Reminders 07-28-09:

- **Read Chapter 8; (make sure you thoroughly read through the chapters we cover)**
- **7th Webassign due Wed. 11:59PM**
- **Skip Chapter 13 Due to Time Constraints**
- ***Exam 3 Chapters 6-8 Thursday***
- **Standard assessment p.169 answers D, B, B, C, B, B, D, it goes past ring. THESE ARE GREAT PRACTICE PROBLEMS!!!!!!!!**

Standard assessment p.195 answers C,D,A,C,D #6 800,000km

Objectives:

- **Rotational Kinematics**
- **Torque**
- **Equilibrium Problems**
- **Rotational Dynamics**
- **Moment of Inertia**

#7

a) $$\frac{G M_E m_s}{r^2} = \frac{m_s v^2}{r}$$

$$v = \sqrt{\frac{G M_E}{r}}$$

b) $$v = \frac{2\pi r}{T}$$

$$T = \frac{2\pi r}{v}$$ then convert to hours

8) Weight → gravitational (pull) force exerted by some body on you.

$$\text{Weight} = m_{you}\, g = \frac{G M_p m_{you}}{r^2}$$

9) $$\text{Weight on Earth} = \frac{G M_E m_{you}}{R_E^2} = W_E$$

$$\text{New weight} = \frac{G M_E m_{you}}{r^2} = \frac{1}{2} W_E$$

$$\frac{\frac{1}{2} W_E}{W_E} = \frac{\frac{G M_E m_{you}}{R_E^2}}{\frac{G M_E m_{you}}{r^2}} = \frac{r^2}{R_E^2}$$

$$\frac{1}{2} = \frac{r^2}{R_E^2} \qquad r^2 = \frac{1}{2} R_E^2$$

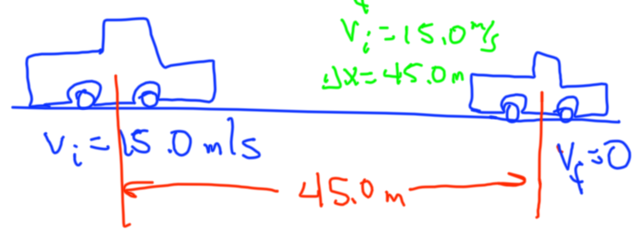
$$r = \frac{1}{\sqrt{2}} R_E$$

- An car is traveling at the rate of 15.0 m/s. The brakes are applied. It comes to a complete stop after traveling 45.0 m. The radius of the wheels on the car are 35.0cm.
  - Calculate α for the wheels of the car?
  - Calculate the stopping time for the car.
  - How many revolutions do the wheels make in stopping?
  - Discuss alternative methods.

Given: $v_f = 0$ $r = .350\,m$

$v_i = 15.0\,m/s$

$\Delta x = 45.0\,m$



Want α

$v_f^2 - v_i^2 = 2a\Delta x$

$-v_i^2 = 2a\Delta x$

$$a = \frac{-v_i^2}{2\Delta x} = \frac{-(15.0\,m/s)^2}{2(45.0\,m)}$$

$$= \frac{-225\,m^2/s^2}{90.0\,m} = -2.50\,m/s^2$$

$a = r\alpha$ $\alpha = \frac{a}{r} = \frac{-2.50\,m/s^2}{0.350\,m}$

$= -7.14/s^2$

$v_f = v_i + at$

$0 = v_i + at$

$-v_i = at$ $t = \frac{-v_i}{a}$

$$t = \frac{-15.0\,m/s}{-2.50\,m/s^2} = \underline{6.00\,s}$$

rev

$\Delta X = 45.0\,m$

$r = 0.350\,m$

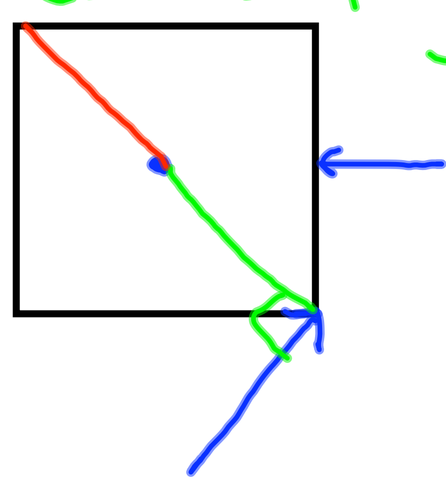
$$\frac{\text{Total dist.}}{\text{Circumference}} = \frac{\Delta X}{2\pi r} = \frac{45.0\,m}{2\pi(.350\,m)}$$

$$= 20.5\,\text{rev}$$

$$\#\,\text{rev} = \frac{\Delta\theta}{2\pi} = \frac{\Delta X}{r}\frac{1}{2\pi} = \frac{\Delta X}{2\pi r}$$

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?

