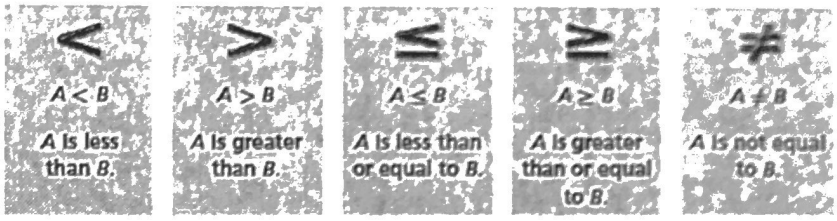
## Day 7 – Solving Inequalities

An **inequality** is a statement that that compares two quantities. The quantities being compared use one of the following signs:


Greater Than Symbol: **BIG > small**




When reading an inequality, you always to want to read from the variable. Translate the following inequalities into words:

A. $x > 2$ x is greater 2

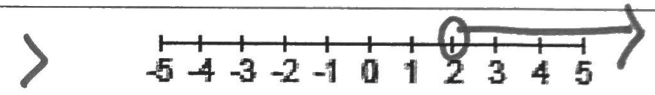
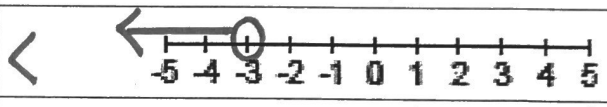
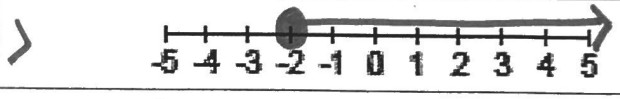
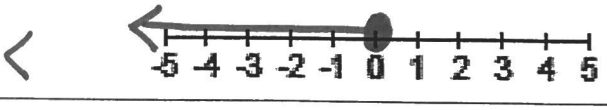
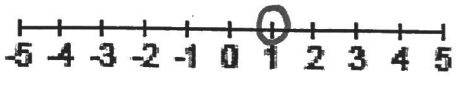
B. $-3 > p$ p is less than -3

C. $y \leq 0$ y is less than or equal to 0

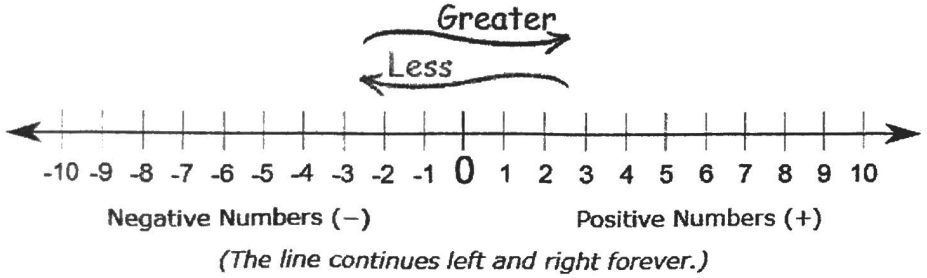
D. $-2 \leq z$ z is greater than or equal to -2

E. $x \neq 1$ x is not equal to 1

When graphing an inequality on a number line, you must pay attention to the sign of the inequality.

| Words | Example | Circle | Number Line |
|---|---|---|---|
| Greater Than | $x > 2$ | Open |  |
| Less Than | $p < -3$ | Open |  |
| Greater Than or Equal To | $z \geq -2$ | Closed |  |
| Less Than or Equal To | $y \leq 0$ | Closed |  |
| Not Equal To | $x \neq 1$ | Open |  |

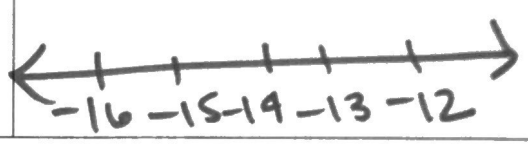
**Reminder: Negative numbers get smaller and smaller the farther away from zero.**




