As you come in today pull out a piece of paper and reflect on the prompt below.

Two students are having a debate about the role of math in physics and make the following statements:

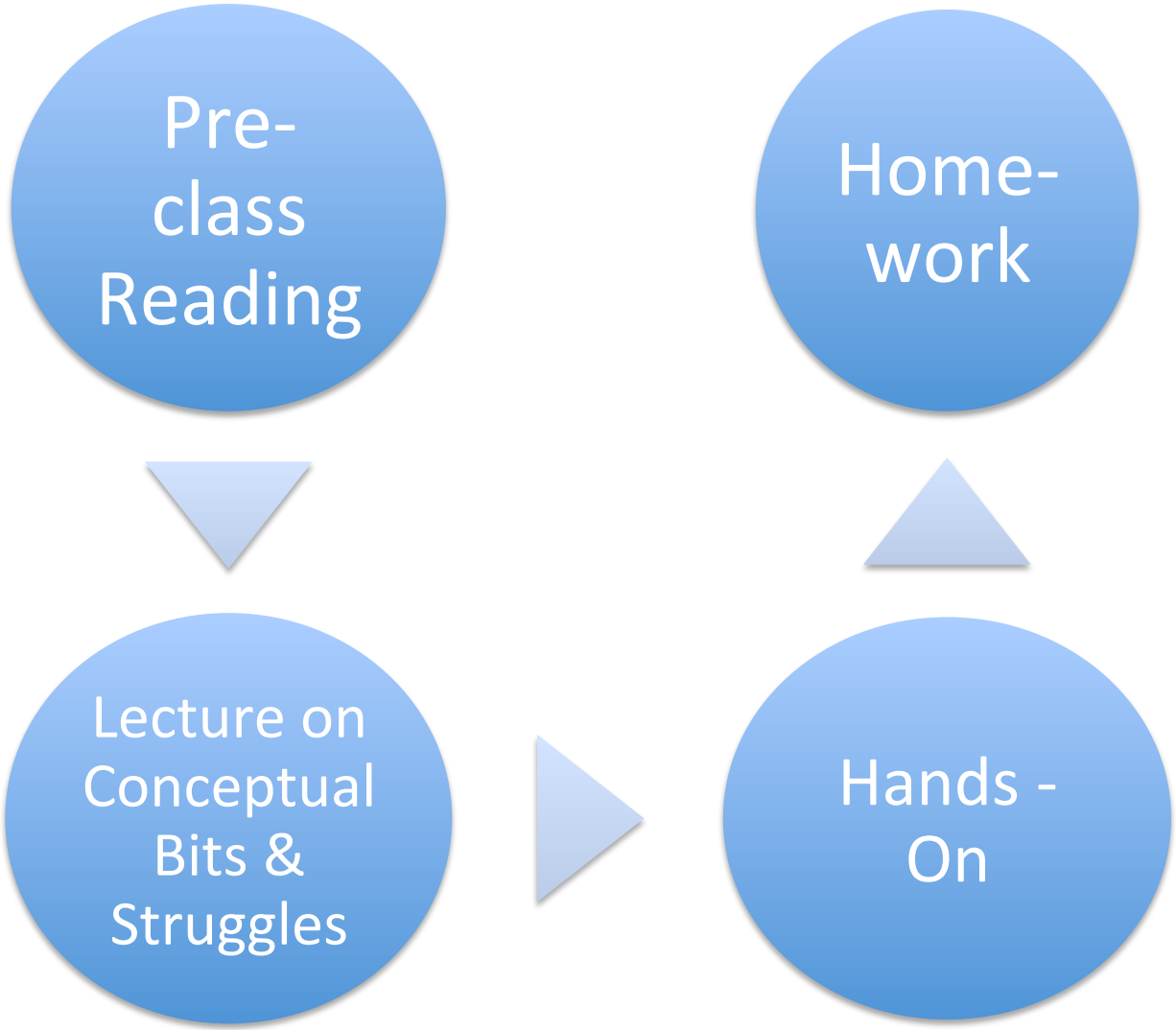
> Student A: Physics is all about the math. The point of learning all these equations is so you can find values that predict how the world works.
>
> Student B: Equations in physics are just another way to think through the concepts. You can get numbers from them, but that's not the point. They are just another representation of the same idea.

Who do you agree with? Why?

