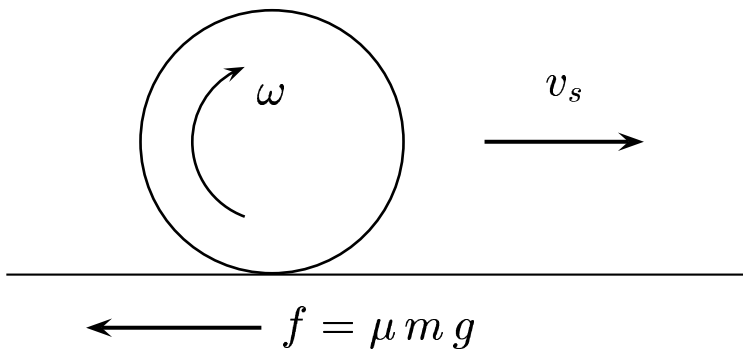


A bowling ball has a mass m , a radius r , and a coefficient of kinetic friction μ . At $t = 0$, $\omega = 0$, $v_s = v_0$.



Find the translational deceleration, a_s , where $v_s(t) = v_0 - a_s t$, and tangential acceleration, $a_\theta = \alpha r$; such that, $v_\theta(t) = \omega r = a_\theta t$.

- A) $a_s = g$ and $a_\theta = \frac{f r}{I}$.
- B) $a_s = g$ and $a_\theta = \frac{f r^2}{I}$.
- C) $a_s = \mu g$ and $a_\theta = \frac{f r}{I}$.
- D) $a_s = \mu g$ and $a_\theta = \frac{f r^2}{I}$.

Translational deceleration

$$f = m a, \quad a_s = \frac{f}{m} = \frac{\mu m g}{m} = \mu g.$$

Tangential acceleration

$$\tau = f r = I \alpha, \quad a_\theta = \alpha r = \frac{f r^2}{I} = \frac{\mu m g r^2}{\frac{2}{5} m r^2} = \frac{5}{2} \mu g.$$

Answer **D**.