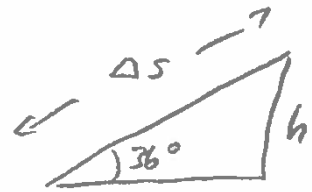


**Physics 10154 - Quiz 9B**

A cylinder ( $I = 0.5MR^2$ ) with a mass of 5.22 kg and a radius of 3.85 cm is rolling without slipping and has an initial linear speed of 5.69 m/s. It encounters a ramp angled  $36.0^\circ$  above the horizontal. While rolling up the ramp, frictional forces do -18.0 Joules of work.

How far does the cylinder roll up the ramp before stopping?

$$\begin{aligned}K_i &= \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2 \\&= \frac{1}{2}mv^2 + \frac{1}{2}\left(\frac{1}{2}MR^2\right)\left(\frac{v}{R}\right)^2 \\&= \frac{1}{2}mv^2 + \frac{1}{4}mv^2 \\&= \frac{3}{4}mv^2 = 126.75 \text{ J}\end{aligned}$$



$$\Sigma W_F = W_g + W_{\text{fric}} = \Delta K \quad (K_f = 0)$$

$$-mgh - 18 = -126.75$$

$$(5.22)(9.8)h = 108.75$$

$$h = 2.126 \text{ m} = \Delta s \sin 36^\circ$$

$$\Delta s = \frac{2.126}{\sin 36^\circ} = \boxed{3.62 \text{ m}}$$