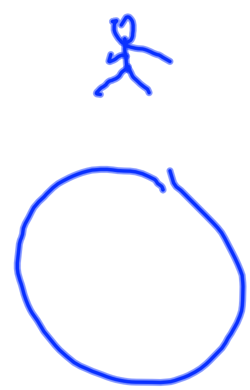
Reminders 10-31-07:
-Next Homework Due 11/1!!!
-Circular Motion Questions due Today.
-Bring Chapter 9 Notes to Lab this week.
-Chapter 7 Conceptual Quiz Next Monday.

Objectives:
-Gravitation and Satellites
-Torque
-Static Equilibrium

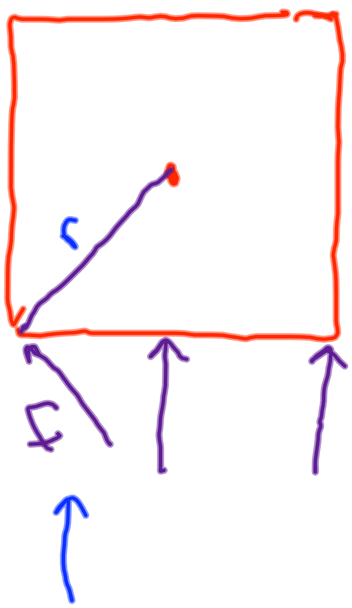
- **What is your apparent weight if you are orbiting the Earth 200km above the its surface? Can you think of problems that are similar to this one?**

$$W = \frac{G M_E m}{r^2}$$

$$= \frac{G M_E m}{(r_E + h)^2}$$



A square, 0.40 m on a side, is mounted so that it can rotate about an axis that passes through the center of the square. The axis is perpendicular to the plane of the square. A force of 15 N lies in this plane and is applied to the square. What is the magnitude of the maximum torque that such a force could produce?



