Today:

Torque

Stress and Strain

Irish Phrasebook

Massive – awesome

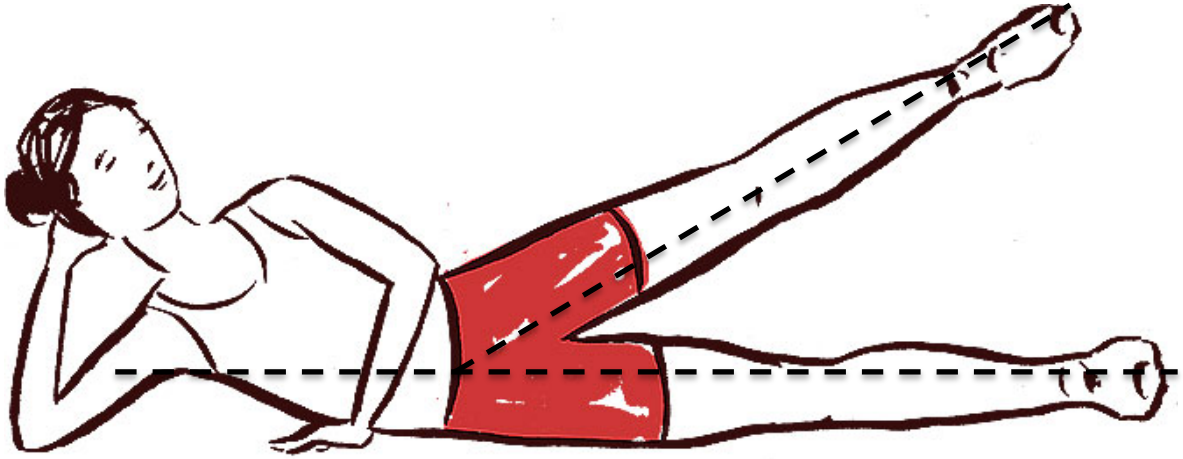
"You look massive" is a compliment

Announcements

- Reading questions for Ch 5 due Thursday 8th
- LON-CAPA homework for Ch 3.5-4.2 due Friday 9th
- Updated help-room hours are on LON-CAPA

A person doing leg lifts, raises one leg to an angle of 30 degrees. She has a 9kg weight attached to her ankle .84 meters from her hip. What is the torque on her leg due to this weight?

A. 64.4 Nm
B. 37.3 Nm
C. 74.8 Nm
D. 0 Nm
E. Something else



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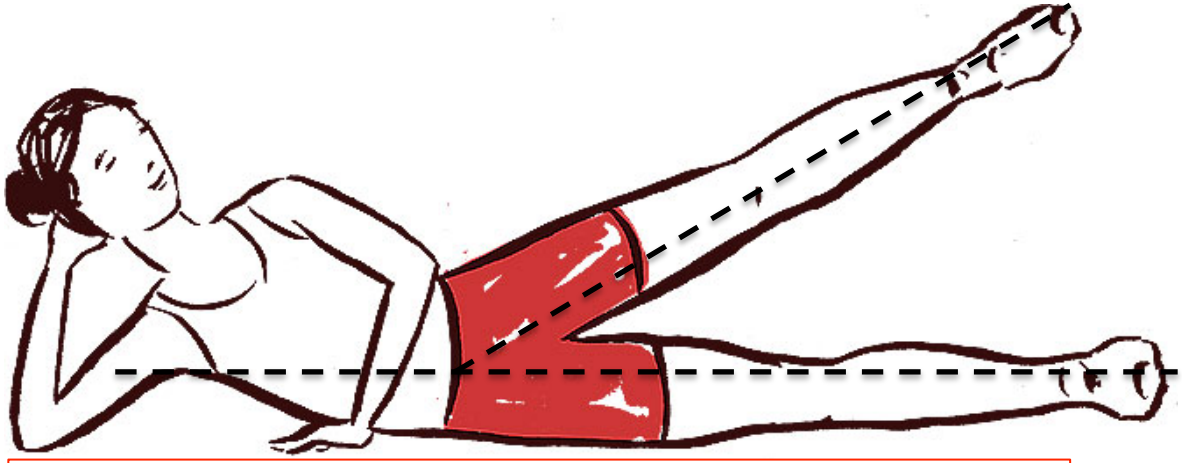
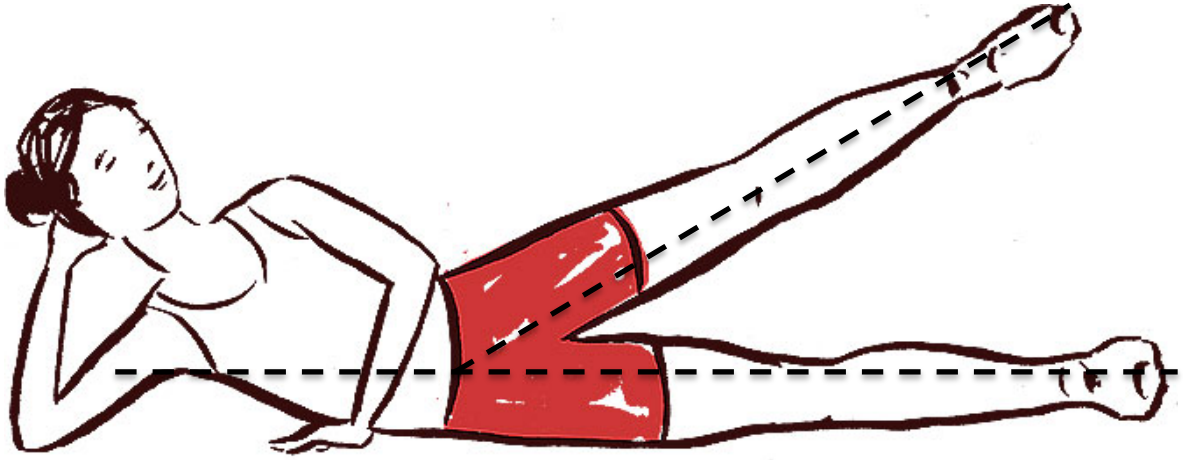


