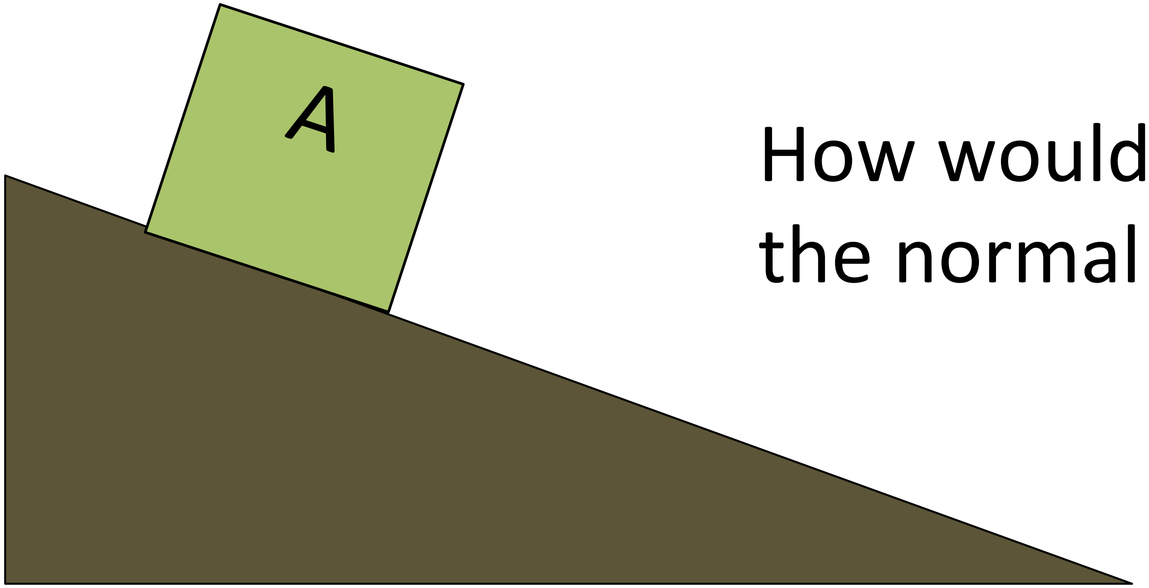
