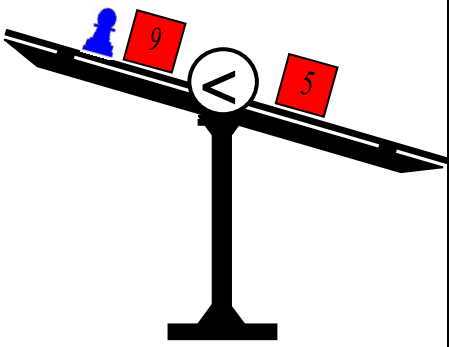
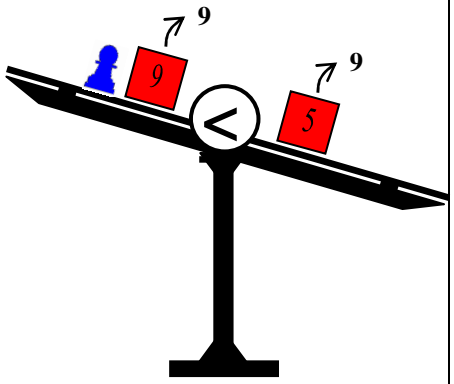
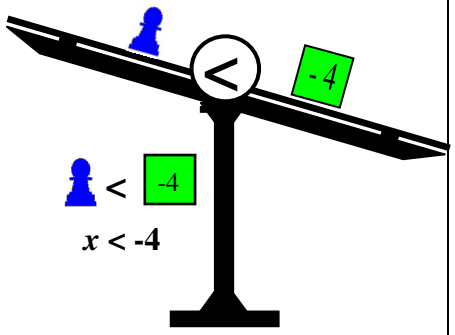
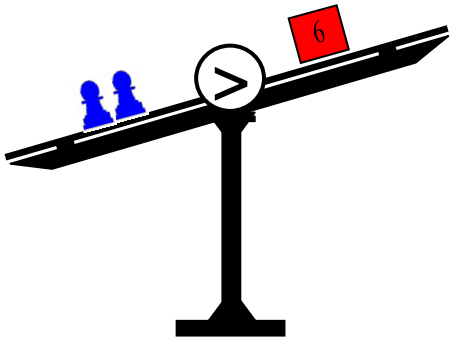
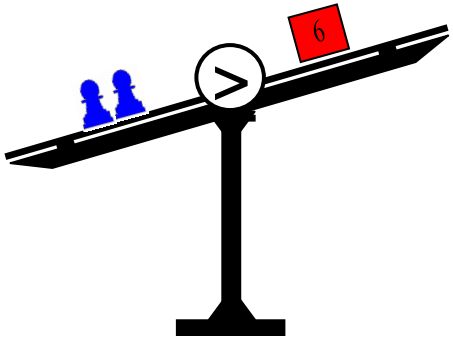
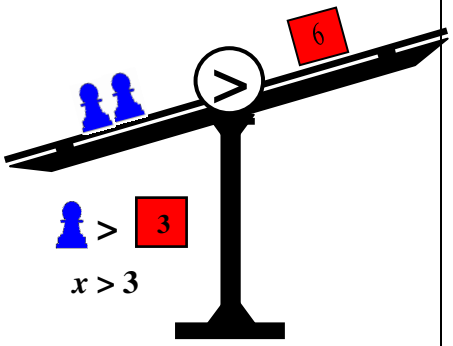
Solving INEQULITIES Models

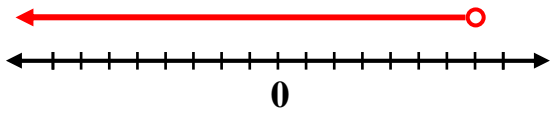
Solve the inequality $x + 9 < 5$:

Step 1: Set up the inequality.	***Step 2:*** Remove (subtract) a value of 9 from each side of the scale.	***Step 3:*** Each pawn has a value less than -4.	***Step 4:*** Check your solution by substituting a value for the pawn that is less than -4.
			Since -7 is less than -4, let's substitute it for our blue pawn. 9 < 5 -7 + 9 < 5 2 < 5 $x < -4$ is the correction solution.

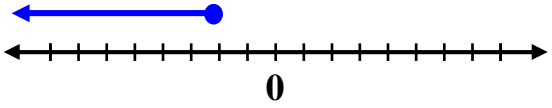
Step 1: Set up the inequality.	***Step 2:*** Divide 6 evenly among each blue pawn.	***Step 3:*** Each pawn has a value greater than 3.	***Step 4:*** Check your solution by substituting a value for each pawn that is greater than 3.
			Since 5 is greater than 3, let's substitute it for our blue pawns. 6 5 + 5 > 6 10 > 6 $x > 3$ is the correction solution.

Graphing Inequalities on a Number Line:

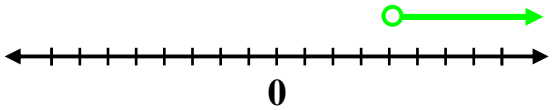
The following are examples of graphing the inequalities <, ≤, >, and ≥ on a number line.



