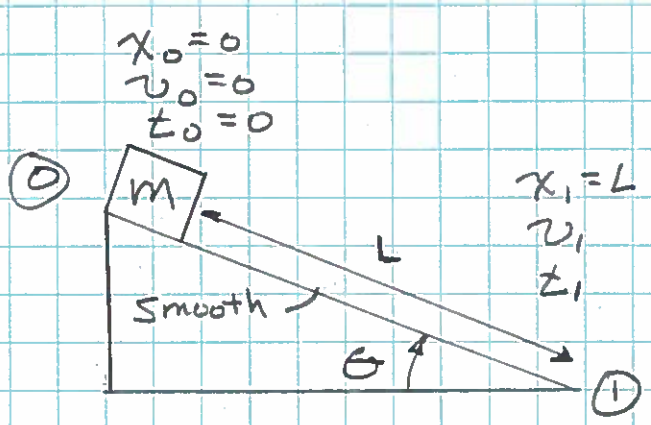
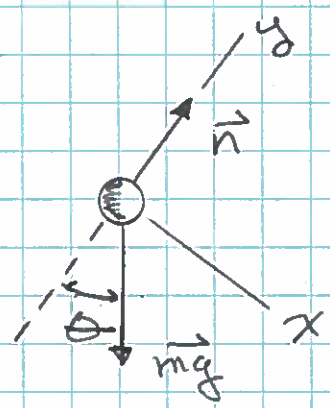


FBD



Find: speed v_1:

$$\Sigma F_y = n - mg\cos\theta = ma_y = 0 \qquad \left[\begin{array}{l} a_y = 0 \\ \text{block stays} \\ \text{on incline} \end{array}\right]$$

$$n = mg\cos\theta$$

$$\Sigma F_x = mg\sin\theta = ma_x$$

$$a_x = g\sin\theta = \text{constant}$$

Kinematics $0 \to 1$:

$$v_1^2 = v_0^2 + 2a_x\Delta x \qquad \Delta x = L - 0 = L$$

$$v_1^2 = 2gL\sin\theta$$

$$\therefore \quad v_1 = \sqrt{2gL\sin\theta}$$