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Where to begin?

Okay, let's start. The first thing we are gonna need is some sort of reference point. We need some sort standard. A starting point. Once we have this started, we can build on it. I mean come on, all them old dudes and dudettes did it with nary a thing! We do have one thing going for us…….The laws of physics. Let's just pick an area and see what we can do.

Torque and Equilibrium

First, I suppose we should define Torque and Equilibrium.

Torque : Define.

Equilibrium : Define.

Okay, we got a couple of things going for us here. See that first equation?

Torque = Force x Lever arm

We're gonna use that……A lot.

I suppose we need one more definition:

Lever arm : Define. **Alternate Terms: Moment arm; Bell crank**

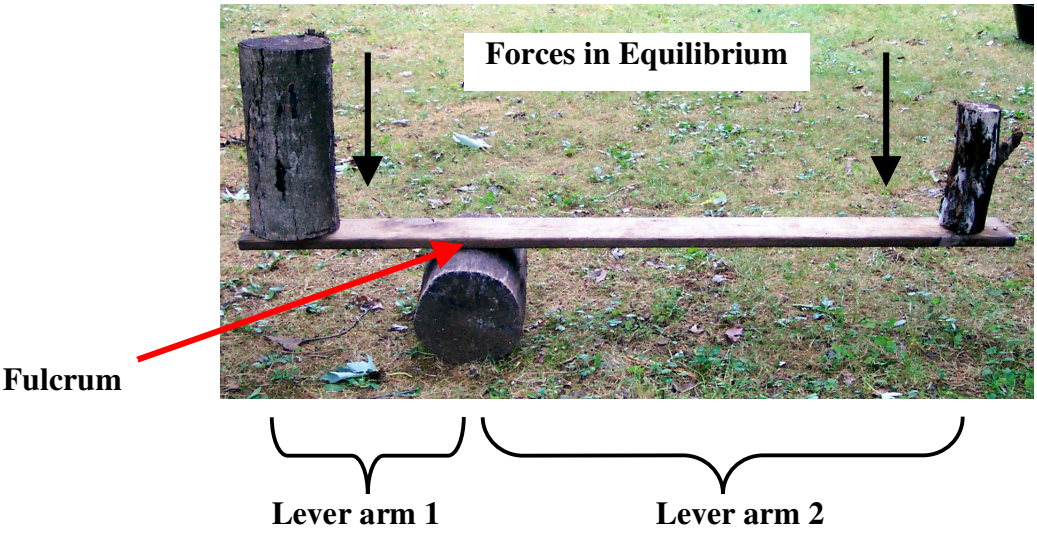
Holy cowpies! It's like a set of tippin' dominoes. Another definition!

Fulcrum : Define.

Oh geez……One more. It's kind of important. I don't think we can do much without it…….

Mass : Define.

Okay, this time I think we are really done with definitions. Let's start with a pretty pictures... I like pictures.

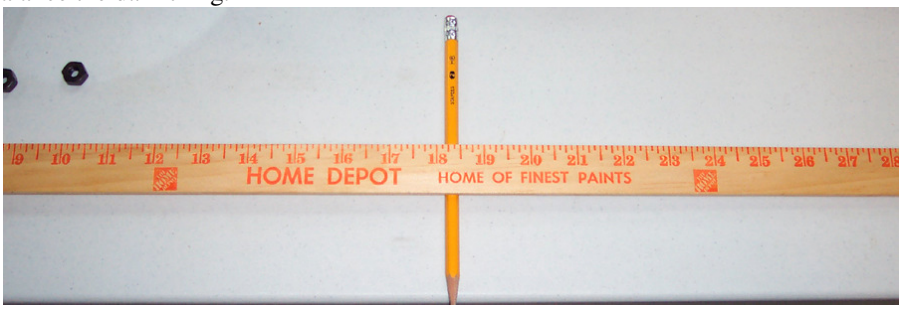


Okay, Let's get started building something.

Materials:

1 Yard Stick
1 Non- round pencil
8 Nuts

First, balance the yardstick on a pencil as shown below. Keep in mind that this first lab is going to be kind'a general. It may not balance exactly on the center of the yardstick. There could be different amounts of wood on one side than the other. There might even be a hole in one end that removes some of the wood from one end. Bottom line, don't sweat it….just balance the darn thing.