Today's scientists have substituted mathematics for experiments, and they wander off through equation after equation, and eventually build a structure which has no relation to reality. (Nikola Tesla)

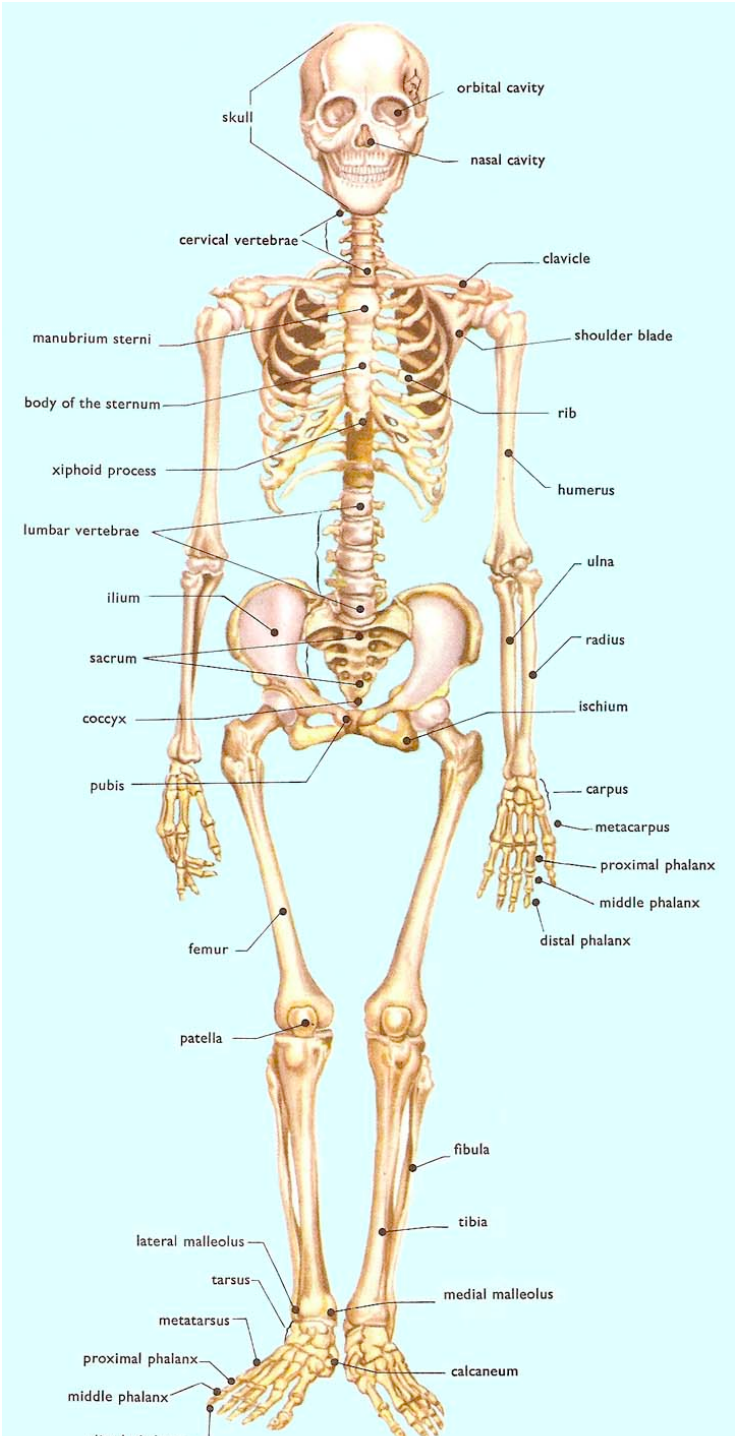
The essence of mathematics is not to make simple things complicated, but to make complicated things simple. (S. Gudder)

