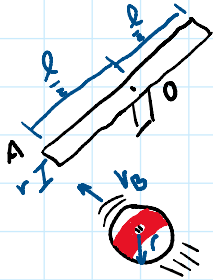


Beginner Impact  
Inspiration: 19-43 Hibbeler

Video

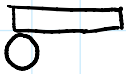
Double check



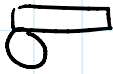
A Rube Goldberg Machine utilizes a pool ball and a slender 2m long rod. If the pool ball has a mass  $m = 0.16 \text{ kg}$  while the rod has mass  $m = 1 \text{ kg}$ , determine the angular velocity of the rod when the pool ball strikes it at  $v = 3 \text{ m/s}$ . The pool ball has radius  $r = 0.025 \text{ m}$  and the coefficient of restitution is  $e = 0.8$

$$I_{\text{rod}} = \frac{1}{12} m l^2 = \frac{1}{12} (1)(2)^2 = \frac{1}{3} \quad \text{Pinned at O} \therefore \omega_2 = \frac{v_{A2}}{\frac{l}{2}} = \frac{v_{A2}}{1}$$

State 1 Right before



State 2 Right after



$$\sum (H_0)_1 = \sum (H_0)_2 \quad H_0 = H_C + r_{C/O} m v$$

$$0 + m_b v_b \frac{l}{2} + 0 = I_{\text{rod}} \omega_2 + m_b v_{b2} \frac{l}{2}$$

$$(0.16)(3)(1) = \frac{1}{3} \omega_2 + (0.16) v_{b2} (1)$$

$$e = \frac{v_{A2} - v_{B2}}{v_{B1} - v_{A1}}$$

$$0.8 = \frac{v_{A2} - v_{B2}}{3 - 0}$$

$$2.4 = v_{A2} - v_{B2}$$

$$0.48 = \frac{1}{3} v_{A2} + 0.16 v_{B2}$$

$$0.48 = \frac{1}{3} (2.4 + v_{B2}) + 0.16 v_{B2}$$

$$v_{B2} = -0.646 \text{ m/s}$$

$$v_{A2} = 1.751351$$

$$\omega_2 = 1.751351 \text{ rad/s}$$