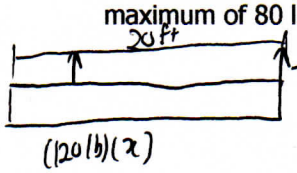
*I can't guarantee the accuracy of the answers to this worksheet since I don't have access to the answers. However, the process of solving the question should be correct.

Name_____

Unit 1 Review Worksheet

Force Equilibrium / Torque Equilibrium / Center of Mass

1. Two men are carrying a uniform ladder that is 20 ft long and weighs 200 lb. If one man can lift a maximum of 80 lb and lifts at one end, at what point should the other man lift?

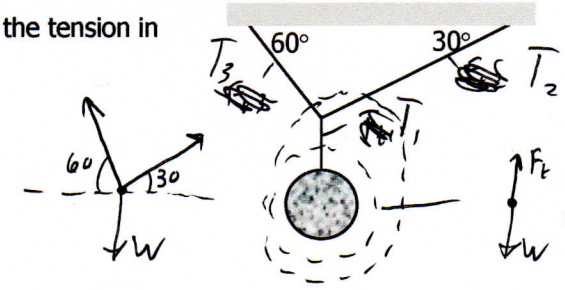


$(80lb)(10ft) = (120lb)(x)$

$x = 6.\overline{66}$

3.3 ft from the other end

2. A rock of weight W is hung as shown at right. What is the tension in each of the strings shown? (Get to simplest form)



$T_2 \sin 30 + T_3 \sin 60 = W$

$T_2 \cos 30 = T_3 \cos 60$

$T_2 = 0.577 T_3$

Do Algebra!

If you think my algebra is wrong... it probably is.

$T_3 = 0.866W$ $\quad T_1 = W$

$T_2 = 0.5W$

3. In the figure below, a box is shown at rest on an angled ramp. The ramp angle is 41 degrees, the block has a mass of 6.0 kg, and the coefficient of static friction between the block and the ramp is 0.91. Based on the information provided:
   a. What is the maximum amount of force the block could withstand before it begins to slide? Assume a person is entered into the diagram and is pushing the box either up or down the ramp (you must decide which), but parallel to the slope of the ramp.

Pushing up the ramp.

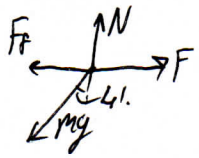
$N = mg\cos 41$

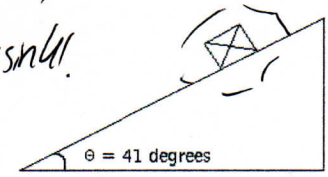
$F = F_f + mg\sin 41$

$F_f = (0.91)(mg\cos 41)$

$F = (0.91)(mg\cos 41) + mg\sin 41$

Rotated Free diagram



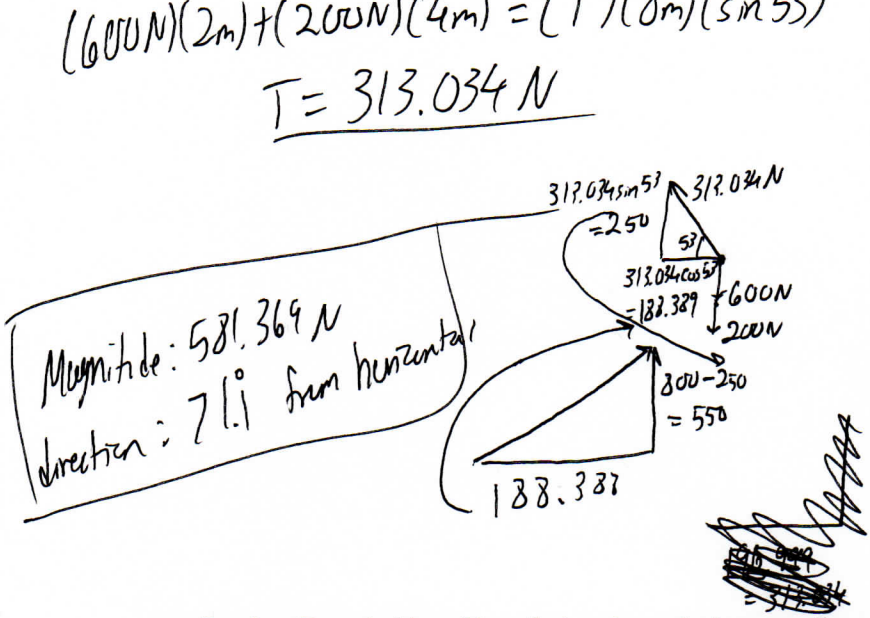


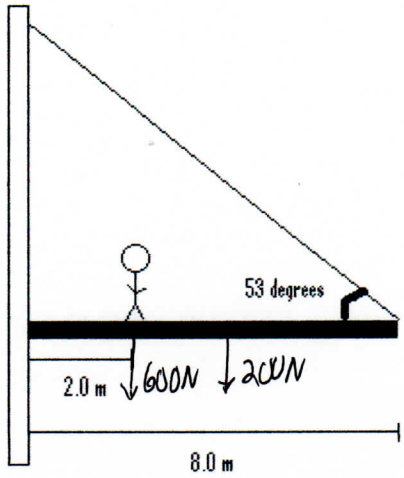
$F = 78.959\ N$

4. A uniform horizontal beam with a length of 8.0 m and a weight of 200 N is attached to a wall by a pin connection. Its far end is supported by a cable that makes an angle of 53 degrees with the beam. (See figure below). A person of weight 600 N stands a distance of 2.0 m from the wall.
   a. Find the tension in the cable
   b. Find the magnitude and direction of the force exerted by the wall on the beam

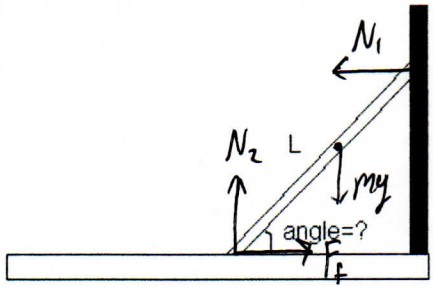
$(600N)(2m)+(200N)(4m)=(T)(8m)(\sin 53)$

$T = 313.034\ N$





5. A uniform ladder of length L rests against a smooth, vertical wall. The mass of the ladder is m, and the coefficient of static friction between the ladder and the ground is $\mu_s = 0.40$. Find the minimum angle at which the ladder does not slip.



$N_2 = mg$

$F_f = \mu N_2$

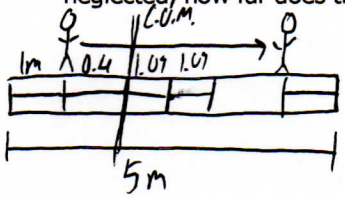
$F_f = \mu mg$

$\tan^{-1}\left(\frac{N_2}{F_f}\right) = \theta$

$\tan^{-1}\left(\frac{mg}{\mu mg}\right) = \theta$

$\theta = 68.199$

6. A man of mass 80 kg stands up in a 30 kg canoe of length 5 m. He walks from a point 1 m from one end to a point 1 m from the other end. If resistance to motion of the canoe in the water can be neglected, how far does the canoe move during this process?



$1.09 \times 2 = 2.182\ m$

C.O.M before

$\frac{(80kg)(1m)+(30kg)(2.5m)}{(110kg)} = 1.409$

$2.5 - 1.409 = 1.09$