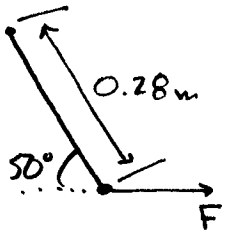
HW #8

9.2.)



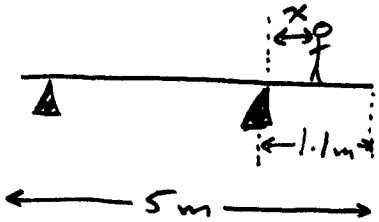
$\tau = 45\ N\cdot m$

$\tau = Fl$

$l = 0.28 \sin 50°$

$F = \frac{\tau}{l} = \frac{45}{0.28 \sin 50} \Rightarrow \underline{F = 210\ N}$

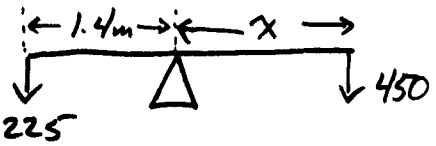
9.14.)



Wt of board = 225 N

Wt of person = 450 N

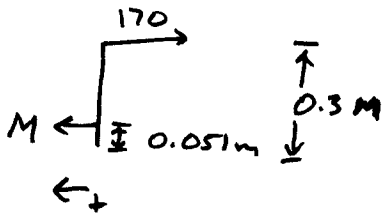
CM of board is in center, can treat as torque prob.



$\Sigma\tau = 1.4(225) - x(450) = 0$

$\Rightarrow 1.4(225) = x(450)$ $\quad x = \frac{1.4(225)}{450} = \underline{0.7\ m}$

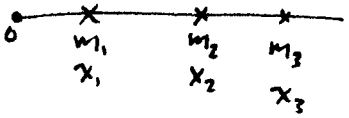
9.19.)



$\Sigma\tau = 0 = 0.051(M) - 170(0.3)$

$M = \frac{(170)\,0.3}{0.051} = \underline{1000\ N\ left}$

9.30.)



$m_1 = 4.0\ kg$ $\quad m_2 = 10\ kg$ $\quad m_3 = 1.5\ kg$

$x_1 = 0.300\ m$ $\quad x_2 = 0.700\ m$ $\quad x_3 = 0.960\ m$

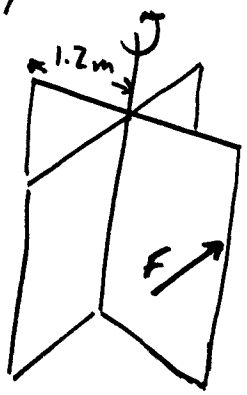
a.) $I_1 = m_1 x_1^2$ $\quad \underline{I_1 = 0.360\ kg m^2}$ $\quad \underline{I_2 = 4.90\ kg m^2}$ $\quad \underline{I_3 = 1.38\ kg m^2}$

b.) $I = I_1 + I_2 + I_3 = \underline{6.64\ kg m^2 = I}$

c.) Smallest mass does <u>not</u> contribute the least because I depends on $m\underline{x^2}$.

HW #8 (pg 2)

9.34.)



$m_{1\,DOOR} = 85\,kg$

$F = 68\,N$

α ?

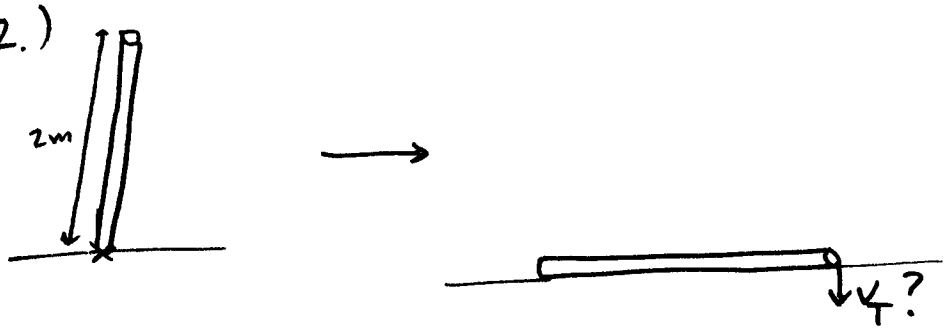
$I_{DOOR} = 4I_{Panel}$ $\qquad I_p = \frac{1}{3}ML^2$

$I_D = \frac{4}{3}ML^2$

$\tau = \alpha I = F\ell$ $\qquad \alpha I_D = FL$

$$\alpha = \frac{FL}{I_D} = \frac{FL}{\frac{4}{3}ML^2} = \frac{3F}{4ML} \qquad \alpha = 0.50\ rad/s^2$$

9.52.)



$E = mgh$

where h is the CM height

$\frac{1}{2}I\omega^2$

no $\frac{1}{2}mv^2$ term because the motion is purely ~~trans~~ rotational

$mgh_{cm} = \frac{1}{2}I\omega^2$; $v_T = r\omega \Rightarrow \omega = \frac{v_T}{r}$; $I = \frac{1}{3}mr^2$

$mgh_{cm} = \frac{1}{2}I\left(\frac{v_T}{r}\right)^2 = \frac{1}{6}m\cancel{r^2}\frac{v_T^2}{\cancel{r^2}}$

$mgh_{cm} = \frac{1}{6}mv_T^2$ $\qquad v_T = \sqrt{6gh_{cm}} = \sqrt{6(9.8)(1)}$

$$v_T = 7.67\ m/s$$