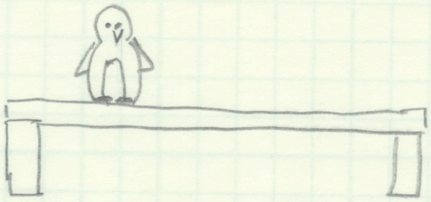
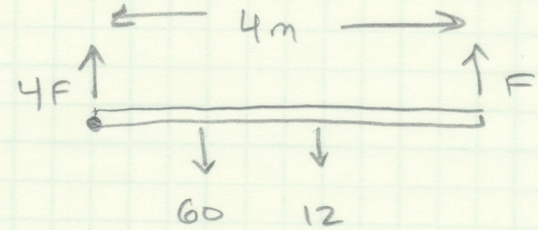
AP PHYSICS C | WEBSHEET 8.2 | SOLUTIONS

1)





STEP ① $\Sigma F_y = ma_y$

$5F - 72 = m\cancel{a}^0$

$F = 14.4$

STEP ② $\Sigma \tau = I\cancel{\alpha}^0$

use pivot @ left

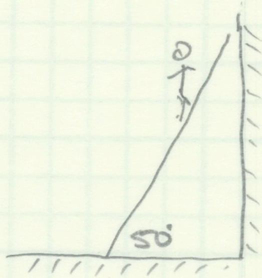
$\tau = rF\sin\theta$ ($\theta = 90°$ here for all)

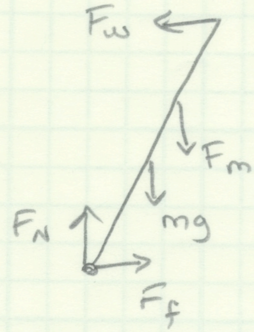
$r(60) + 2(12) - 4(14.4) = 0$

$60r = 33.6$

$$\boxed{r = 0.56 \text{ m}}$$

2)





$\Sigma F_x = m\cancel{a_x}^0$

$F_f - F_w = 0$

$F_f = F_w$ (solve for)

$\Sigma \tau = I\cancel{\alpha}^0$; $\tau = rF\sin\theta$

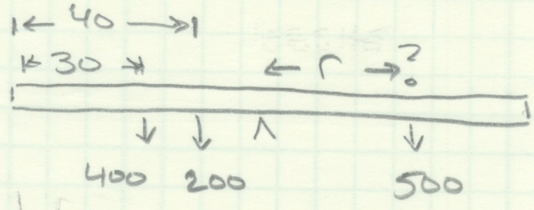
pivot @ bottom $\qquad \theta \neq 90°$

$0 = 4(250)\sin 40° + \frac{2}{3}(8)(850)\sin 40° - 8F_w \sin 50°$

$0 = 642.79 + 2914.0 - 6.13(F_w)$

$$\boxed{F_w = 580.2 \text{ (ish) N}}$$

3)



using torque (although could use X_{cm})

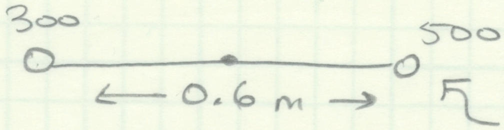
$\Sigma \tau = I\alpha \to 0$ pivot at center $\tau = rF\sin\theta$, $\theta = 90°$

$10(200) + 20(400) - r(500) = 0$

$10\,000 = r(500)$ $r = 20$ cm from center

place 500 @ **70 cm**

4)



point masses

$I = \Sigma mr^2$ (for point masses)

$= (.3)(.3)^2 + (.5)(.3)^2 =$ **$0.072\ kg\,m^2$**

5)

$\tau = I\alpha \to \alpha = \frac{\tau}{I} = \frac{0.3}{0.68} = 0.441$

$\Delta\theta = \omega_0 t + \frac{1}{2}\alpha t^2$ ($\omega_0 \to 0$)

$\Delta\theta = \frac{1}{2}(0.441)(7)^2 = 10.8$ rad

$\Delta\theta = 10.8\text{ rad} \cdot \frac{1\text{ rev}}{2\pi\text{ rad}} =$ **1.72 rev**

6)

$\tau = I\alpha$

$\alpha = \frac{\Delta\omega}{t} = \frac{-6.8}{14}$

$\alpha = -0.486 \frac{rad}{s^2}$

$\tau = (0.26)(-0.486)$

$\boxed{\tau = -0.126 \text{ m}\cdot\text{N}}$

*if the question asked for force we would have to assume 90° angle

$\tau = rF \sin 90$

$F_f = \frac{\tau}{r}$

but we only needed torque, so we did not use the radius.