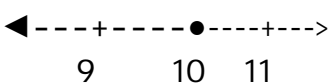


- 7-1 Solving Inequalities by Using Addition and Subtraction and
- 7-2 Solving Inequalities by Using Multiplication and Division and
- 7-3 Solving Multi-step Inequalities

To graph an inequality on a number line:

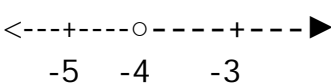
- 1) Put the appropriate circle **ON** the tick mark designated to that number.  
For  $>$  or  $<$ , use an open circle  
For  $\geq$  or  $\leq$ , use a closed circle
- 2) As long as the variable is on the left, shade in the direction the inequality is pointing.
- 3) Make the arrow **BIG** to indicate that it keeps going.

1) The graph of  $x \leq 10$  looks like: 

Notice the circle is closed because it was  $\leq$  (less than OR EQUAL TO). The "OR EQUAL TO" tells you that number is INCLUDED, so we color in the circle.

The variable was on the left and the inequality points to the left, so we shaded left.

The left arrow was made **BIG** so we know that all numbers to the left are included.

2) The graph of  $-4 < x$  looks like: 

You will need to rewrite this inequality as  $x > -4$  before graphing!!!

Notice the circle is open because it was  $>$ . Since there is no "OR EQUAL TO" the number is NOT included, so we color in the circle.

Since the variable was NOT on the left we had to rewrite it. Once we did, we could see that the inequality points to the right, so we shaded right.

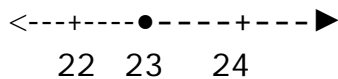
The right arrow was made **BIG** so we know that all numbers to the right are included.

To solve an inequality, use inverse operations to isolate the variable. There is one difference between solving equations and solving inequalities and that is:

When solving inequalities, if you multiply or divide **BY** a negative number, change the inequality symbol to its opposite.

Solve, graph, and check.

$$\begin{array}{r}
 3) \quad 9x - 12 \geq 11 + 8x \\
 - 8x \qquad \qquad - 8x \\
 \hline
 x - 12 \geq 11 \\
 + 12 \quad + 12 \\
 \hline
 \boxed{x \geq 23}
 \end{array}$$



Unlike the equations we solved in Chapter 3 where there was only ONE solution, inequalities have an infinite number of solutions. Therefore, there are two kinds of checks for inequalities: “yes checks” and “no checks”

**YES CHECKS** are when you take a number that you know is a solution, plug it into the original inequality and a true statement is the result.

**NO CHECKS** are when you take a number that you know is NOT a solution, plug it into the original inequality and a false statement is the result.

When we check we are going to use the numbers on our number line. As you can see from our last graph, our two choices are to check  $x = 22$  and  $x = 24$ . 22 is NOT a solution because it is not in the shaded portion. Therefore,  $x = 22$  will be our NO check. 24 is in the shaded portion of the graph because it IS a solution. Therefore,  $x = 24$  will be used for our YES check.

YES  $\checkmark$ :  $x = 24$

$$\begin{array}{l}
 9(24) - 12 \geq 11 + 8(24) \\
 216 - 12 \geq 11 + 192 \\
 204 \geq 203 \\
 \text{YES}
 \end{array}$$

No  $\checkmark$ :  $x = 22$

$$\begin{array}{l}
 9(22) - 12 \geq 11 + 8(22) \\
 198 - 12 \geq 11 + 176 \\
 186 \geq 187 \\
 \text{NO}
 \end{array}$$

Remember, simplify each side using the order of operations. You may do one simplification per side per step.

Please make sure you tell me which check it is (Yes or No), state the number you are checking, and tell me if the final statement is YES for true, or NO for false.

$$\begin{aligned}
 4) \quad & 4x - 7 > 6x + 11 \\
 & -6x \quad -6x \\
 & -2x - 7 > 11 \\
 & \quad +7 > +7 \\
 & \underline{-2x} > \underline{18} \\
 & \quad -2 \quad -2
 \end{aligned}$$

$$x < -9$$

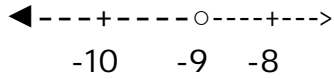
YES  $\checkmark$ :  $x = -10$

$$\begin{aligned}
 4(-10) - 7 &> 6(-10) + 11 \\
 -40 - 7 &> -60 + 11 \\
 -47 &> -49 \\
 &\text{Yes}
 \end{aligned}$$

No  $\checkmark$ :  $x = -8$

$$\begin{aligned}
 4(-8) - 7 &> 6(-8) + 11 \\
 -32 - 7 &> -48 + 11 \\
 -39 &> -37 \\
 &\text{No}
 \end{aligned}$$

Because we divided by -2, change the inequality to <!



(Be careful when doing number lines with negative numbers!!)

Be sure to have the box from page 386 in your notes!