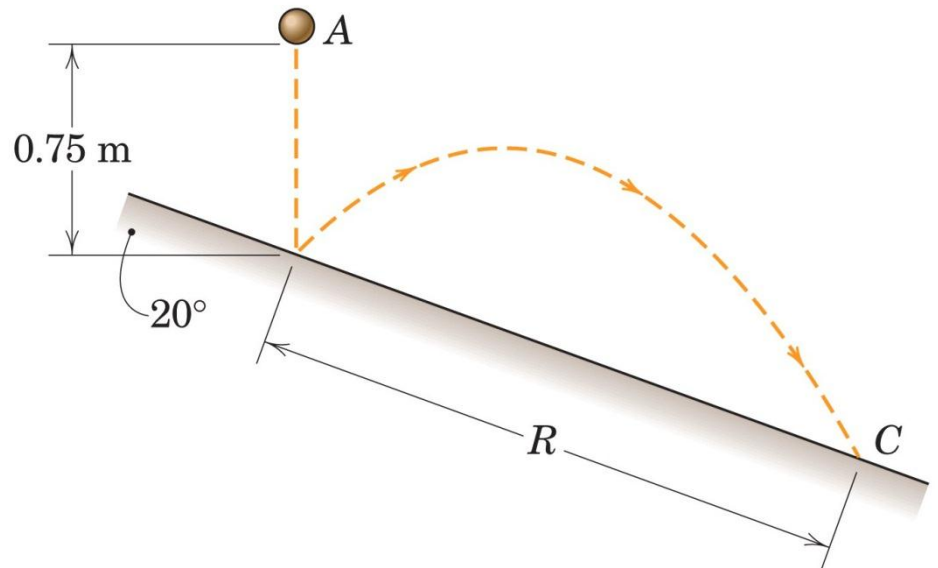


PROBLEM 3/255

The ball is released from position A and drops 0.75 m to the incline. If the coefficient of restitution in the impact is $e = 0.85$, determine the slant range R .



3/255 $v = \sqrt{2gh} = \sqrt{2(9.81)(0.75)} = 3.84 \text{ m/s}$

$v_{0t} = 3.84 \sin 20^\circ = 1.312 \text{ m/s}$

$v_{0n} = (3.84 \cos 20^\circ)(0.85) = 3.06 \text{ m/s}$

$v_0 = \sqrt{v_{0t}^2 + v_{0n}^2} = 3.33 \text{ m/s}$

$\beta = \tan^{-1} \frac{v_{0n}}{v_{0t}} = 66.8^\circ$

The diagram shows a velocity vector v_0 at an angle β to the incline. The incline is at 20° to the horizontal. The components v_{0t} (tangential) and v_{0n} (normal) are shown. The angle between the vertical and the normal is 20°.

$\theta = \beta - 20^\circ = 46.8^\circ$

$x = x_0 + v_{x_0} t : R \cos 20^\circ = 0 + 3.33 \cos 46.8^\circ t \quad (1)$

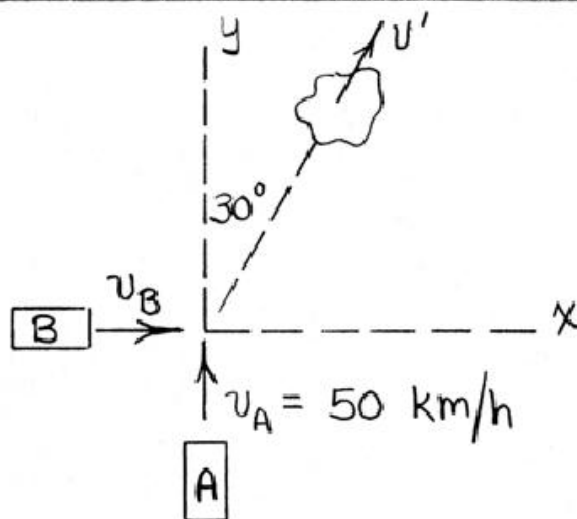
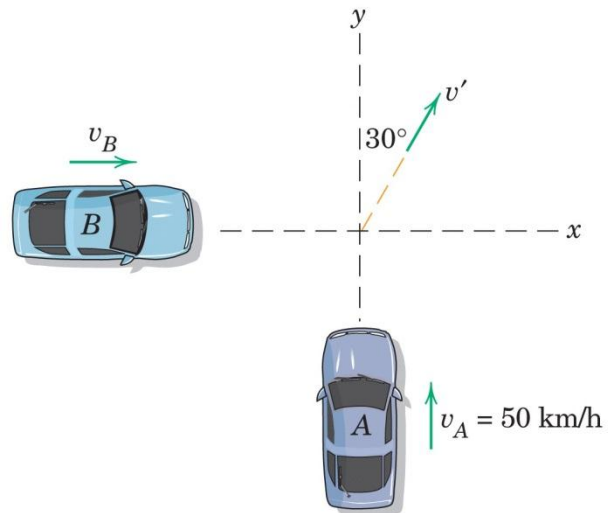
$y = y_0 + v_{y_0} t - \frac{1}{2} g t^2 : -R \sin 20^\circ = 0 + 3.33 \sin 46.8^\circ t - \frac{9.81}{2} t^2 \quad (2)$

Solve (1) for t & substitute into (2) to obtain

$R = 1.613 \text{ m}$

PROBLEM 3/258

The two cars collide at right angles in the intersection of two icy roads. Car A has a mass of 1200 kg and car B has a mass of 1600 kg. The cars become entangled and move off together with a common velocity v' in the direction indicated. If car A was traveling 50 km/h at the instant of impact, compute the corresponding velocity of car B just before impact.



$$G_{1x} = G_{2x}: m_B v_B + 0 = (m_A + m_B) v' \sin 30^\circ$$

$$1600 v_B = 2800 v' \left(\frac{1}{2} \right) \quad (1)$$

$$G_{1y} = G_{2y}: m_A v_A + 0 = (m_A + m_B) v' \cos 30^\circ$$

$$1200 (50) = 2800 v' (0.866) \quad (2)$$

From (2): $v' = 24.7 \text{ km/h}$

From (1): $\underline{v_B = 21.7 \text{ km/h}}$