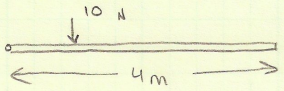
AP physics C Websheet 8.1 solution guide

AP C WEBSHEET 8.1 TORQUE

1) 

rotational equilibrium

$\alpha = 0 \quad \therefore \Sigma\tau = 0$

$\Sigma\tau = I\alpha^{\nearrow 0}$

$r_1 F_1 \sin\theta_1 + r_2 F_2 \sin\theta = 0$

$(1.4)(10)1 = -r_2(6)\sin 40$

$\boxed{-3.63\text{m} = r_2}$

(the negative means one of two things, either on the opposite side of the pivot or on the other side of the rod. EITHER way, the second force tries to rotate the rod ccw.)

2) $\Sigma\tau = \tau_1 + \tau_2$

$= r_1 F_1 \sin\theta_1 + -r_2 F_2 \sin\theta_2$ ← b/c rotates opposite direction

$= 2(400)1 - 2(360)1$ (both F's assumed ⊥)

$= 800 - 720$

$\boxed{\tau_{NET} = 80\ \text{m}\cdot\text{N}}$

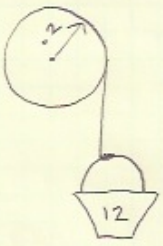
(m·N is not = Joules Torque is not energy)

3) $\Sigma\tau = I\alpha$

$\alpha = \frac{\tau_{NET}}{I} = \frac{80}{450}$

$\boxed{\alpha = 0.18\ \frac{\text{rad}}{\text{s}^2}}$

4)



Since $a = 1.5\ m/s^2$, $\alpha = \frac{a}{r}$

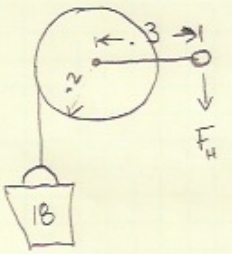
$\alpha = \frac{1.5}{.2} = 7.5\ \frac{rad}{s^2}$

$\Sigma\tau = I\alpha$

$\tau_{NET} = 4(7.5) = \boxed{30\ m\cdot N}$

(Hint: remember that $T \neq mg$ since the bucket has an F_{net} up.)

5)



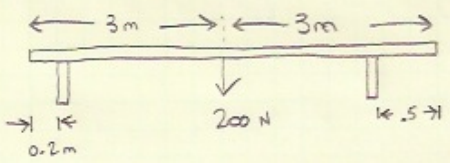
$\Sigma\tau = I\alpha$ $\quad a = 0 \therefore \alpha = 0$

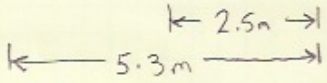
$\Sigma\tau = 0$

$-.2(180) - .3(F_H) = 0$

$F_H = \frac{+.2(180)}{.3} = \boxed{120\ N}$

6)





$\Sigma\tau = I\alpha = 0$

$\Sigma\tau = 0$ make right pier the pivot.

$r_1 F_1 \sin\theta_1 = r_2 F_2 \sin\theta_2$

$2.5(200) = 5.3(F_{NL})$

$\boxed{94.3\ N = F_{NL}}$

(Notice it is less than half the total weight)