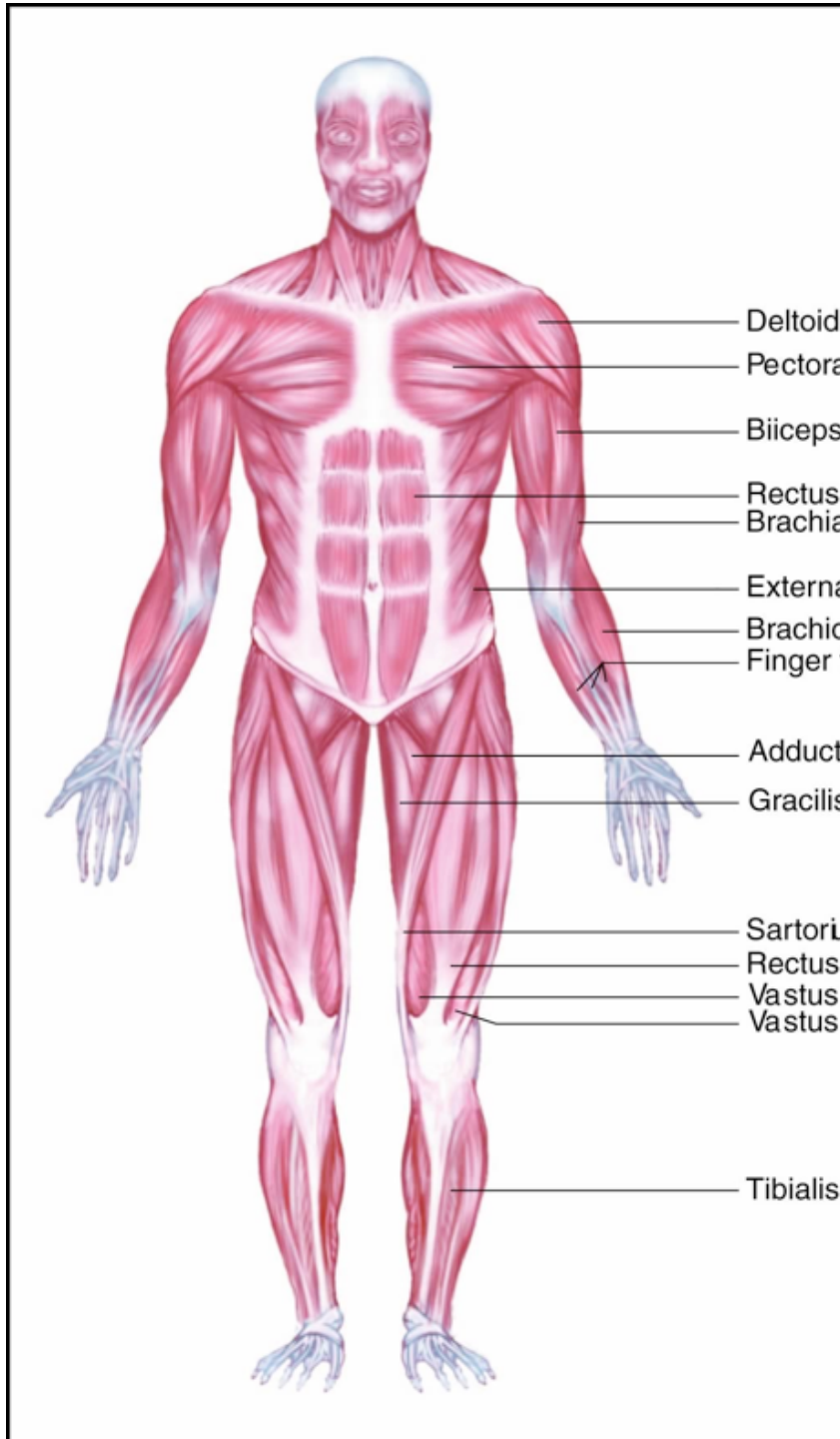
How does this class work?