Remember the torque is equal to the piece of the force that is perpendicular to the moment arm! So in this case we should be using cos(30 deg) or sin(60 deg)

If she raises her leg higher, will the torque from the ankle weight increase, decrease, or stay the same?

A. Increase
B. Decrease
C. Stay the same
D. Something else



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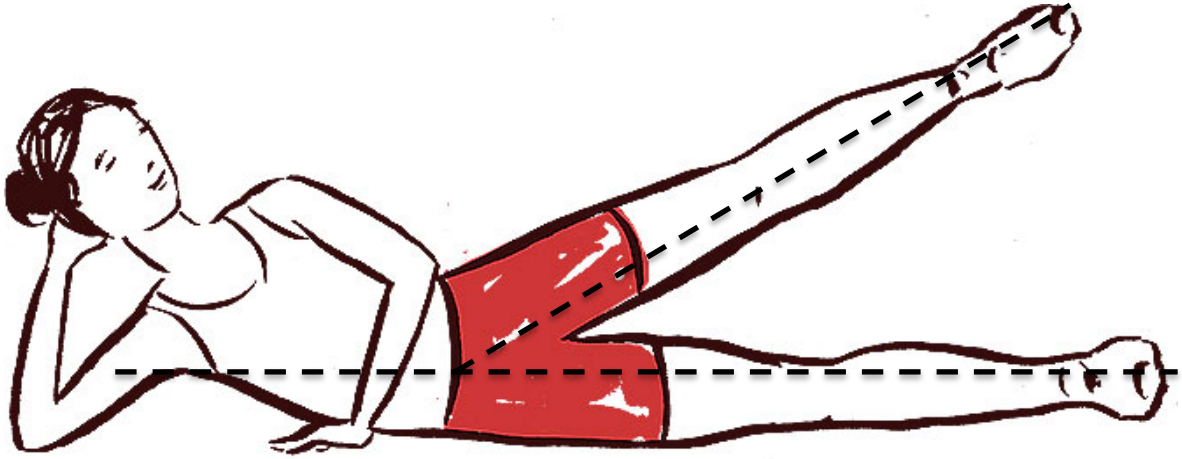
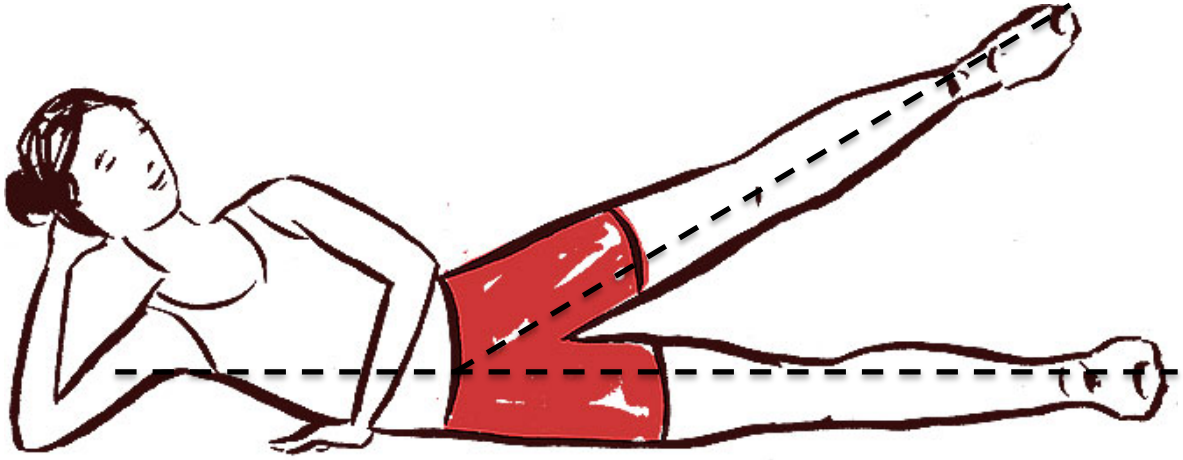


