1 • Derivation

$$U = K_{mech} + K_{rot}$$
$$mgh = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$$
$$mgh = \frac{1}{2}mv^2 + \frac{1}{2}I\frac{v^2}{r^2}$$
$$mgh - \frac{1}{2}mv^2 = \frac{1}{2}I\frac{v^2}{r^2}$$

By graphing $mgh - \frac{1}{2}mv^2$ on the y-axis and $\frac{v^2}{r^2}$ on the x-axis, the constant slope of $\frac{1}{2}I$ can be obtained, which can be doubled to obtain I.

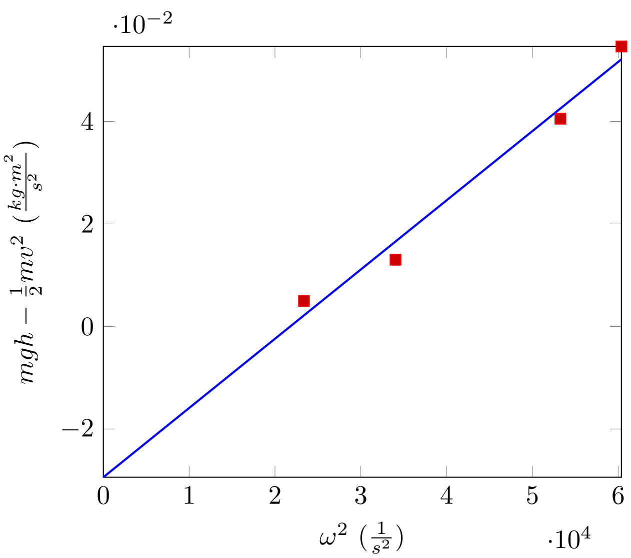
Having measured the radius and the mass, the theoretical moment of inertia was found using $I = \frac{2}{5}mr^2$:

Radius (m)	Mass (kg)	Theoretical Moment of Inertia (kgm^2)
$1.27 \cdot 10^{-2}$	$6.7 \cdot 10^{-2}$	$4.32 \cdot 10^{-6}$

2 • Procedure

1. Mass ball and measure ball radius.
2. Attach one end of ramp to pole.
3. Release ball and record time for ball to reach ground.
4. Repeat for three trials at same pole attachment height to obtain average time.
5. Repeat for four different pole attachment heights.

3 • Results



The slope of the graph is $1.35 \cdot 10^{-6} \frac{kg \cdot m^2}{s^2}$, which can be doubled to obtain an I value of $2.70 \cdot 10^{-6} \frac{kg \cdot m^2}{s^2}$, which is within an order of magnitude of the theoretical moment of inertia.