Announcements

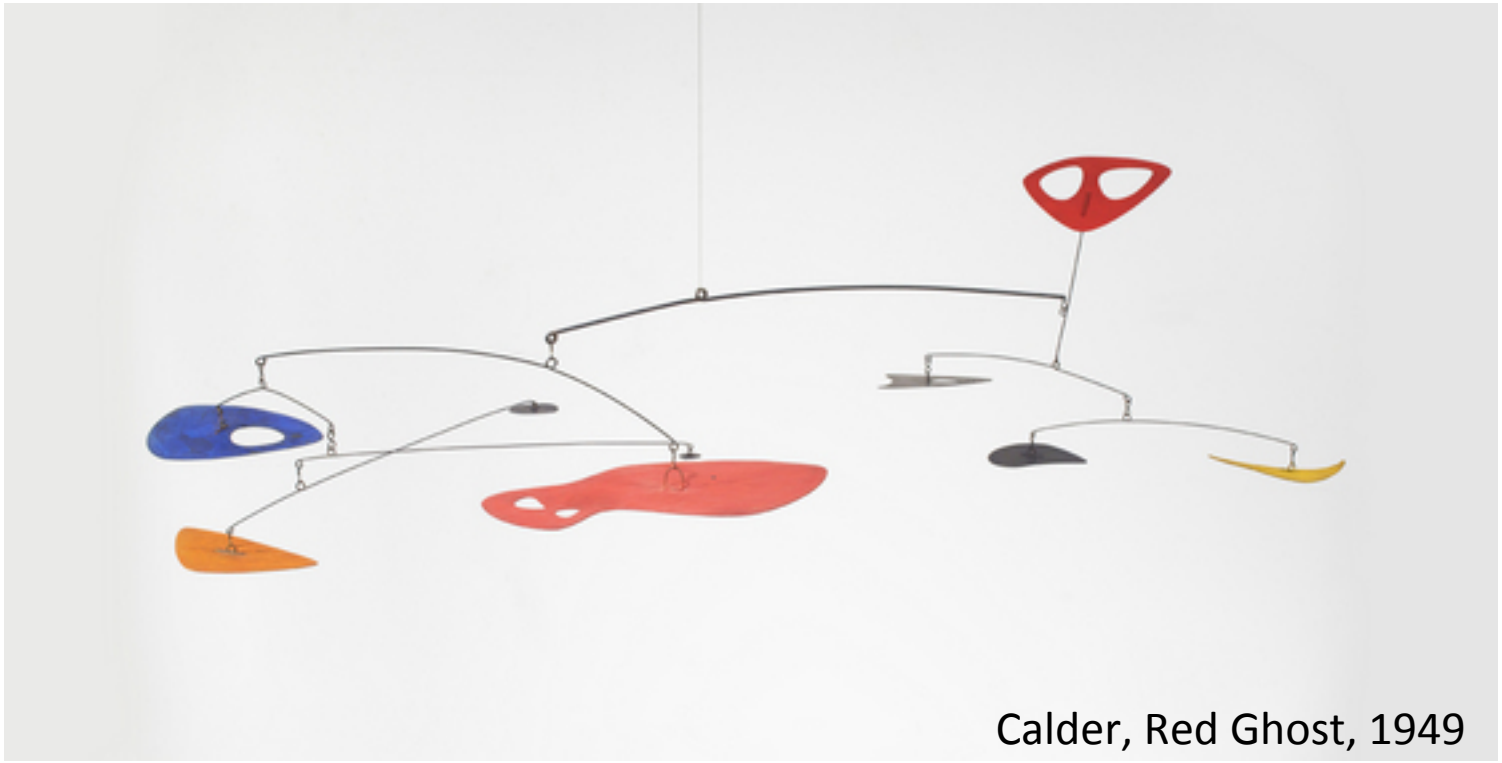
- Help room hours shift:
  - No hours on Thursdays from 4-6pm, but now hours on Fridays 3-5pm!
- Don't worry about LON-CAPA clicker points at the moment. I'm still trying to communicate with LON-CAPA
- I will spend some time on Friday going over what to expect on the first midterm exam


skull
orbital cavity
nasal cavity
cervical vertebrae
clavicle
manubrium sterni
shoulder blade
body of the sternum
rib
xiphoid process
humerus
lumbar vertebrae
ulna
ilium
radius
sacrum
ischium
coccyx
carpus
pubis
metacarpus
proximal phalanx
middle phalanx
distal phalanx
femur
patella
fibula
tibia
lateral malleolus
tarsus
medial malleolus
metatarsus
proximal phalanx
calcaneum
middle phalanx

