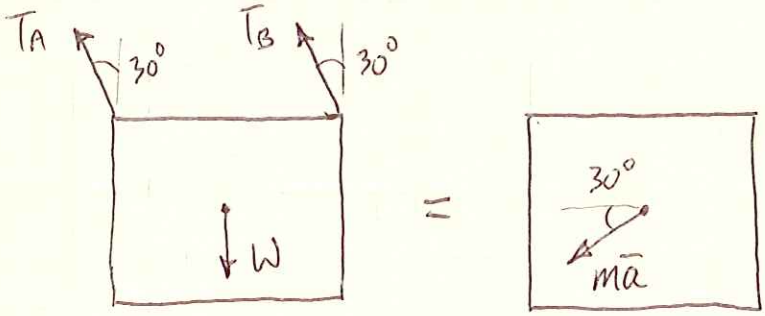
PROB. 16-14 $m = 5^{kg}$

$\theta = 30°$, FIND a, T_A, T_B : CURVILINEAR TRANSLATION



$$\vec{T}_A = T_A\left[(-\sin 30°)\hat{i} + (\cos 30°)\hat{j}\right] = T_A\left[(-0.5)\hat{i} + (0.866)\hat{j}\right]^N$$

$$\vec{T}_B = T_B\left[(-0.5)\hat{i} + (0.866)\hat{j}\right]^N$$

$$\vec{W} = \left[-(5^{kg})(9.81\ \tfrac{m}{s^2})\right]\hat{j} = (-49.05)\hat{j}\ ^N$$

$$m\bar{a} = (5^{kg})a\left[(-\cos 30°)\hat{i} + (-\sin 30°)\hat{j}\right]$$

$$m\bar{a} = a\left[(-4.33)\hat{i} + (-2.5)\hat{j}\right]^N$$

$$\Sigma F_x = ma_x : \quad -0.5\,T_A - 0.5\,T_B = -4.33a$$

$$T_A = -T_B + 8.66a$$

$$\Sigma F_y = ma_y : \quad 0.866\,T_A + 0.866\,T_B - 49.05 = -2.5a$$

$$T_A = -T_B + 56.64 - 2.887a$$

$$-T_B + 8.66a = -T_B + 56.64 - 2.887a$$

$$\boxed{a = 4.905\ \tfrac{m}{s^2} \searrow 30°}$$

PROB. 16-14 CONT.

FIND TENSION IN ROPES:

$\Sigma \vec{M}_A = \Sigma (\vec{M}_A)_{EFF}$ $\circlearrowleft +$:

$$(0.3^m)(0.866\, T_B) - \tfrac{1}{2}(0.3^m)(49.05^N) = -\tfrac{1}{2}(0.24^m)(4.33)(4.905)$$
$$-\tfrac{1}{2}(0.3^m)(2.5)(4.905)$$

$$\boxed{T_B = 11.43^N}$$

$$T_A = -11.43 + 8.66(4.905) \boxed{= 31.05^N}$$