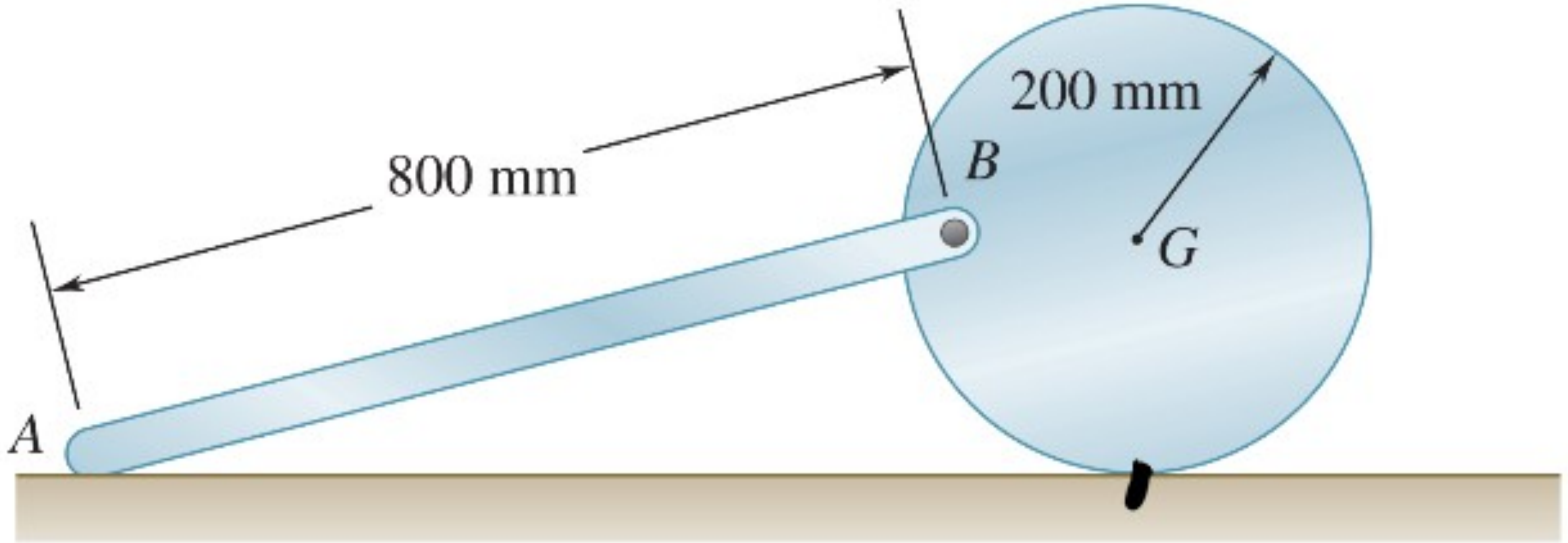
The 200-mm-radius disk rolls without sliding on the surface shown. Knowing that the distance BG is 160 mm and that at the instant shown the disk has an angular velocity of 8 rad/s counterclockwise and an angular acceleration of 2 rad/s^2 clockwise, determine the acceleration of A.



$$\vec{a}_A = \vec{a}_B + \vec{a}_{A/B} = \vec{a}_B + \alpha k \times \vec{r}_{B/A} - \omega^2 \vec{r}_{B/A}$$

$$\vec{a}_B = \vec{a}_G + \vec{a}_{B/G}$$

$$V_B = 8 \ \frac{rad}{s} \ 160 \ mm \downarrow$$

$$\alpha = \frac{(a_B)_t}{AB}$$

1. a_G
2. V_B
3. a_B
4. ω AB
5. α AB
6. a_A

A uniform rod of length L and mass m is supported as shown. If the cable attached at end B suddenly breaks, determine (a) the acceleration of end B, (b) the reaction at the pin support.

