Tuesday, September 25/12
Physics 122/121

Student Information Profiles
Luc and Steven

1. Test - Unit 1: Forces (Absent P1: Kayla, Bryce)
   (Absent P6: Jonathon)

2. Anti-Bullying - Lesson #1 - Pink Shirt Day

Stopped Here P1

3. Static Equilibrium Revisited

4. Steps for Solving Static Equilibrium Problems

5. Static Torque Examples

6. Handout - Torque P6 - HW #1-3

Stopped Here P6

7. Textbook - Page 501 #31
   Page 529 #27

8. Another Example (More Complex)

9. Textbook - Page 501 #33 (a)
   Page 529 #28 (a)

10. Handout - More Torque Problems

Torque Problems

Handout - Torque

Textbook - Page 501 #31
Page 529 #27

Textbook - Page 501 #33 (a)
Page 529 #28 (a)

Handout - More Torque Problems

Static Equilibrium - Revisited

An object is in static equilibrium if:

1. $\mathbf{v} = 0$ m/s
2. $\mathbf{F_{net}} = 0$ N
3. $\boldsymbol{\tau}_{\mathbf{net}} = 0$ Nm

Conditions

Steps for Solving Static Equilibrium Problems

1. Study the diagram provided or draw a diagram. $\tau = rF\sin\theta$
2. Label all forces acting on the board, beam, etc.
3. Choose a pivot point. It is helpful to place the pivot point where an unknown force exists. Label the pivot point.
4. Label distances from the pivot point to the forces. (r values)
5. Choose a coordinate system.
6. Resolve a force into its perpendicular components if the force doesn't fit into the chosen coordinate system.
7. Write F_{netx} and F_{nety} equations.
8. Write a τ_{net} equation.
9. Solve the equation(s) for the unknown(s).

<u>Example</u>: A massless board serves as a seesaw for two giant hamsters as shown below. One hamster has a mass of 30 kg and sits 2.5 m from the pivot point. At what distance from the pivot point must a 25 kg hamster place himself to balance the seesaw? (3.0 m)

$\tau = rF\sin\theta$ $\qquad \vec{\tau}_{net} = 0$

$$+\tau_{W_1} - \tau_{W_2} = 0$$

$$r_1 W_1 \sin 90.0^\circ - r_2 W_2 \sin 90.0^\circ = 0$$

$$r_1 m_1 g \sin 90.0^\circ - r_2 m_2 g \sin 90.0^\circ = 0$$

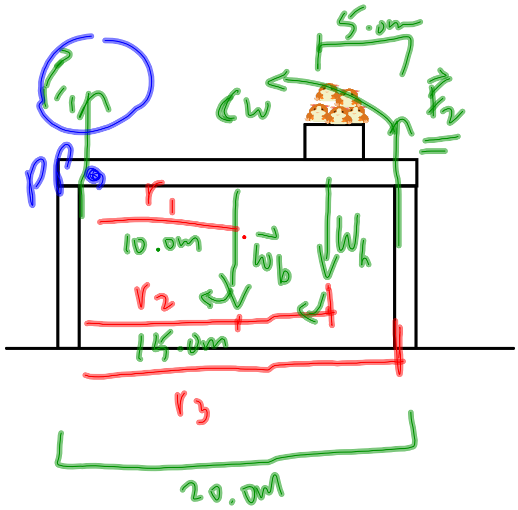
$$r_2 = \frac{r_1 m_1}{m_2}$$

$$r_2 = \frac{(2.5\,m)(30\,kg)}{25\,kg}$$

$$r_2 = 3.0\,m$$

* If a solid object has mass, treat the object as if all its mass were concentrated at a point - the <u>center of mass</u>.

Example: A uniform 1500 kg beam, 20.0 m long, supports a 15000 kg box of hamsters 5.0 m from the right support column. Calculate the magnitude of the forces on the beam exerted by each of the vertical support columns. (1.2×10^5 N, 4.2×10^4 N)



$\vec{\tau_{net}} = 0$

$-\tau_{Wb} - \tau_{Wh} + \tau_{F_2} = 0$

$-r_1 W_b \sin 90.0° - r_2 W_h \sin 90.0° + r_3 F_2 \sin 90.0° = 0$

$-r_1 m_b g - r_2 m_h g + r_3 F_2 = 0$

$$F_2 = \frac{r_1 m_b g + r_2 m_h g}{r_3}$$

$F_2 = 1.2 \times 10^5$ N ⇐

$\vec{F}_{net\,y} = 0$

$+F_1 - W_b - W_h + F_2 = 0$ ⇐

$F_1 - m_b g - m_h g + F_2 = 0$

$F_1 = m_b g + m_h g - F_2$

$F_1 = 4.2 \times 10^4$ N ws