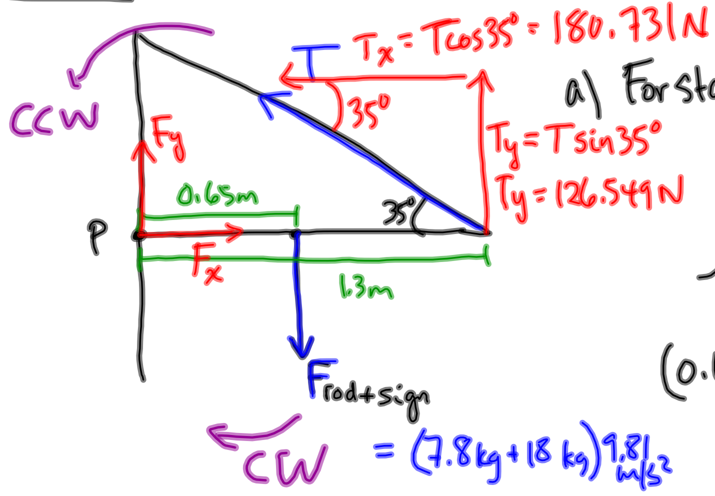
More Static Equilibrium + Torque

MP|498



$= (7.8 kg + 18 kg) 9.81 m/s^2$

$\doteq 253.098 N$

a) $T = ?$

b) $\vec{F}_{wall} = ?$

a) For static Equilibrium $\vec{\tau}_{net} = 0$!!

$$\Sigma \tau_{cw} = \Sigma \tau_{ccw}$$

$$\tau_{rod+sign} = \tau_T$$

$$(0.65 m)(253.098 N) = (1.3 m) T (\sin 35°)$$

$$T = \frac{(0.65 m)(253.098 N)}{(1.3 m)(\sin 35°)}$$

$$T \doteq 2.2 \times 10^2 N$$

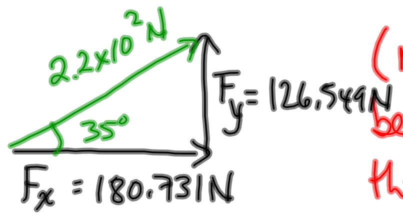
b) $\vec{F}_{net} = 0$.

Horizontally: $F_x = T_x = 180.731 N$

Vertically: $F_y + T_y = 253.098 N$

$F_y = 253.098 N - 126.549 N$

$F_y = 126.549 N$



(Note that F_y and T_y are the same ONLY because of the symmetry in this problem and all the weight of the sign and the rod is centred on the rod)

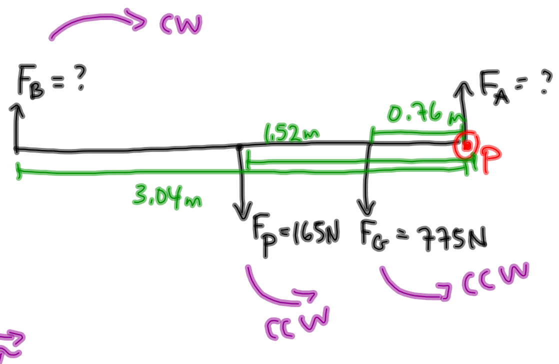
The force at P is $2.2 \times 10^2 N$ [outward and 35° up]

(Note that this "matches" the tension due to the symmetry)

A Bridge Problem

$F_{G\,cabin} = 775N$

$F_{plank} = 85N + 80N = 165N$



① $\vec{\tau}_{net} = 0$

$$\Sigma\tau_{cw} = \Sigma\tau_{ccw}$$

$$\tau_B = \tau_p + \tau_G$$

$$(3.04m)F_B = (1.52m)(165N) + (0.76m)(775N)$$

$$(3.04m)F_B = 250.8\,N\cdot m + 589\,N\cdot m$$

$$F_B = \frac{839.8N}{3.04N}$$

$$\boxed{F_B \doteq 276N}$$

255N

② $\vec{F}_{net} = 0$

$$F_A + F_B = F_p + F_G$$

$$F_A = F_p + F_G - F_B$$

$$F_A = 165N + 775N - 276N$$

$$F_A \doteq 664N$$

705N

To Do

① FOP | §6-3 | PP 2-7

② PP | 501