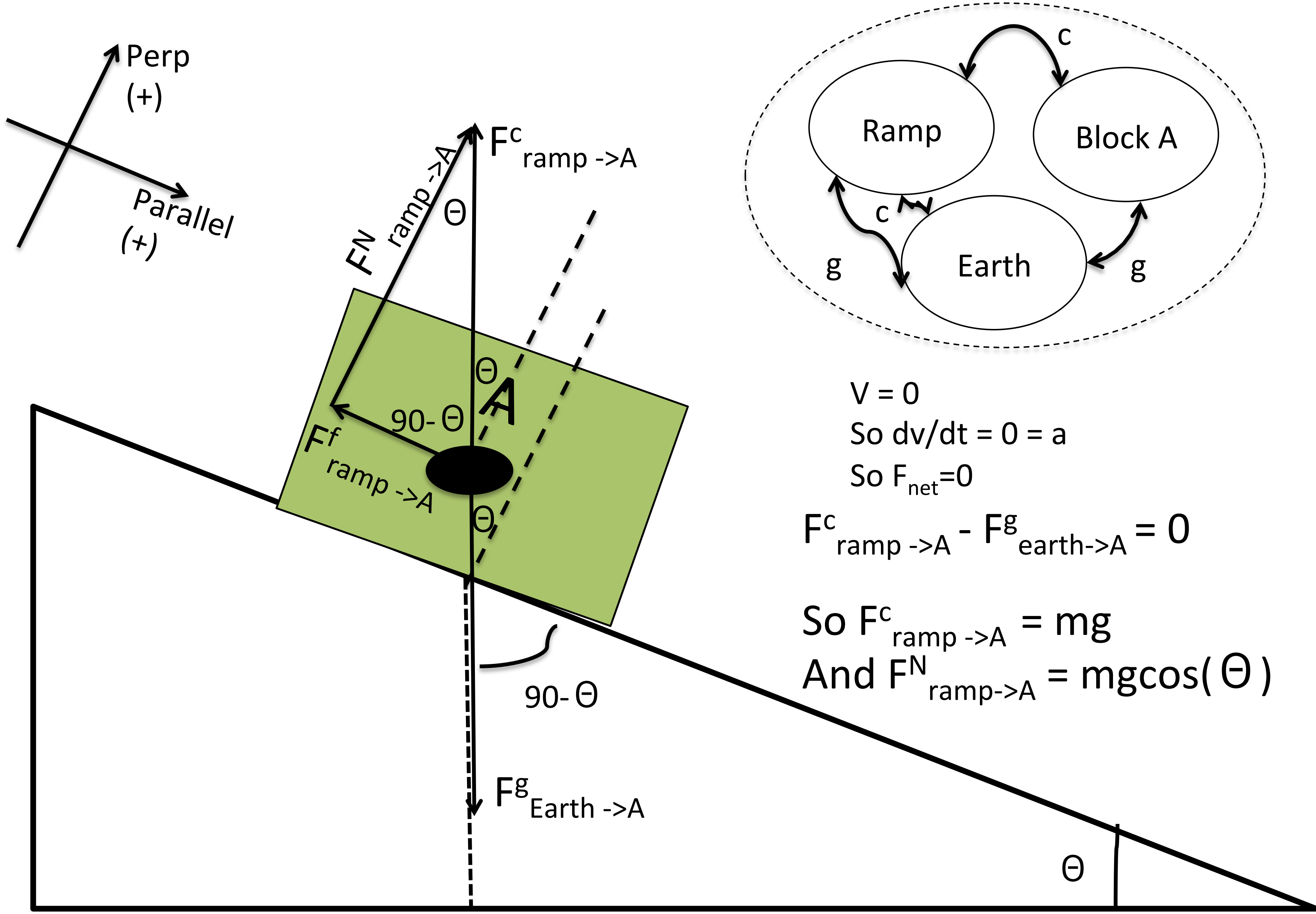
Open with CUWiP

