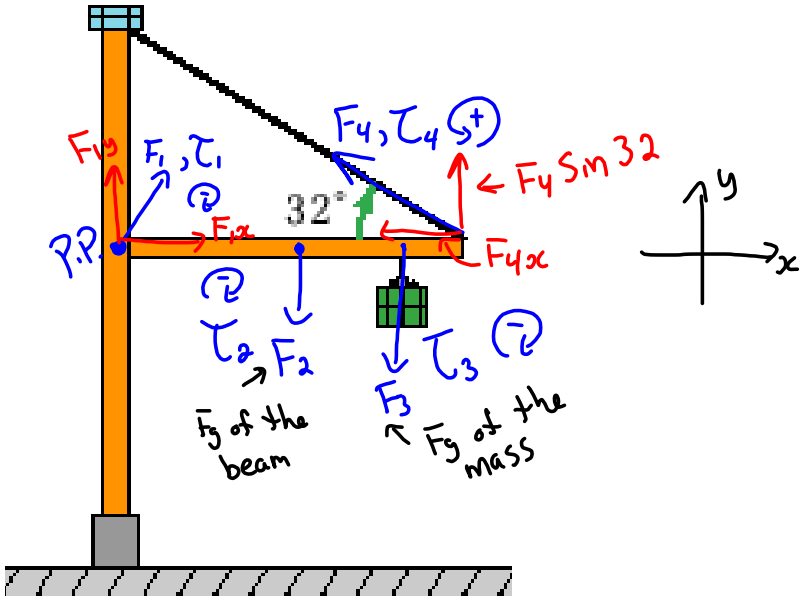
The 355 kg container is hanging from a cable that is 6.15 m out on the 7.50 m arm. The arm has a mass of 345 kg. A cable that is attached at its end makes an angle of 32° with the horizontal.

1. Calculate the tension in the cable (8582 N).
2. Calculate the net force on the hinge.



1. Calculate the tension in the cable (8582 N).

$$\tau_{net} = \tau_1 + \tau_2 + \tau_3 + \tau_4$$

$$0 = -(0)(F_1) - (3.75)(345)(9.81) - (6.15)(355)(9.81) + (7.5)(F_4)\sin 32^\circ$$

$$0 = 0 - 12691 - 21418 + 3.97F_4$$

$$34109 = 3.97F_4$$

$$\boxed{8592\ N = F_4}$$

2. Calculate the net force on the hinge.

$F_{net_y} = \sum$ Forces in y-dir $= 0\ N$

$F_{net_y} = F_{1y} + F_2 + F_3 + F_{4y}$

$0 = F_{1y} - (345)(9.81) - (355)(9.81) + (8592)\sin 32$

$0 = F_{1y} - 3384 - 3483 + 4553$

$2314\ N = F_{1y}$

$F_{net_x} = \sum$ Forces in x-dir $= 0\ N$

$F_{net_x} = F_{1x} + F_{4x}$

$0 = F_{1x} - 8592\cos 32$

$0 = F_{1x} - 7286$

$7286 = F_{1x}$

Find F_1

$F_1^2 = F_{1y}^2 + F_{1x}^2$

$F_1 = \sqrt{(2314)^2 + (7286)^2}$

$F_1 = 7645\ N$

$\theta = \tan^{-1}\left|\frac{F_{1y}}{F_{1x}}\right|$

$\theta = \tan^{-1}\frac{2314}{7286} = 18^\circ$

$F_1 = 7645\ N$ @ 18° up from beam

Attachments

balancing-act_en.jar