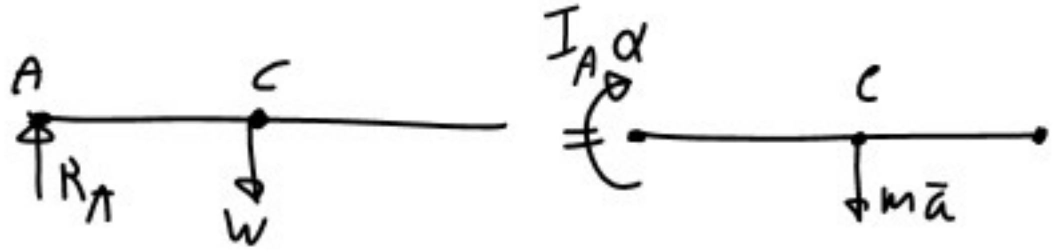
$$\Sigma F = m\bar{a}$$

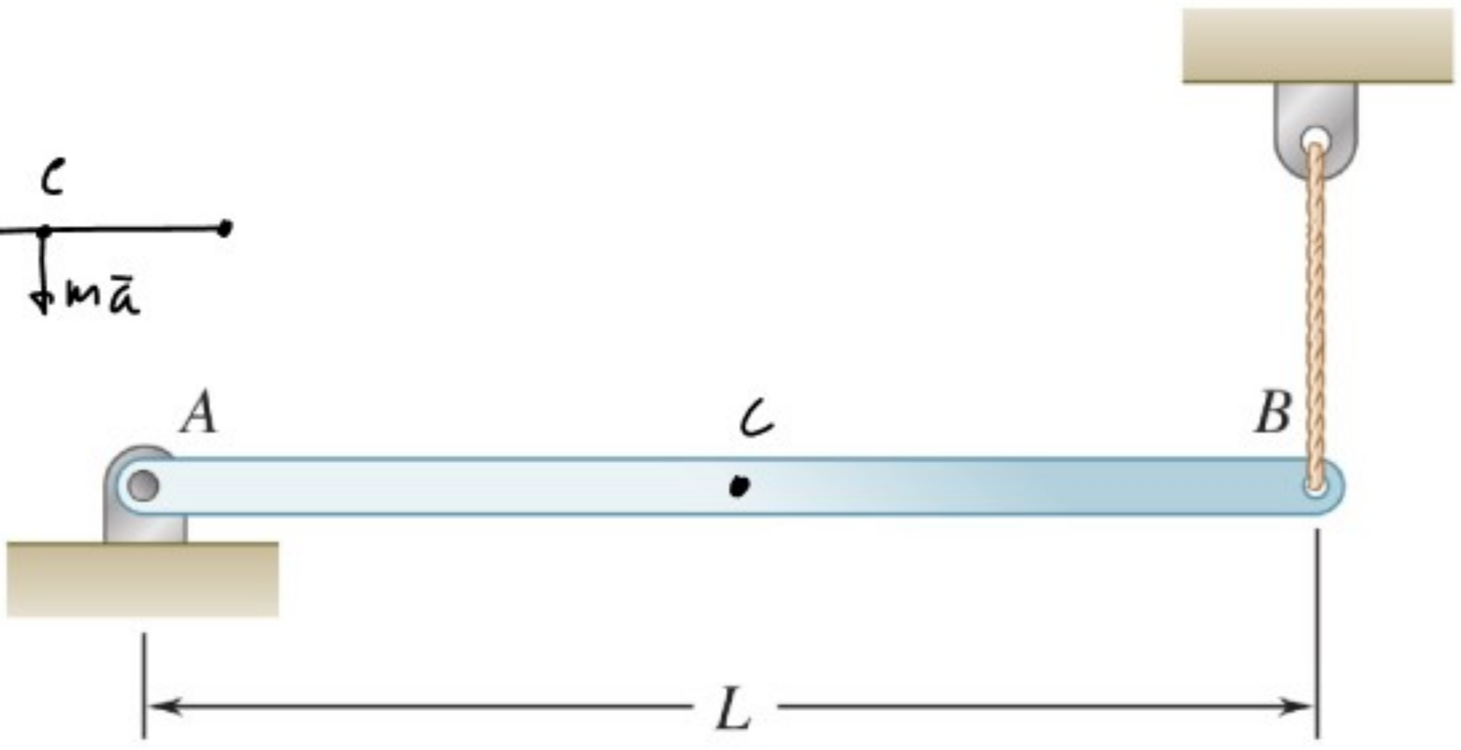
$$I_c = \frac{1}{12} mL^2$$

$$I_A = I_c + md^2$$

$$= \frac{1}{12} mL^2 + m\left(\frac{L}{2}\right)^2$$

$$= \left(\frac{1}{12} + \frac{1}{4}\right) mL^2 = \frac{mL^2}{3}$$





$$\Sigma M_A = I_A \alpha$$

$$-\frac{L}{2} W = I_A \alpha$$

$$-\frac{\cancel{L}}{2} \cancel{m} g = \frac{1}{3} \cancel{m} L^{\cancel{2}} \alpha \Rightarrow \alpha = \frac{-3}{2}\frac{g}{L}$$

$$a_B = \alpha L = \frac{-3}{2}\frac{g}{\cancel{L}}\cancel{L} = \boxed{-\frac{3}{2} g}$$