https://sites.google.com/a/umich.edu/cuwip/

Box A is sitting still on the ramp. Draw a free body diagram for box A.



How would you quantify the normal force?



V = 0

So dv/dt = 0 = a

So F_{net}=0

$F^{c}_{ramp\ ->A} - F^{g}_{earth->A} = 0$

So $F^{c}_{ramp\ ->A}$ = mg

And $F^{N}_{ramp->A}$ = mgcos(Θ)

How would you feel about moving Chapters 3 & 4 homework to due on Monday?

A. Yes please!
B. Meh, I don't really care.
C. No way! That will really mess with my schedule!

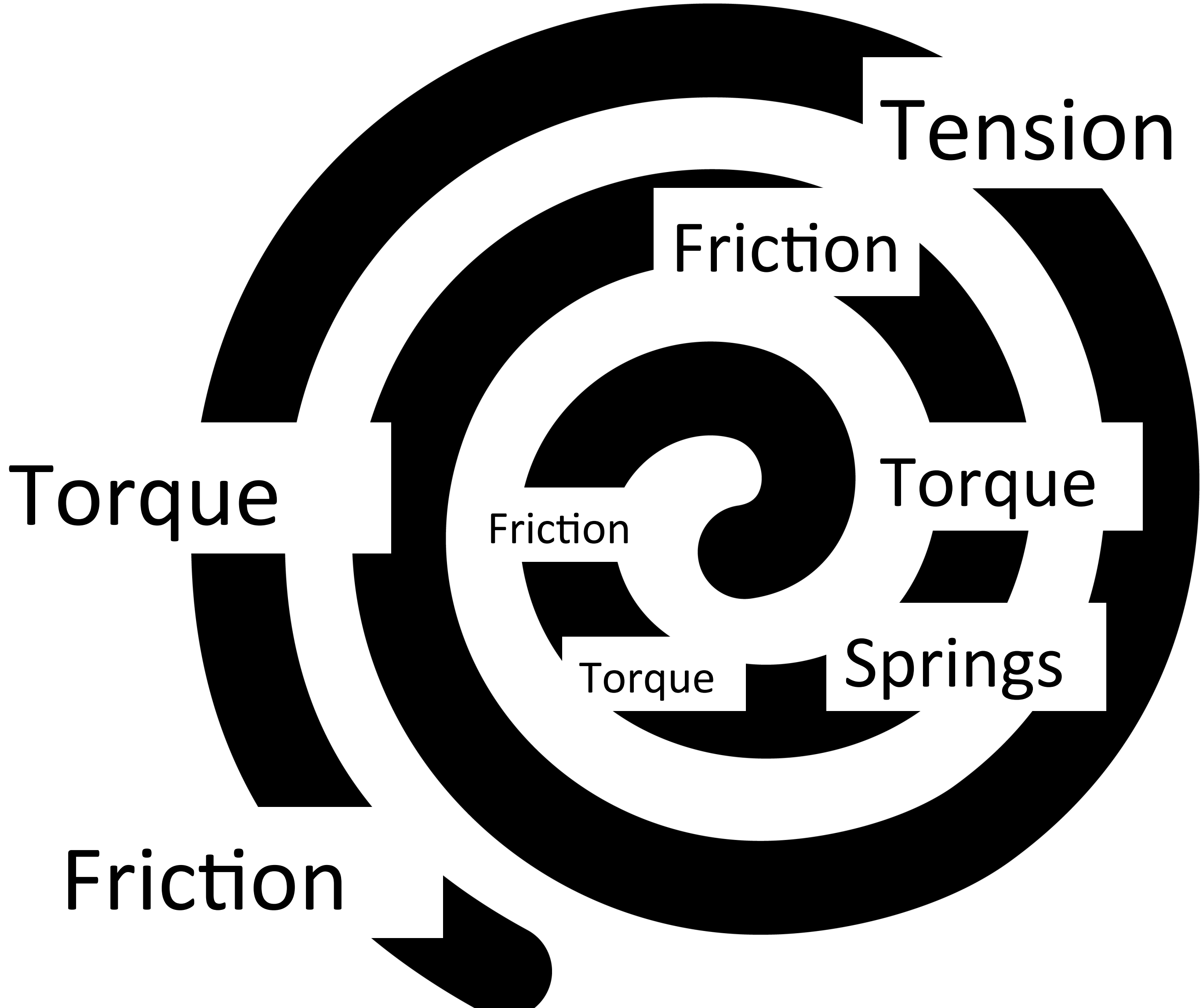
Homework for Chapter 3 & 4 will be due on Monday 9/22

