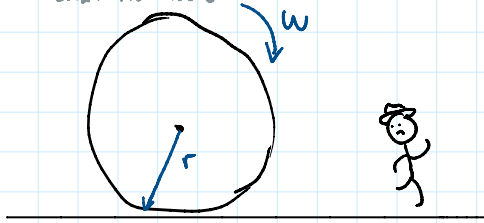


20-R-WE-DK-9

Beginner Kinetic Energy

Inspiration: None



Montana James is shooting a scene in which he is running away from a foam cylinder (it will be replaced by a boulder in post-production). If the cylinder has mass $m = 35 \text{ kg}$ and a radius $r = 1.8 \text{ m}$, calculate the cylinder's total kinetic energy. Assume the cylinder rolls without slipping at an angular velocity of $\omega = 4 \text{ rad/s}$.

$$T = \frac{1}{2}mv_c^2 + \frac{1}{2}I_c\omega^2$$

Rolling without slipping $\Rightarrow v = \omega r$

$$v = (4)(1.8) = 7.2$$

$$I_c = \frac{1}{2}mr^2 = \frac{1}{2}(35)(1.8)^2 = 56.7$$

$$T = \frac{1}{2}(35)(7.2)^2 + \frac{1}{2}(56.7)(4)^2 = \boxed{1360.8 \text{ J}}$$