$F = 15\,N$

$L = 0.40\,m$

$\tau = r F \sin\theta$

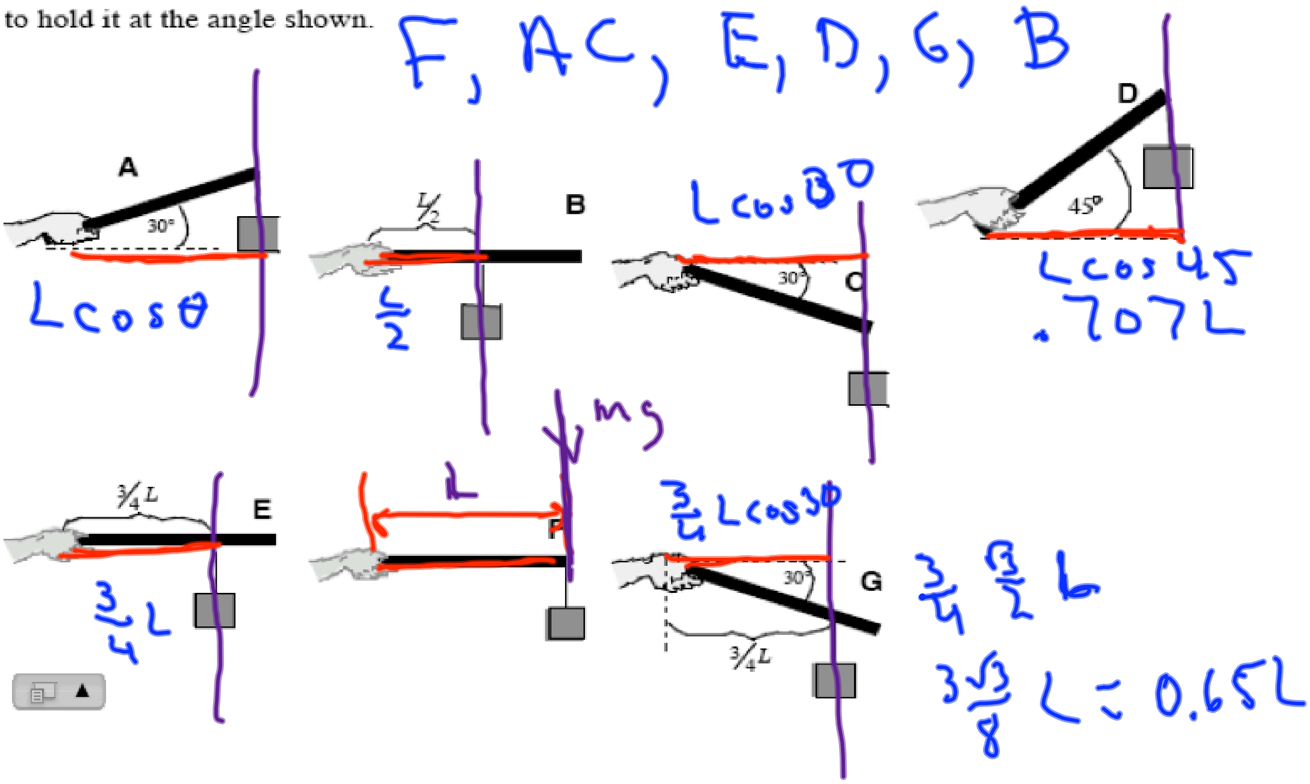
$= F\ell$

$\left(\frac{(\sqrt{2})(.4)}{2}\right) 15\,N \sin 90 = \tau$

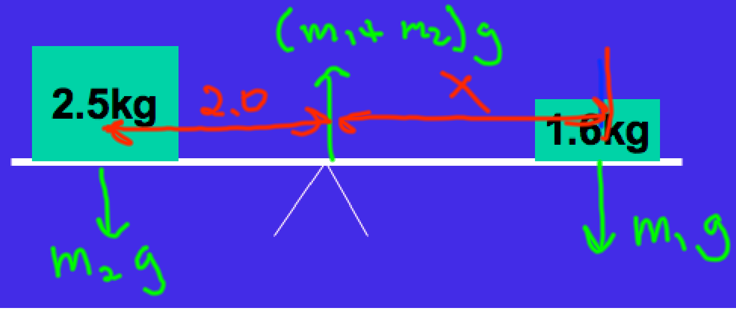
$(.28)(15)(1) = \underline{4.2\,Nm}$

Shown below are seven situations where a student is holding a meter stick at the left end at variou angles. A 1000 g mass is hung on the meter sticks at different locations. All of the meter sticks are identical, but the distance along the meter stick at which the 1000 g mass is hung and the angles at whicl the student holds the meter stick vary. Specific values are given in each figure. (Ignore the mass of th meter stick.)

Rank these situations, from greatest to least, on the basis of how difficult it would be for the student t hold the meter stick from the left end in the position shown. That is, put first the situation where it woul be hardest to hold the meter stick at the angle shown and put last the situation where it would be easies to hold it at the angle shown.



- A plank is balanced on a pivot. A 2.5kg mass is placed on the plank 2.0 m from the fulcrum. Where should the 1.6kg mass be placed so that the system remains in equilibrium?



$$\Sigma\tau = 0 \qquad \Sigma\tau_{cw} = \Sigma\tau_{ccw}$$

$$\tau_{2.5} = m_2 g(2.0\,m)$$

$$\tau_{1.6kg} = -m_1 g(X)$$

$$\Sigma\tau = \tau_{2.5} + \tau_{1.6} = 0$$

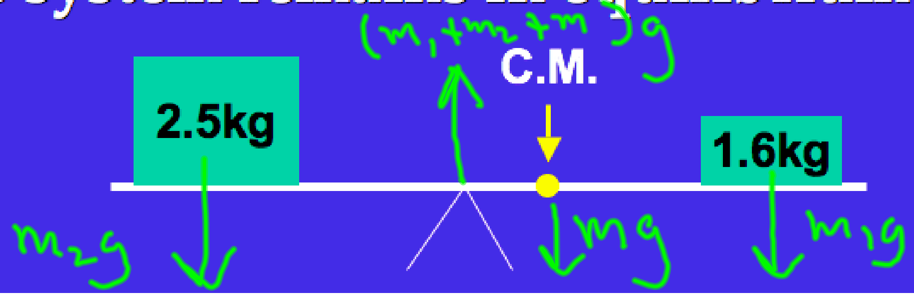
$$0 = m_2 g(2.0\,m) - m_1 g(x)$$

$$0 = m_2(2.0) - m_1(x)$$

$$m_2(2) = m_1 X$$

$$x = \frac{m_2}{m_1}(2) = \left(\frac{2.5}{1.6}\right)(2) = 3.1\,m$$

- A 2.0 kg plank is balanced on a pivot. The c.m. of plank is 0.50m to the right of the pivot point. A 2.5kg mass is placed on the plank 2.0 m from the fulcrum. Where should the 1.6kg mass be placed so that the system remains in equilibrium?