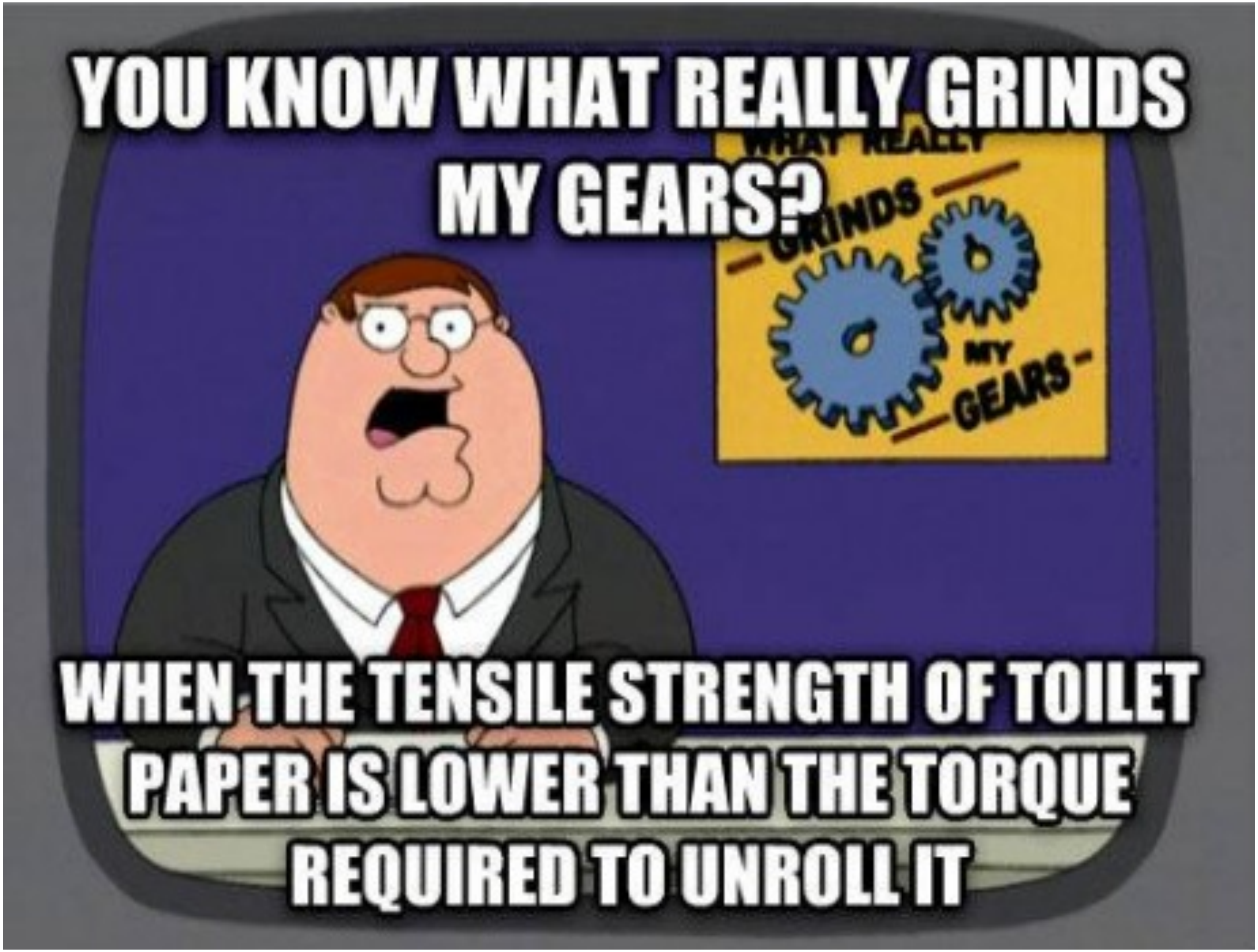
The amount of concern over torque makes me want to spend a little more time on this.

Announcements

- Conference for undergraduate women in physics at Univ. of Michigan
  - https://sites.google.com/a/umich.edu/cuwip/
- Remember! I put the lecture slides up on LON-CAPA every day, and I also put the correct clicker question responses with some amount of explanation
- Chapter 4 Reading Questions due tomorrow at midnight (note: chapter 4 expands on torque a bit more)

A note about how this book is laid out




YOU KNOW WHAT REALLY GRINDS MY GEARS?
GRINDS
MY
GEARS
WHEN THE TENSILE STRENGTH OF TOILET PAPER IS LOWER THAN THE TORQUE REQUIRED TO UNROLL IT

Reading Questions - Torque

When a rope is in "tension" is it simply acting as a transmitter of force from the hanging object to whatever else the rope is attached to? Or does the rope affect the force experienced by either object?