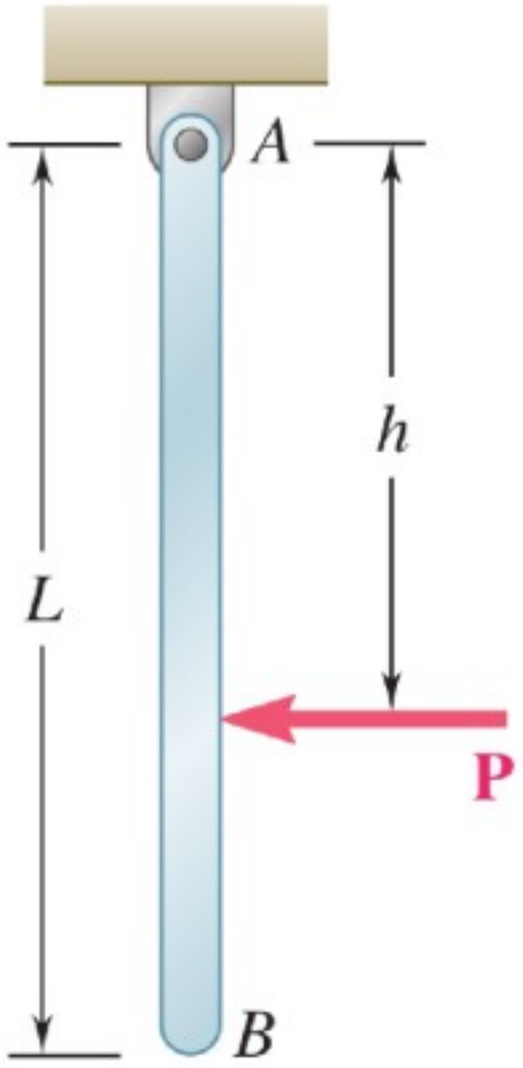
$$\bar{a} = \alpha \frac{L}{2} = \frac{-3}{4} g$$

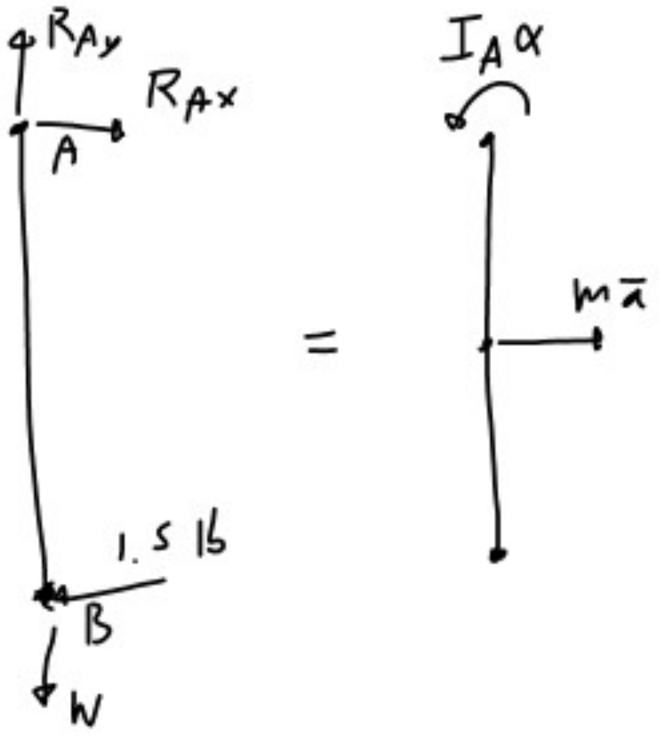
$$\Sigma F_y = m\bar{a}$$

$$R_A - W = m\left(-\frac{3}{4} g\right)$$

$$R_A = m\left(-\frac{3}{4} g\right) + mg = \boxed{\frac{mg}{4}}$$

A uniform slender rod of length $L = 36$ in. and weight $W = 4$ lb hangs freely from a hinge at A. If a force **P** of magnitude 1.5 lb is applied at B horizontally to the left ($h = L$), determine (a) the angular acceleration of the rod, (b) the components of the reaction at A.





$$\Sigma M_A = I_A \alpha$$