*(The line continues left and right forever.)*

## Solutions to Inequalities

A **solution** to an inequality is any number that makes the inequality true

| Value of x | Solve by substituting for 'x': $2x - 4 \geq -12$ | Translate into words: | Is the inequality true? |
|---|---|---|---|
| -2 ✓ | $2(-2) - 4 \geq -12$<br>$-4 - 4 \geq -12$<br>$-8 \geq -12$ | -8 is greater than or equal -12<br>  | yes |
| -4 ✓ | $2(-4) - 4 \geq -12$<br>$-8 - 4 \geq -12$<br>$-12 \geq -12$ | | yes |
| -6 X | $2(-6) - 4 \geq -12$<br>$-12 - 4 \geq -12$<br>$-16 \geq -12$ |  | NO |

## Solving and Graphing Linear Inequalities

Solving linear inequalities is very similar to solving equations, but there is one minor difference. See if you can figure it out below:

**Experiment**

Take the inequality $6 > 2$. Is this true? yes

1. Add 3 to both sides. What is your new inequality?

$$\begin{array}{rcl} 6 & > & 2 \\ +3 & & +3 \\ \hline 9 & > & 5 \end{array}$$ ✓TRUE

2. Subtract 3 from both sides. What is your new inequality?

$$\begin{array}{rcl} 6 & > & 2 \\ -3 & & -3 \\ \hline 3 & > & -1 \end{array}$$ TRUE

3. Multiply both sides by 3. What is your new inequality?

$3 \cdot 6 > 2 \cdot 3$

$18 > 6$ TRUE

4. Divide both sides by 3. What is your new inequality?

$\frac{6}{3} > \frac{2}{3}$

$2 > 0.67$ TRUE

3. Multiply both sides by -3. What is your new inequality?

$-3 \cdot 6 > 2 \cdot -3$

$-18 > -6$ False

*flip sign $-18 < -6$ True

4. Divide both sides by -3. What is your new inequality?

$\frac{6}{-3} > \frac{2}{-3}$

$-2 > -0.67$ False

$-2 < -0.67$ True

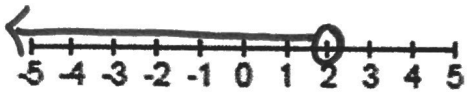
**Conclusion:** You must flip the sign of the inequality if you (x) or (÷) by a negative number.

**Practice:** Solve each Inequality and graph.

1. $x - 4 < -2$

$+4 \quad +4$

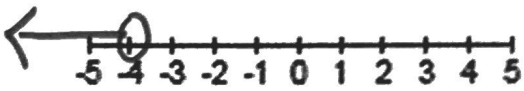
$x < 2$




2. $\frac{-3x}{-3} > \frac{12}{-3}$

$x < -4$

* Flip sign when dividing by (-)

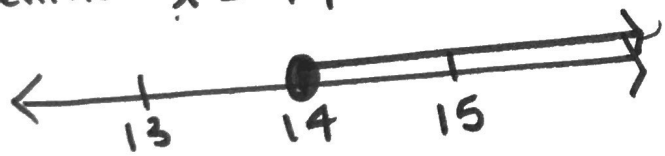



3. $\frac{2}{1} \cdot \frac{7}{1} \leq \frac{x}{2} \cdot \frac{2}{x}$

$\frac{14}{1} \leq x$

* $14 \leq x$

Rewrite: $x \geq 14$

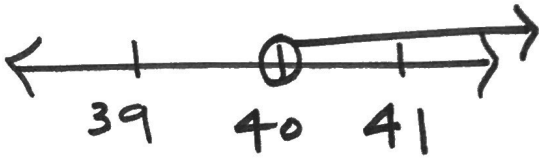



4. $\frac{x}{4} - 1 > 9$

$+1 \quad +1$

$4 \cdot \frac{x}{4} > 10 \cdot 4$

$x > 40$




5. $-2(x+1) \geq 6$

6. $6x - 5 \leq 7 + 2x$

$-2x \quad -2x$

$4x - 5 \leq 7$

$+5 \quad +5$

$\frac{4x}{4} \leq \frac{12}{4}$

$x \leq 3$