$$\Sigma\tau = 0$$

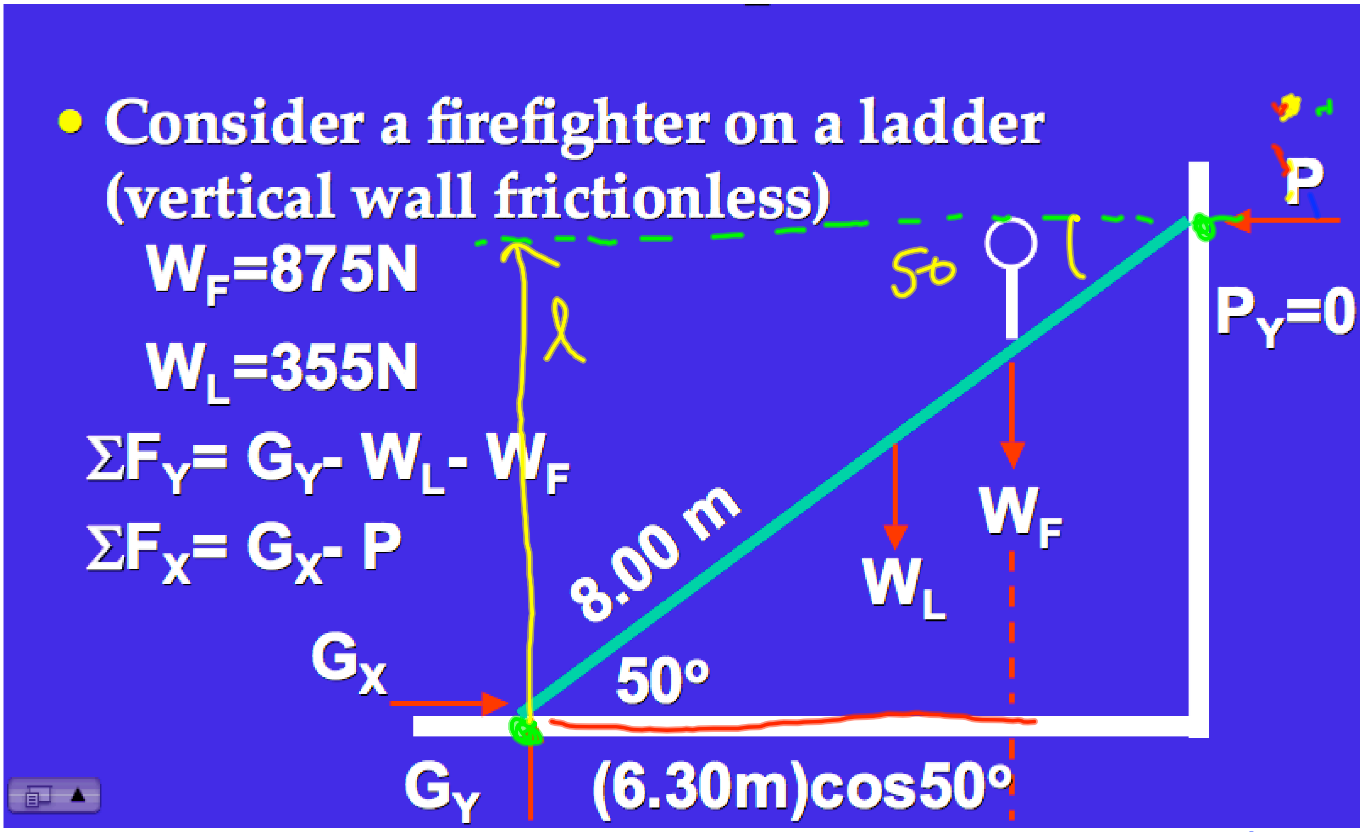
$$= m_2 g(2) - mg(0.50m) - m_1 g(x)$$

$$m_1 g(x) = m_2 g(2) - mg(.5)$$

$$x = \frac{m_2(2) - m(.5)}{m_1}$$

$$= \frac{(2.5kg)(2m) - (2kg)(.5m)}{1.6kg}$$

$$= \underline{2.5m}$$



$$G_y = W_L + W_f = (875 + 355)\,N$$

$$G_y = 1230\,N$$

$$\tau_p + \tau_{W_L} + \tau_{W_f} = 0$$

$$P\,8\sin 50 - W_f\,6.30\cos 50 - W_L\,4\cos 50 = 0$$

$$P = \frac{W_f(6.30)\cos 50 + W_L\,4\cos 50}{8\sin 50}$$