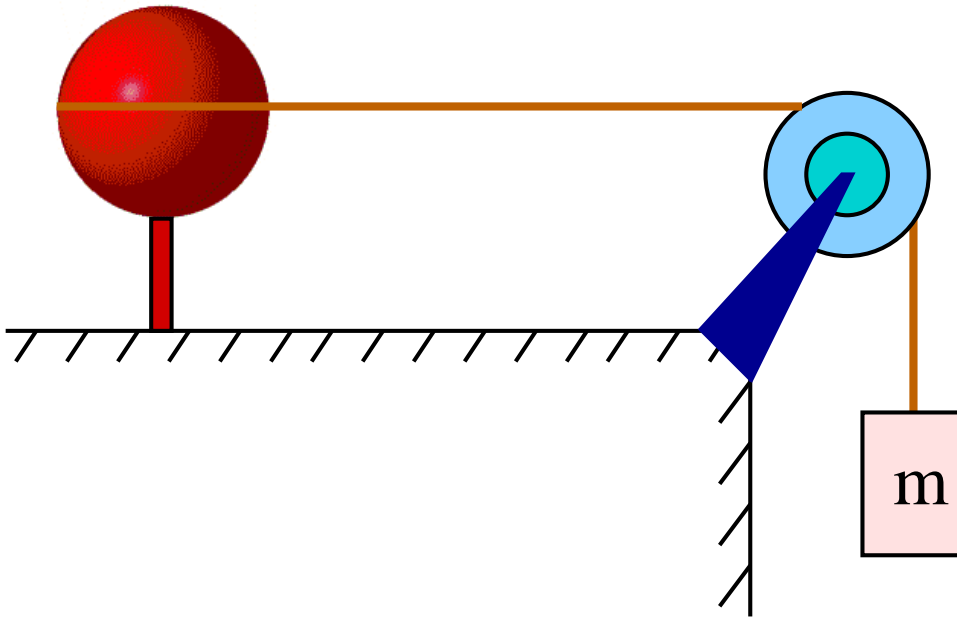


Ex: Consider the system shown. What is the speed of the box of mass m after it has fallen a distance h from rest?



- From conservation of mechanical energy: $E_i = E_f$

$$mgh = \frac{1}{2}mv^2 + \frac{1}{2}I_s\omega_s^2 + \frac{1}{2}I_p\omega_p^2$$

Use the following information:

$$I_s = \frac{2}{5}M_sR_s^2 \quad I_p = \frac{1}{2}M_pR_p^2$$

and note that $\omega_s = v/R_s$ and $\omega_p = v/R_p$.

$$v = \sqrt{\frac{2gh}{1 + \frac{2M_s}{5m} + \frac{M_p}{2m}}}$$