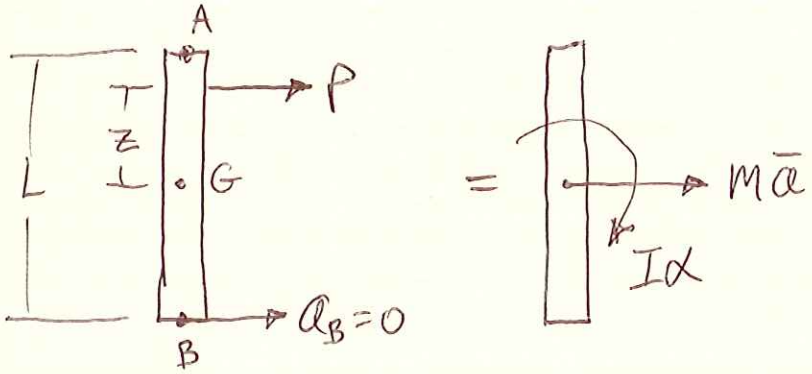
PROB. 16-49

$P = 0.25^{\text{LB}}$, $W = 1.75^{\text{LB}}$, FIND z FOR $a_B = 0$ AND a_A



$\Sigma F_x = ma_x$: $P = m\bar{a}$, $\bar{a} = \frac{P}{m} = \frac{Pg}{W}$

$\Sigma \vec{M}_G = \Sigma (\vec{M}_G)_{EFF}$ $+\circlearrowleft$: $-zP = -I\alpha$, $\alpha = \frac{zP}{I}$

$I = \frac{1}{12} mL^2 = \frac{1}{12}\left(\frac{W}{g}\right)L^2$

$$\alpha = \frac{zP}{\frac{1}{12}\left(\frac{W}{g}\right)L^2} = \frac{12gzP}{WL^2}$$

$$a_B = \bar{a} - \left(\frac{L}{2}\right)\alpha = \frac{Pg}{W} - \left(\frac{L}{2}\right)\left(\frac{12gzP}{WL^2}\right) = 0$$

$\frac{6z}{L} = 1$, $z = \frac{L}{6} = \frac{(3\text{ ft})}{6} = \boxed{= \frac{1}{2}\text{ ft}}$

$$a_A = \bar{a} + \left(\frac{L}{2}\right)\alpha = \frac{Pg}{W} + \left(\frac{L}{2}\right)\left(\frac{12gzP}{WL^2}\right)$$

$$a_A = \frac{Pg}{W}\left(1 + \frac{6z}{L}\right) = \frac{(0.25^{\text{LB}})(32.2\ \frac{\text{ft}}{\text{s}^2})}{(1.75^{\text{LB}})}\left[1 + \frac{6(\frac{1}{2}\text{ ft})}{(3\text{ ft})}\right]$$

$$\boxed{a_A = 9.2\ \frac{\text{ft}}{\text{s}^2} \longrightarrow}$$