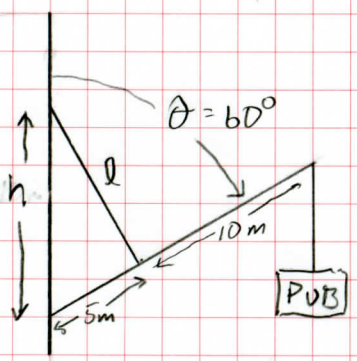
T6 PR 12.68

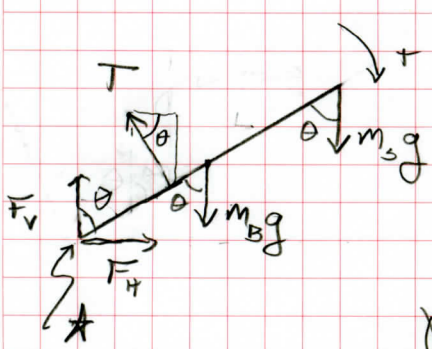


A PUB SIGN HANGS AS SHOWN

a) FIND EXPRESSIONS FOR THE TENSION IN THE CABLE AND AND FORCE EXERTED ON THE BEAM BY THE WALL

b) EVALUATE FOR $m_B = 8\,kg$ AND $m_s = 35\,kg$

FBD:



a) APPLY NSL TO FORCES

$$\Sigma F_H = m\cancel{a_H}^{\,0} \qquad \Sigma F_V = m\cancel{a_V}^{\,0}$$

$$F_H - T\cos\theta = 0 \qquad T\sin\theta + F_V - (m_B + m_s)g = 0$$

$$F_H = T\cos\theta \qquad F_V = (m_B + m_s)g - T\sin\theta$$

APPLY NSL TO TORQUES

$$\Sigma \tau_A = I\cancel{\alpha}^{\,0}$$

$$(h)(m_s g)\sin\theta + \left(\tfrac{1}{2}h\right)(m_B g)\sin\theta - \left(\tfrac{1}{3}h\right)T = 0$$

$$\boxed{T = 3\left(m_s + \tfrac{1}{2}m_B\right)g\sin\theta}$$

THUS $\boxed{F_H = 3\left(m_s + \tfrac{1}{2}m_B\right)g\sin\theta\cos\theta}$

$$\boxed{F_V = \left[(m_s + m_B) - 3\left(m_s + \tfrac{1}{2}m_B\right)\sin^2\theta\right]g}$$

b) $T = 3(35+4)(9.8)\sin(60) = \boxed{992\,N = T}$

$F_H = 3(39)(9.8)\sin(60)\cos(60) = \boxed{496\,N = F_H}$

$F_V = \left[(43) - 3(39)\sin^2(60)\right](9.8) = \boxed{-495\,N = F_V}$

Σ So F_V is Down!