According to my [crappy] answer to the last question I need to understand torque better. After looking for other ways to say it, I'm more confused :P

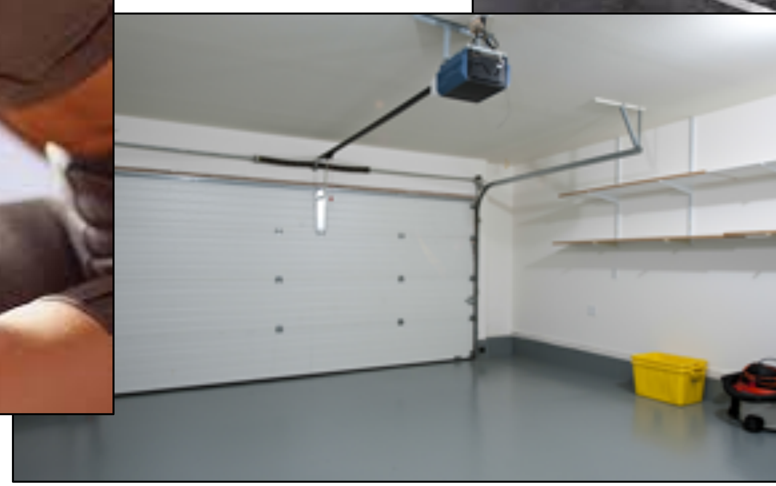
how is torque different then force when drawing a diagram?

Can we go over how to tell from a free body diagram if the object will rotate?

What is an every day uses for knowing what torque is?

How to do you calculate rotation when trying to determine torque?

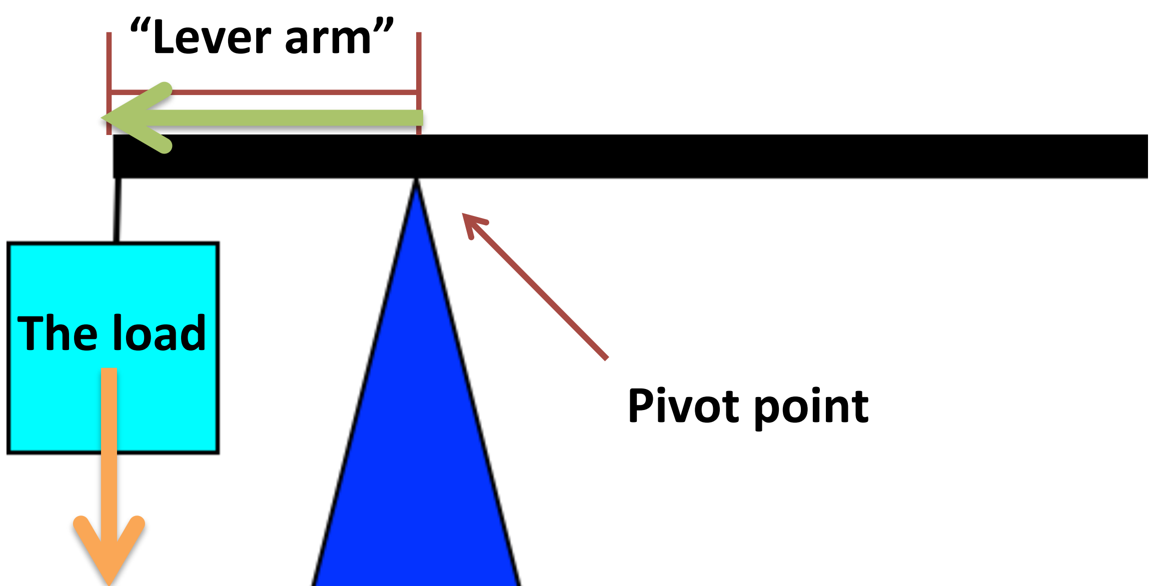
Real Life Example of Torque



Foothold Ideas Underlying Torque

- Start by identifying the pivot point
- Next identify where the push or pull is (sometimes called "the load")
- Measure the distance between the push and the pivot point (also called the "lever arm")
- The torque is

$$\vec{\tau} = \vec{r} \times \vec{F}$$



Reading Response

Torque itself is a force. Normally when we think of "force," we think of a push or pull, toque is similar to this because it is a "twist."