As she lifts her leg, less and less of the weight force from the ankle weight is pointing perpendicular to her leg (aka the angle is getting bigger)

Her leg weights approximately 15kg, what is the torque exerted by her leg? (Her leg is still .84 meters long.)

A. 107 Nm
B. 53.5Nm
C. 123.6 Nm
D. Something else



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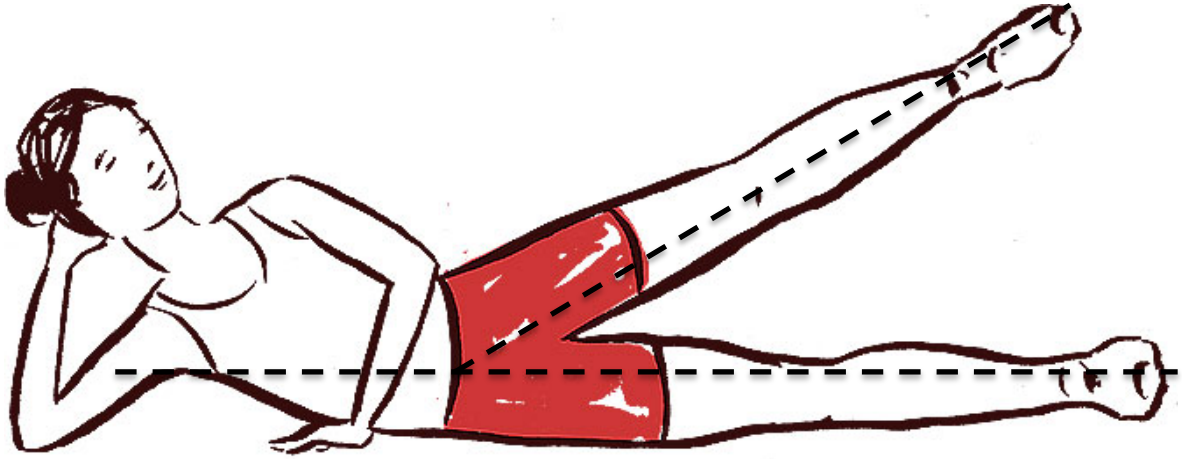
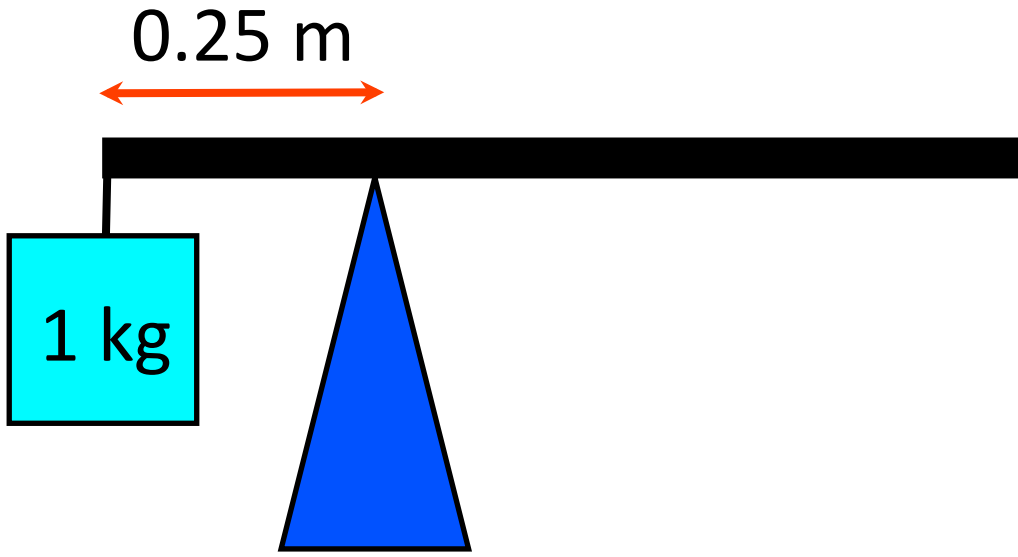


