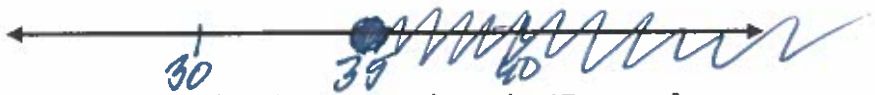
Graph of $x < 3$	Graph of $x \geq -1$
	

Your Turn: Graph the following inequalities.

$x > 4$	$x \leq -2$
	

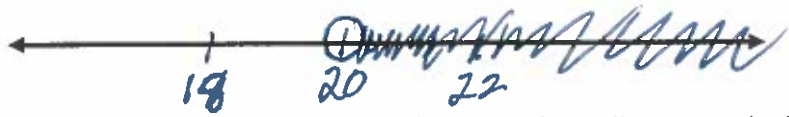
Write an inequality for and Graph each real-world situation on the number line.

1. To serve as president of the US you must be at least 35 years old.

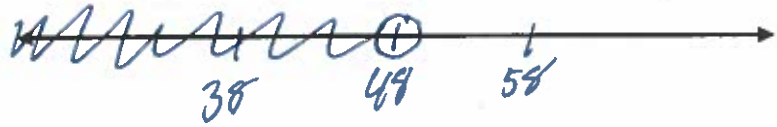


2. To compete in the junior Olympics you must be under 17 years of age.

3. For Thanksgiving dinner we will need a turkey weighing more than 20 pounds.



4. At the amusement park, only children less than 48 inches tall may use the kiddie rides.



Solving Inequalities with one variable.

Solving inequalities is much like solving equations.

The goal is still the same:

- Isolate the variable using inverse operations

There is ONE BIG DIFFERENCE:

If you multiply or divide by a negative, you have to reverse the symbol

To check solutions of inequalities:

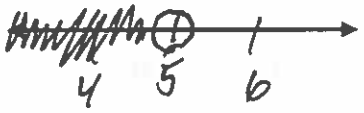
- Use an integer that makes the final statement True
- Substitute that integer into the original inequality
- Check to see if it's true.

Examples: Solve each inequality. Check your answer. Then graph your solution.

a. $x - 3 < 2$

$+3 \quad +3$

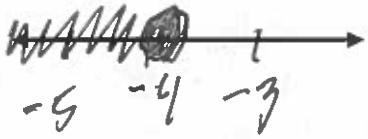
$x < 5$



b. $-3x \geq 12$

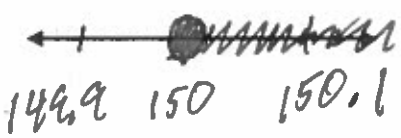
$\frac{-3x}{-3} \geq \frac{12}{-3}$

$x \leq -4$



c. $\frac{x}{5} \leq -30$ · 5

$x \leq 150$



Multi-step Inequalities

We use the same steps to solve multi-step inequalities as we did to solve multi-step equations (just remember: with inequalities, when you MULTIPLY or DIVIDE by a NEGATIVE, FLIP the inequality symbol!!).

Examples:

a) $3x - 7 < 8$

b) $-3(w + 12) \leq 0$

c) $4 - 2m > 7 - 3m$

You try!:

d) $6x + 3 \leq 3(x + 2)$

e) $2x - 14 > 4x + 4$

f) $8 - 2(3x - 4) > 10x - 20$

Special Cases of Inequalities

- Just like equations, inequalities have special cases
- Sometimes, an inequality may Never be true no matter what number you substitute for the variable.
  - If the final inequality is False → NO SOLUTION
- Other times, an inequality may be true for Every value of the variable
  - If the final inequality is True → INFINITE SOLUTIONS

NO SOLUTIONS

$6(4 + y) - 3 \leq 4(y - 3) + 2y$

$24 + 6y - 3 \leq 4y - 12 + 2y$

$21 + 6y \leq 6y - 12$

False

This inequality has No Solution $\emptyset$.
There is no number that will make this inequality true.

IDENTITY (INFINITE SOLUTIONS)

$3(a + 1) - 5 \leq 3a + 3$

$3a + 3 - 5 \leq 3a + 3$

$-2 < 3$

This inequality has Infinite.
Any number you choose will make this type of inequality true.

Examples:

a) $3p - 5 > 2p + p - 7$

b) $5(m + 5) < 5m + 17$

c) $1 - 8x \leq -4x(2x - 1)$

You try!:

1. $14x + 5 < 7(2x - 3)$

2. $12x - 1 > 6(2x - 1)$