Torque "quantifies this 'ability to cause an object to begin to rotate'" and it is equal to the magnitude of a force times the "moment-arm" of the applied force. In other words, torque is determined by the size of the force used and how the force as applied.

When you look at the hobbit door of Bag End, the outside has the doorknob in the center of the door, the inside has the doorknob on the edge. Which would be easier to open?

A. The outside because pushing the door is easier than pulling the door.
B. The inside because the knob farther from the hinge means I have to apply less force to get the same amount of torque.
C. They are the same because the door weighs the same.
D. They are the same as long as you push/pull with the same force because the torque depends on the force applied.

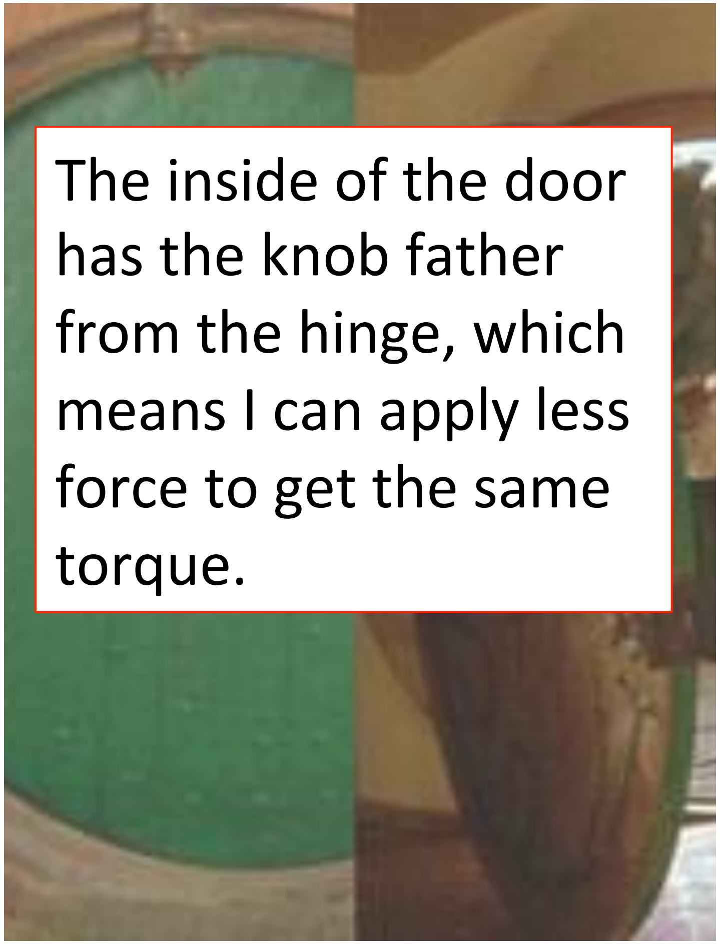
When you look at the hobbit door of Bag End, the outside has the doorknob in the center of the door, the inside has the doorknob on the edge. Which would be easier to open?