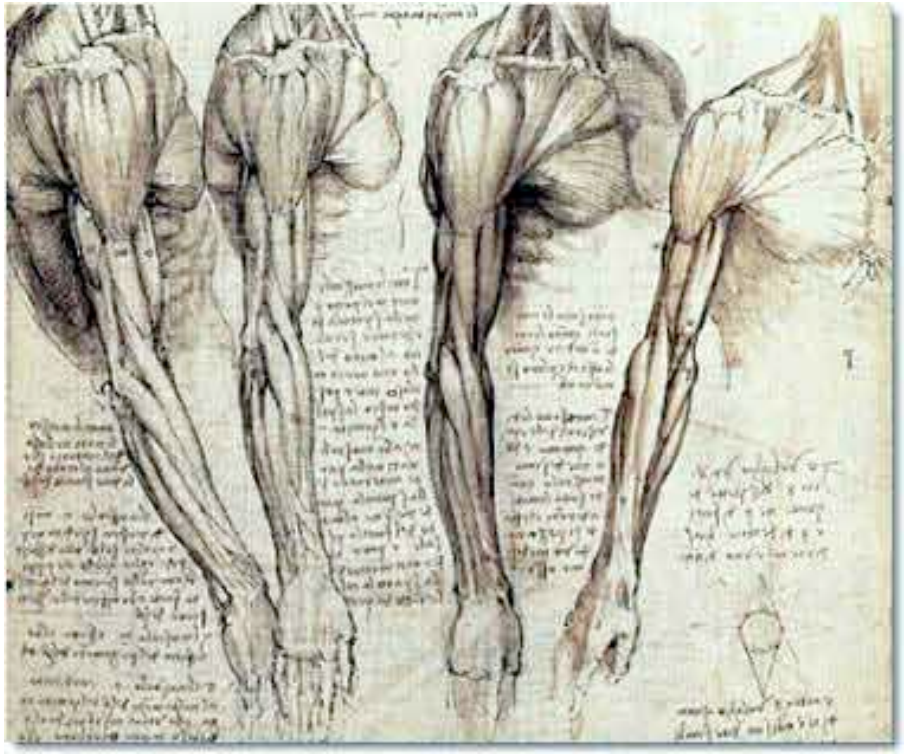

Deltoid
Pectora
Biiceps
Rectus
Brachia
Externa
Brachio
Finger
Adduct
Gracilis
Sartori
Rectus
Vastus
Vastus
Tibialis

Reading Questions - Tension

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?

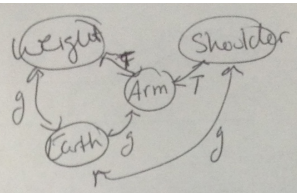


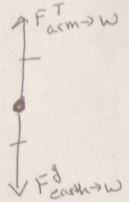
Calder, Red Ghost, 1949



Imagine a person holding a barbell in their hand, with the hand by their side. Nothing is moving. Draw the free-body diagrams for (1) the weight, (2) the person's arm, and (3) their shoulder. Take into account the weight of the arm in your diagrams.

Weight (w)





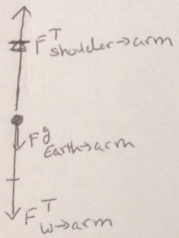
$$\Sigma F = 0$$

$$F^T_{arm \to w} - F^g_{earth \to w} = 0$$

$$F^T_{arm \to w} = F^g_{earth \to w}$$

$$F^T_{arm \to w} = m_w g$$

Arm



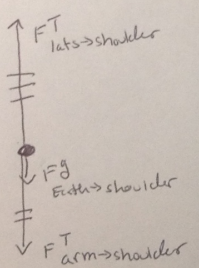
$$\Sigma F = 0$$

$$F^T_{shoulder \to arm} - F^g_{Earth \to arm} - F^T_{w \to arm} = 0$$

$$F^T_{shoulder \to arm} = m_{arm} g + m_w g$$

$$F^T_{shoulder \to arm} = (m_{arm} + m_w) g$$

Shoulder



$$\Sigma F = 0$$

$$F^T_{lats \to shoulder} - F^g_{Earth \to shoulder} - F^T_{arm \to shoulder} = 0$$