$L = 0.40\,m$



L

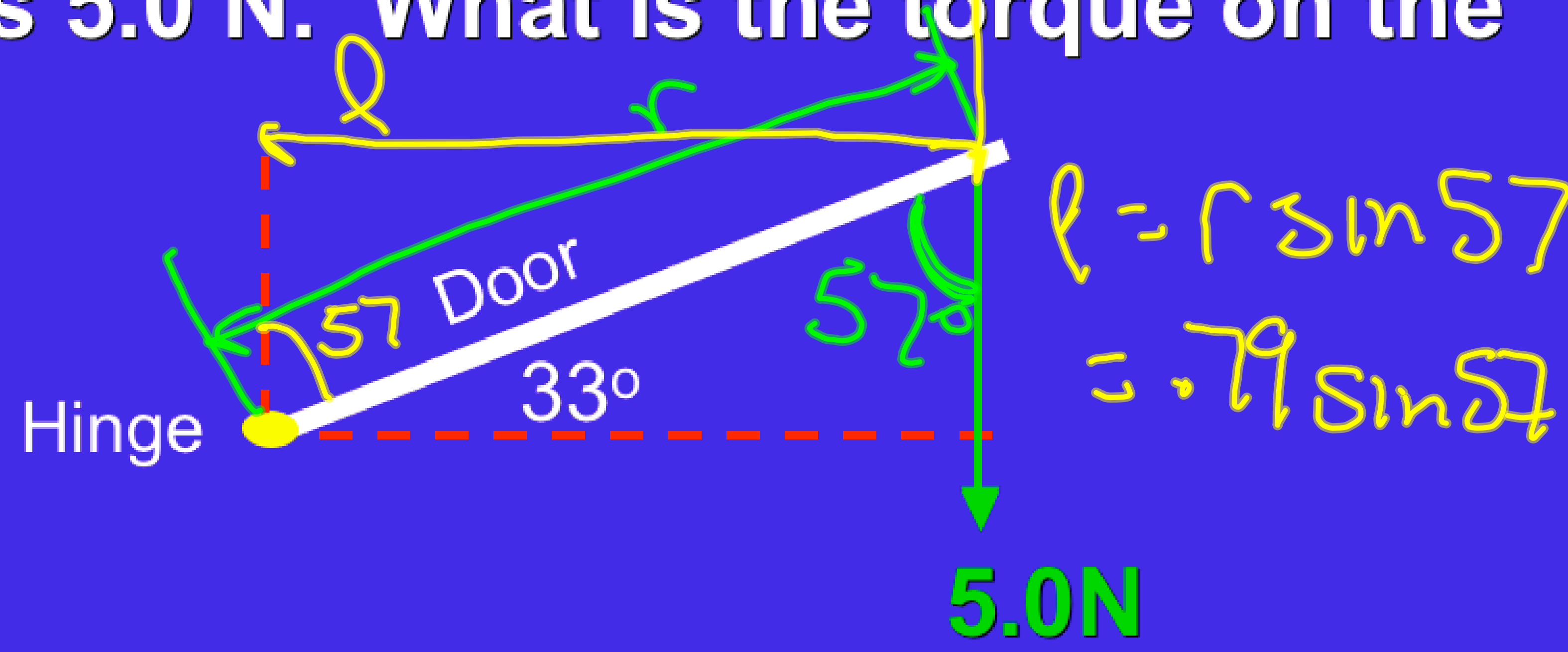
$\tau = F r \sin\theta$

$= 15\left(\frac{\sqrt{2}}{2}\,.40\,m\right)\sin 90$

$= 4.2\ N\,m$

$r = \frac{\sqrt{2}}{2} L$

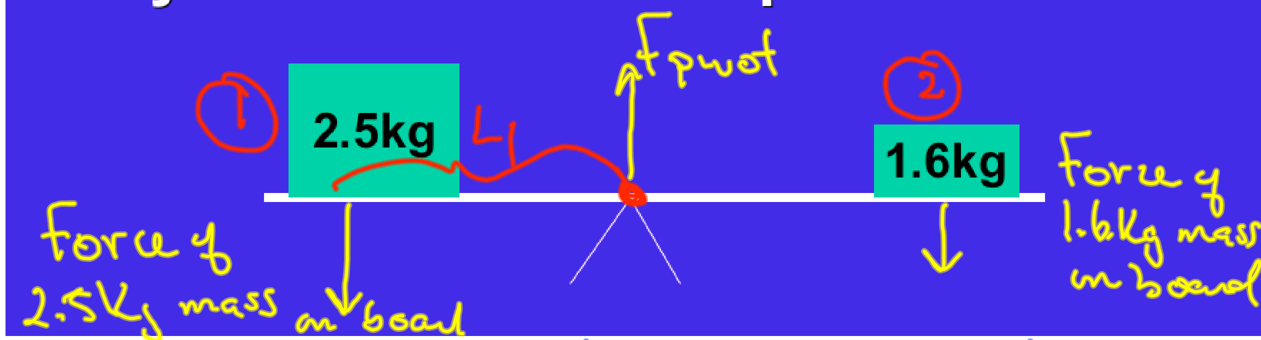
- A string is tied to a door knob 0.79 m from the hinge as shown in the figure. At the instant shown, the force applied to the string is 5.0 N. What is the torque on the door?



$$\tau = F r \sin\theta$$
$$= (5.0\,N)(.79\,m)\sin 57$$

θ is angle between r & F

- 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?



Don't forget weight of rod

$$F_{pivot} - m_1 g - m_2 g = 0$$

$$\sum \vec{\tau} = 0 = +m_1 g (L_1) - m_2 g (L_2) = 0$$

$$m_1 L_1 - m_2 L_2 = 0$$

$$m_1 L_1 = m_2 L_2$$

$$L_2 = \frac{m_1}{m_2} L_1 = \frac{2.5\,kg}{1.6\,kg} 2.0\,m$$

$L_2 = 3.1\,m$ to right of pivot

- 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?

$$F_{pivot} - m_1 g - m_2 g - m_3 g = 0$$

$$\Sigma \tau = 0$$

$$m_1 g L_1 - m_2 g L_2 - m_3 g L_3 = 0$$