A. The outside because pushing the door is easier than pulling the door.

B. The inside because the knob farther from the hinge means I have to apply less force to get the same amount of torque.

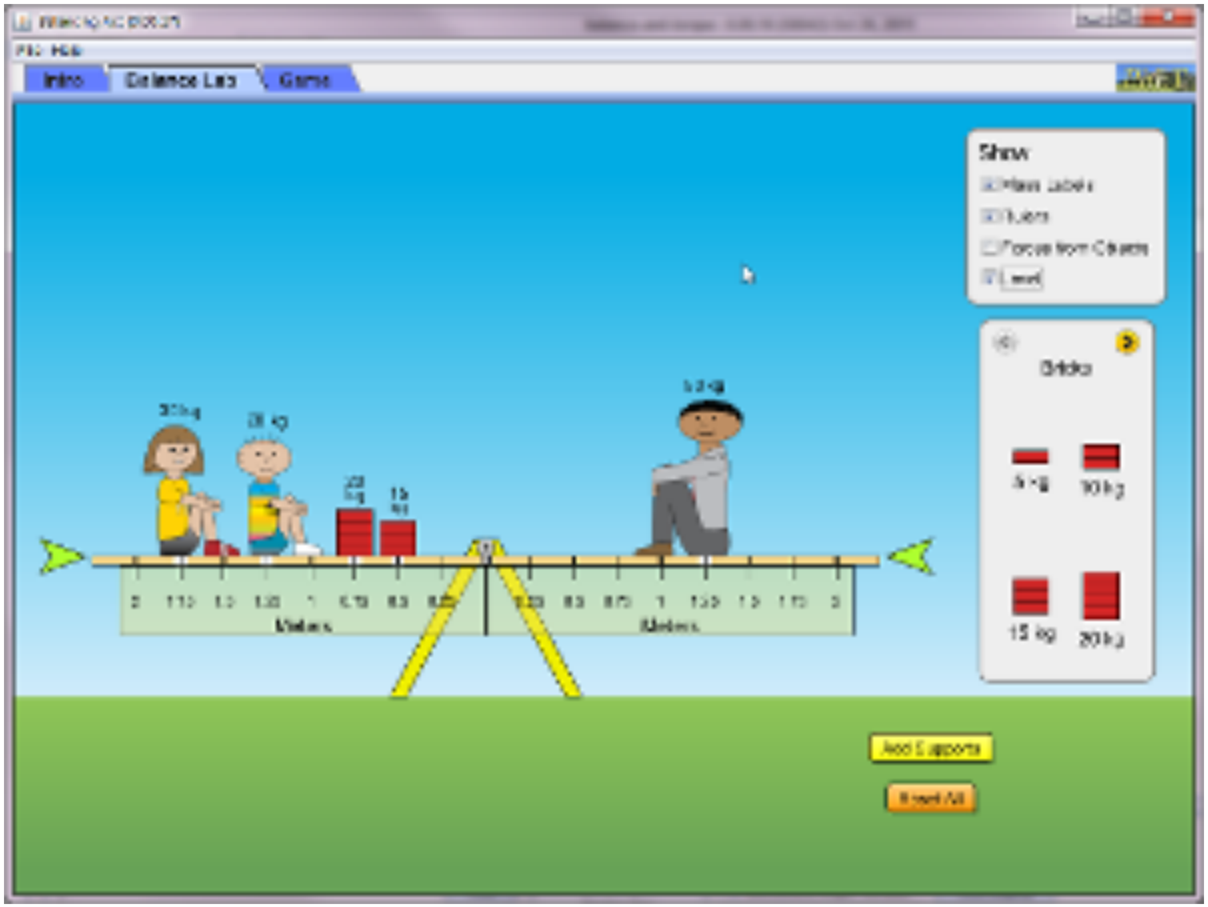
C. They are the same because the door weighs the same.

D. They are the same as long as you push/pull with the same force because the torque depends on the force applied.

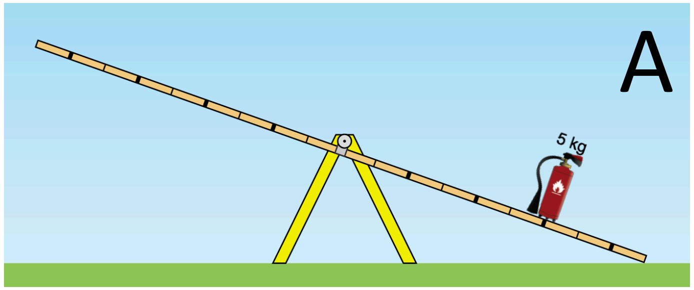


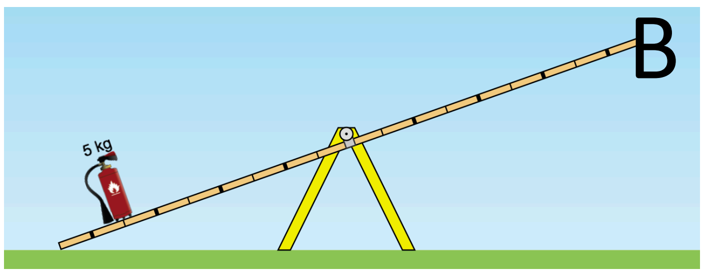
The inside of the door has the knob father from the hinge, which means I can apply less force to get the same torque.