$$F^T_{lats \to shoulder} = F^g_{Earth \to shoulder} + F^T_{arm \to shoulder}$$

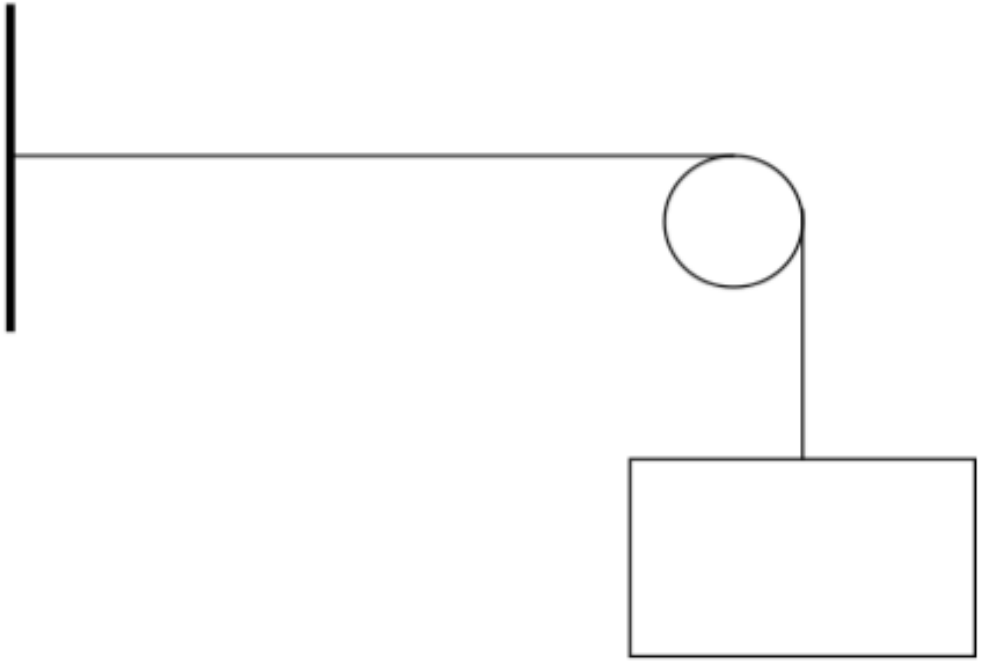
$$F^T_{lats \to shoulder} = m_{shoulder} g + (m_{arm} + m_w) g$$

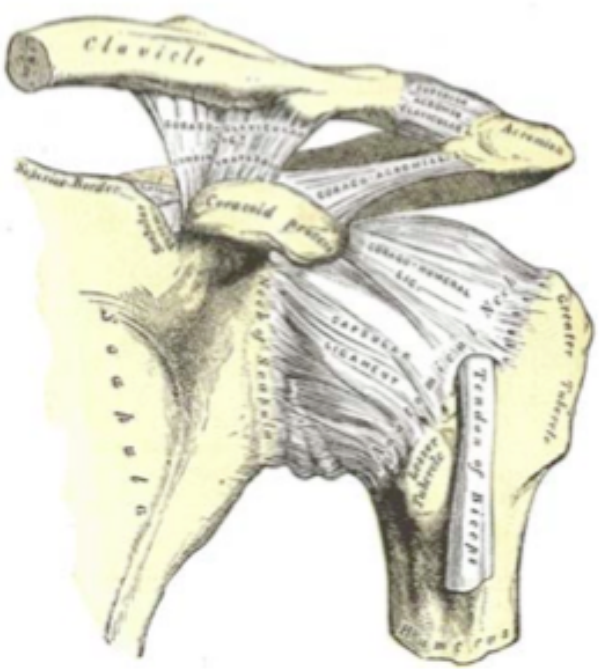
$$F^T_{lats \to shoulder} = (m_{shoulder} + m_{arm} + m_w) g$$

Conceptual Ideas Underlying Tension

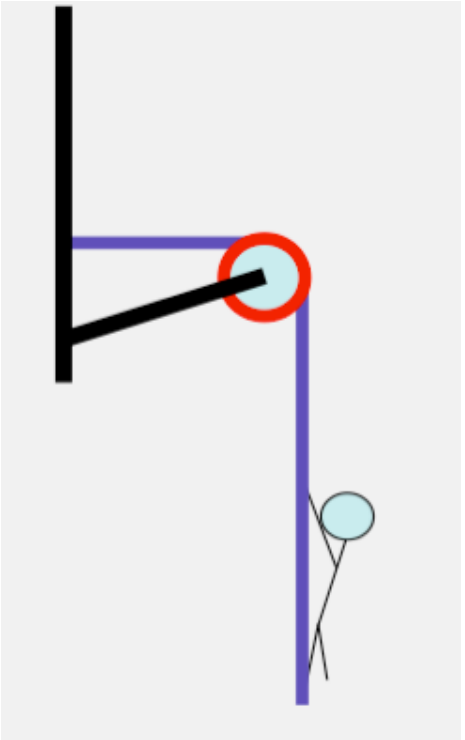
- Most solids support loads through compression (bones) or tension (muscles)
- Tension is basically a way to transmit force from one place to another

Transmitting a Force Around a Corner





A climber with mass m_c hangs from a vertical massless rope. The rope goes over a pulley and, after traveling horizontally for a short distance, is attached to the wall. What is the tension on the rope, T_r?



A. $T_r < m_c g$
B. $T_r = m_c g$
C. $T_r > m_c g$
D. Not enough information given to answer the question

(note: g = accel. due to gravity)