Okay, now take one nut and place it 4 inches (10cm if your using a meter stick) from the point where the yardstick touches the pencil. Hopefully, if you're abiding by the laws of physics, the yardstick will tip down and the touch the table.

Alrighty, now take and place another nut the same distance away from the pencil on the other side of ruler. Check out the illustration below:

Slide the nut I tiny bit if you need to, but make sure the yardstick is balanced.

Now, repeat the same procedure at 8 inches (20cm) from the pencil and 12 inches (30cm).

Hopefully in each case the yardstick remained more or less in balance.

Now comes the cool part…well, cooler part.

Now place 2 nuts, 2 inches (10cm) from the left side of the pencil. Okay, now take one nut and slide it out on the right side of the yardstick until the ruler balances. Note the general location. Heck, I'm going to give you a whole table of values to try it on. Just write your answers in the third column. Ignore the "relationship column for now.

Number of Nuts	Distance to the left of the pencil.	Distance to the right where one nut balances the yardstick.	Relationship
2	2in or (5cm)		
2	4in or (10cm)		
2	8in or (20cm)		
3	2in or (5cm)		
3	4in or (10cm)		
3	5in or (20cm)		
5	2in or (5cm)		

Well, did you notice a trend here?

On the very first one, I assume that the one nut balanced your 2 nuts at two inches when it was about 4 inches away from the pencil on the right side…kind's like this:

For the moment, let's use the abreiveation "nt" for our nuts and simply the number recorded for the distance. For example, on the very first experiment we would say:

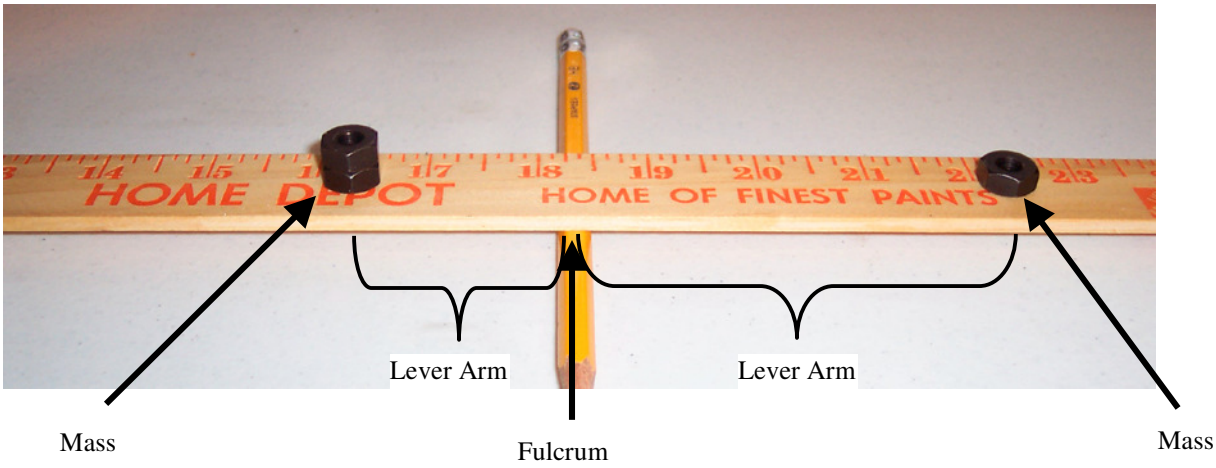
2nt x 2 = 1nt x 4

Number of nuts — Distance from the pencil

Check that out! (2 x 2 = 4) and (1 x 4 = 4)! The equation fits!

Now go down and write an equation like the one above in each spaces of the "Relationship" column in the table above.

Wow! Now let's tie all this together in the nomenclature that we used at the intro of this lab. Let's say your nuts are **Mass**. After all, they do have mass. We could weigh them as long as we have gravity to help us out. While were at it, let's tag everything else as well. The pencil would be our **Fulcrum** and the distance from the pencil or fulcrum would be our **Lever Arm.** Check it out diagrammed next:



Okay, here's the thing……the challenge…..Can you derive a simple Equation from our experiments using the terms Mass, and Lever arm? What I am looking for is a Equation that describes what happens when our yardstick is balanced.

Here is a hint: There will be an equal sign in the middle

Equation:

Wow! That's it….We are ready to move on!