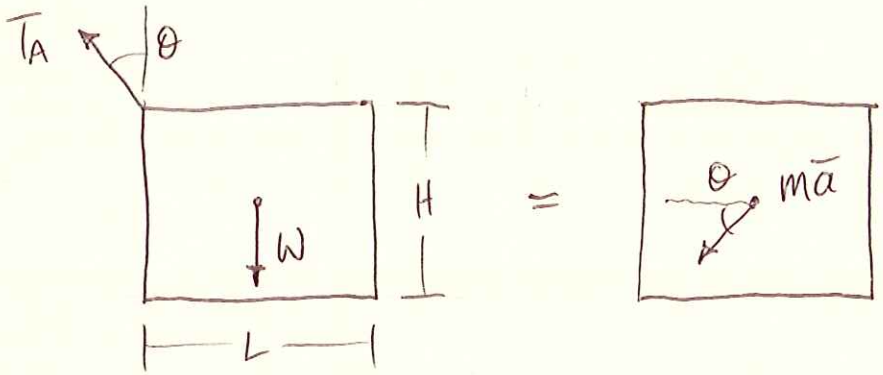
PROB. 16-15

$m = 5^{kg}$, FIND θ FOR WHICH BOTH T_A AND $T_B > 0$:
OCCURS WHEN $T_B = 0$



$$\vec{T}_A = T_A\left[(-\sin\theta)\hat{i} + (\cos\theta)\hat{j}\right], \quad \vec{W} = (-mg)\hat{j}$$

$$m\bar{a} = ma\left[(-\cos\theta)\hat{i} + (-\sin\theta)\hat{j}\right]$$

$$\Sigma F_x = ma_x: \; -T_A\sin\theta = -ma\cos\theta \Rightarrow ma\cos\theta = T_A\sin\theta$$

$$\Sigma F_y = ma_y: \; T_A\cos\theta - mg = -ma\sin\theta \Rightarrow ma\sin\theta = mg - T_A\cos\theta$$

$$\Sigma \vec{M}_A = \Sigma(\vec{M}_A)_{EFF} \;\; +\circlearrowleft: \; -\frac{L}{2}\cdot mg = -\frac{L}{2}\cdot(ma\sin\theta) - \frac{H}{2}\cdot(ma\cos\theta)$$

$$Lmg = L(mg - T_A\cos\theta) + H(T_A\sin\theta)$$

$$0 = -LT_A\cos\theta + HT_A\sin\theta$$

$$0 = -L + H\cdot\frac{\sin\theta}{\cos\theta}$$

$$\tan\theta = \frac{L}{H} = \frac{0.3}{0.24} \Rightarrow \boxed{\theta = 51.34^\circ}$$