$$m_1 L_1 - m_2 L_2 - m_3 L_3 = 0$$

$$m_1 L_1 - m_2 L_2 = m_3 L_3$$

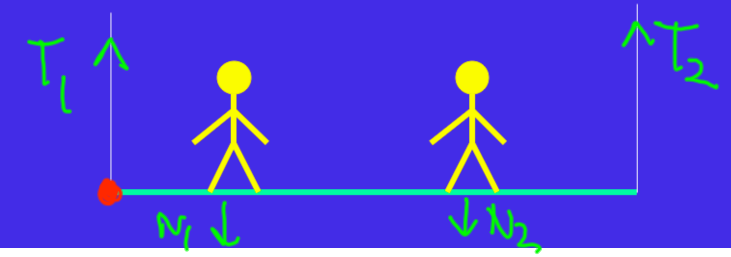
$$L_3 = \frac{m_1 L_1 - m_2 L_2}{m_3}$$

$$= \frac{(2.5kg)(2.0m) - (2.0kg)(0.50m)}{1.6m}$$

$L_3 = 2.5$ m to right of pivot point

Torque

- Two painters are standing on a scaffold supported by two ropes. The length of the scaffold is 9.0m. The painter on the left is standing 2.0m from the rope on the left. The painter on the right is standing 3.0m from rope on the right. If both painters have a mass of 81 kg, calculate the tension in each rope. Assume the plank's mass is negligible.



$$\Sigma F = 0 = T_1 + T_2 - N_1 - N_2 = 0$$

$$= T_1 + T_2 - m_1 g - m_2 g = 0$$

$$= T_1 + T_2 = m_1 g + m_2 g$$

$$\Sigma \tau = 0$$

$$= -m_1 g (2.0\,m) - m_2 g (6.0\,m) + T_2 (9.0)$$

$$m_1 g (2.0\,m) + m_2 g (6.0\,m) = T_2 (9.0\,m)$$

$$T_2 = \frac{m_1 g (2.0\,m) + m_2 g (6.0\,m)}{9.0\,m}$$

$$T_2 = 710\,N$$

$$T_1 = m_1 g + m_2 g - T_2$$

$$= 880\,N$$