The center of mass of her leg will be in the middle of length of her leg (.42m). This is where the weight force is being exerted.

A uniform, massive beam with a length of 1 meter and mass of 1 kg is placed across a fulcrum and has a 1 kg mass attached to it, as shown. When released, will it rotate?



A. Yes, counterclockwise - the 1kg weight exerts a force perpendicular to the lever arm with the net torque pointing out of the screen.
B. Yes, clockwise, because the 1kg weight exerts a force perpendicular to the lever arm with the torque pointing into the screen.
C. Yes, counterclockwise, because the torque from the 1kg weight is greater than the torque from the mass of the beam.
D. No it will not rotate, because the force of gravity on the beam balances the force of the 1kg weight on the beam.
E. Not enough information to determine

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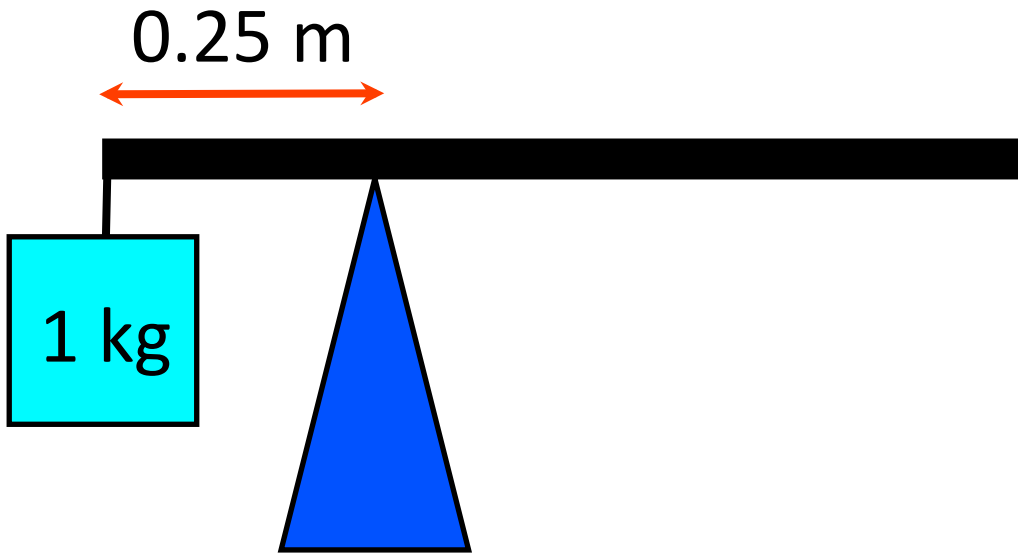

A. Yes, counterclockwise - th … ar to the lever arm with the …
B. Yes, clockwise, because th … ar to the lever arm with the …
C. Yes, counterclockwise, because the torque from the 1kg weight is greater than the torque from the mass of the beam.
D. No it will not rotate, because the force of gravity on the beam balances the force of the 1kg weight on the beam.
E. Not enough information to determine

The force of the 1kg weight is at a distance of .25m. The center of mass of the whole beam is at .5m, which is .25m from the pivot point. So the two torques on the right hand side and left hand side of the beam balance each other.

Ch 4.3-4.6:
Stress and Strain

Foothold Principles of Springs & Stretchy Stuff

- N3: When I pull a spring, it pulls back on me.
- A spring changes its length in response to pulls (or pushes) in the opposite direction
- How hard it pulls depends on the spring (which depends on what it's made of)

$$F^{s}_{\text{spring} \rightarrow \text{hand}} = -k\Delta x$$

How much you stretched it.

Foothold Principles of Springs & Stretchy Stuff

- We can also think of this in the reverse way (which is more applicable to the stress/strain analogy).
  - How the spring stretches is a result of how much force you put on it
  - And what the material is made of

$$\Delta x = \frac{F^{s}_{\text{spring ->hand}}}{k}$$