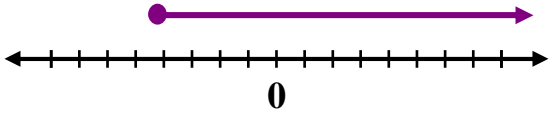
$x < 7$



$x \leq -2$



$x > 4$



$x \geq -4$

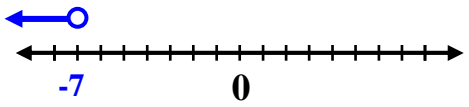
Solve and graph the following inequalities.

1. $2b + 4 < -10$

$-4 \quad -4$

$\frac{2b}{2} < \frac{-14}{2}$

$b < -7$

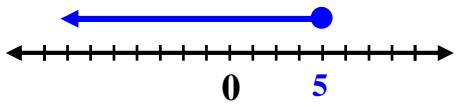


2. $12 \leq 3b - 3$

$+3 \quad +3$

$\frac{15}{3} \leq \frac{3b}{3}$

$5 \leq b$

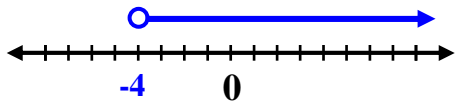


3. $-b - 6 < -2$

$+6 \quad +6$

$\frac{-b}{-1} > \frac{4}{-1}$ *divide by –, change the sign*

$b > -4$



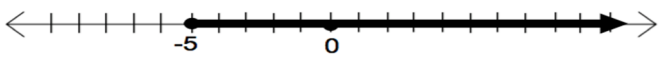
In solving Inequalities, explain why dividing by a negative reverses the direction of the inequality sign.

Students often struggle with the concept that division by a negative reverses the direction of the inequality sign. Let's look of some examples to show why this works.

Example 1:

We know that 2 is most certainly less than 3, hence the statement **2<3** is most a true statement. But if you multiply the inequality by -1, you get -2<-3. This inequality is saying that -2 smaller than -3, but this is a FALSE statement.

Any positive number gets larger as the absolute value of that positive number gets larger, but any negative number gets SMALLER as the absolute value of that number gets LARGER. This makes working with inequalities and multiplying by negatives tricky. Think about it in terms of sets of numbers, for example x≥-5 (see below). This is the set of all numbers that are larger than -5.



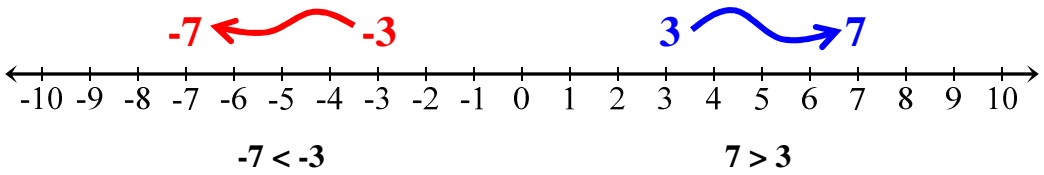
Now let's explore with this statement. Suppose I want to add 3 to both sides of this inequality: x+3≥-5 +3 or x+3≥-2, will the same set of numbers as above make this statement true? Yes. If I substitute -4 in for x the statement will be true, but if I substitute -6 it will not. I can do the same thing buy trying to subtract 3 from both sides, or multiplying by any positive number. But let's try simply multiplying both sides by -1: -x≥5 would be the new statement, is this statement still true for the values above, let's again check -4 and -6. If I substitute -4 into the new inequality, I get 4≥5 NOT true, this is a contradiction to the original inequality. If I substitute -6, I get a true statement which is also a contradiction.

Example 2:

When you multiply or divide by a **negative number** you have to **reverse** the inequality. **Why?**

Well, just look at the number line!

For example, from 3 to 7 is **an increase**, but from -3 to -7 is **a decrease.** See how the inequality sign reverses (from < to >)?



-7 < -3 **7 > 3**

Solve: -2*y* < -8

Divide both sides by -2 ... and **reverse the inequality**!

$$\frac{-2y}{-2} < \frac{-8}{-2}$$

$$y > 4$$

And that is the correct solution: ***y* > 4**

(Note that I reversed the inequality **on the same line** I divided by the negative number.)

So, just remember:

When multiplying or dividing by a negative number, **reverse** the inequality

Problem Solving with Inequalities:

1. Alex earns $7.50 per hour by working after school. Alex needs at least $60 to buy a video game. Write and solve an inequality that shows how many hours he must work to buy the video game.

$$\frac{7.50}{7.50}x \geq \frac{60}{7.50} \qquad x \geq 8 \text{ hours}$$

2. To make a profit, Elwin's Electronics has to sell more than 200 items in a month. If Elwin sold 30 items in the first week of the month, write and solve an inequality that shows how many items need to be sold in the remaining weeks to earn a profit.

$$\begin{array}{r} x + 30 > 200 \\ -30 \quad -30 \\ \hline x \qquad > 170 \end{array} \quad \text{items}$$