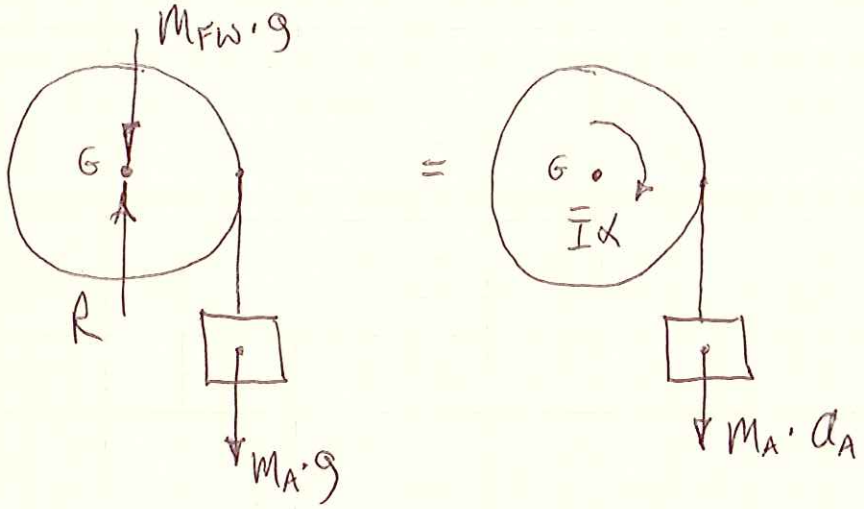
PROB. 16-32

$r = 0.5^{m}$, $m_{FW} = 120^{kg}$, $k = 0.375^{m}$, $m_A = 15^{kg}$, $v_{A,0} = 0$, FIND a_A, v_A AFTER BLOCK A MOVES $(x_A - x_{A,0}) = 1.5^{m}$.



$$\Sigma \vec{M}_G = \Sigma (\vec{M}_G)_{EFF} \quad +\circlearrowleft: \; -(m_A g) r = -\bar{I}\alpha - (m_A a_A) r$$

$\bar{I} = k^2 \cdot m_{FW}$ MASS MOMENT OF INERTIA

$\not{a}_A = r\alpha$, $\alpha = \dfrac{a_A}{r}$

$$m_A g r = (k^2 m_{FW})\left(\frac{a_A}{r}\right) + m_A a_A r$$

$$a_A \left(\frac{k^2 m_{FW}}{r} + m_A r \right) = m_A g r$$

$$a_A = \frac{m_A g r^2}{(k^2 m_{FW} + r^2 m_A)} = \frac{(15^{kg})(9.81 \frac{m}{s^2})(0.5^{m})^2}{[(0.375^{m})^2 (120^{kg}) + (15^{kg})(0.5^{m})^2]}$$

$$\boxed{a_A = 1.784 \frac{m}{s^2} \downarrow}$$

VELOCITY OF A: $v_A^2 = (v_A)_0^2 + 2 a_A (x_A - x_{A,0})$

$$v_A = \sqrt{2(1.784 \frac{m}{s^2})(1.5^{m})} \quad \boxed{= 2.313 \frac{m}{s} \downarrow}$$