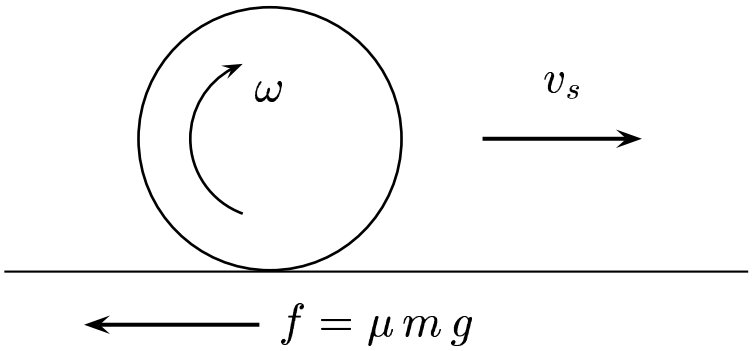
A bowling ball has a mass m, a radius r, and a coefficient of kinetic friction μ. At $t = 0$, $\omega = 0$, $v_s = v_0$.



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 $a_\theta = \dfrac{f r}{I}$.

B) $a_s = g$ and $a_\theta = \dfrac{f r^2}{I}$.

C) $a_s = \mu g$ and $a_\theta = \dfrac{f r}{I}$.

D) $a_s = \mu g$ and $a_\theta = \dfrac{f r^2}{I}$.

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**.