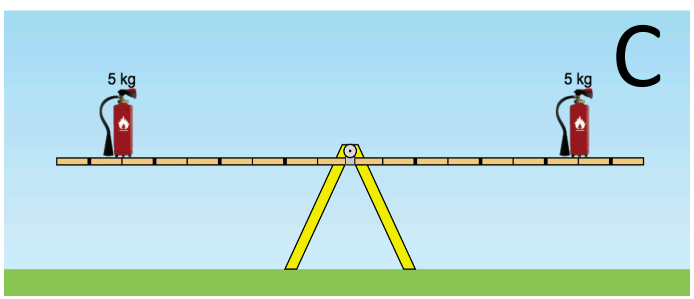
Rotational Motion



http://phet.colorado.edu/en/simulation/balancing-act







D None of these

What happens if you have objects of equal weight at equal distance?
Different distances?
Different weight at equal distances.

$T_{left} = T_{right}$
$(rF)_{left} = (rF)_{right}$
$(r*mg)_{left} = (r*mg)_{right}$

Now there are two ways to think about this:

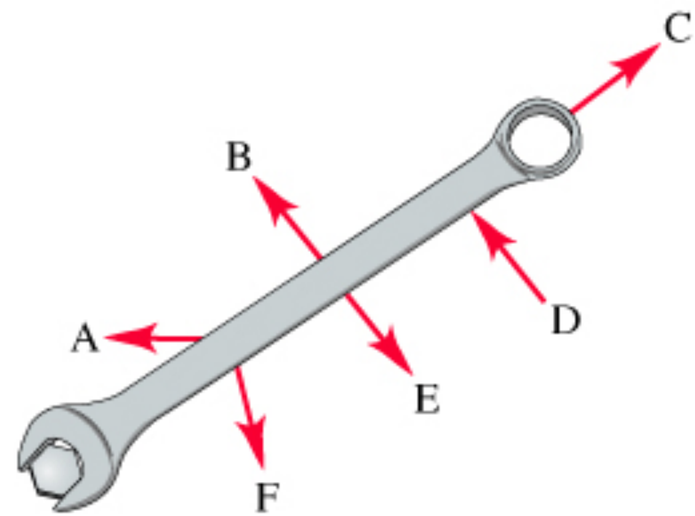
1) We can plug everything in: (so example of 20 kg and 15 kg)
   $r_{left} * 15kg * g = 2units * 20kg * g$
   $r_{left} = 2 * 20/15$

2) We know we're changing the mass and the distance needs to compensate so we create a proportion:

$$\frac{m_{left}}{m_{right}} = \frac{r_{right}}{r_{left}}$$

The wrench in the figure has 6 forces with equal magnitudes acting on it. Rank these forces (A through F) based on the magnitude of the torque they apply to the wrench, measure about the axis centered on the bolt.

A. A, F, E=B, D, C
B. B = E, D, F, A, C
C. D, E=B, F, A, C
D. None of these
E. I don’t even know where start



The wrench in the figure has 6 forces with equal magnitudes acting on it. Rank these forces (A through F) based on the magnitude of the torque they apply to the wrench, measure about the axis centered on the bolt.

A. A, F, E=B, D, C
B. B = E, D, F, A, C
C. D, E=B, F, A, C
D. None of these
E. I don’t even know where start

The force applied at the farthest distance will be the largest torque (D), then E&B because they are farther than F & A.
F will be bigger than A because it’s angle is more perpendicular than A. C will be 0 because it’s completely parallel to the moment arm.