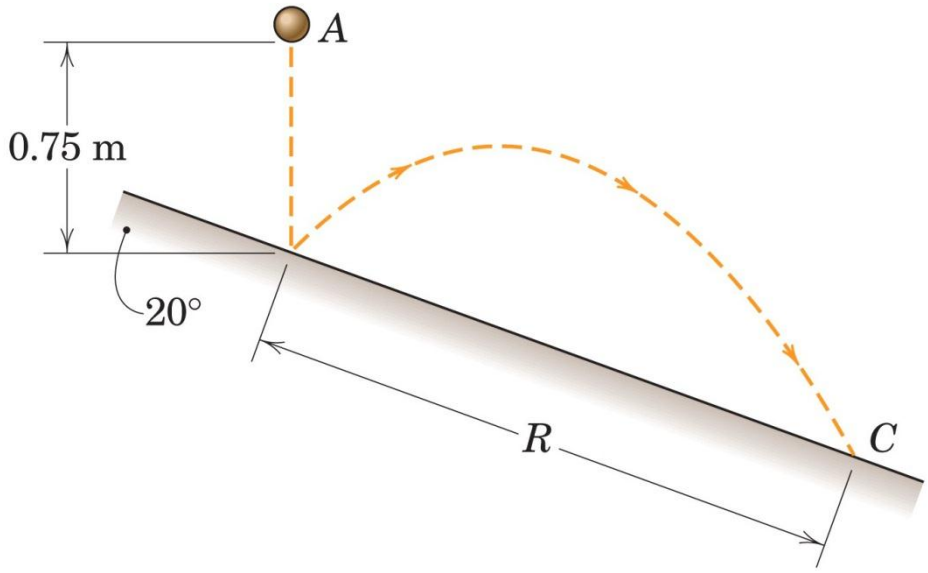
PROBLEM 3/255

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.



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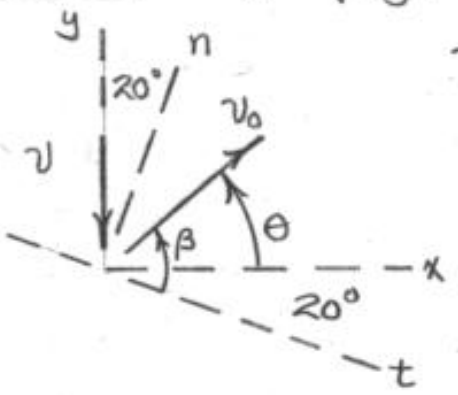
$v = \sqrt{2gh} = \sqrt{2(9.81)(0.75)} = 3.84$ m/s



$v_{0t} = 3.84 \sin 20° = 1.312$ m/s

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

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

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

$\theta = \beta - 20° = 46.8°$

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

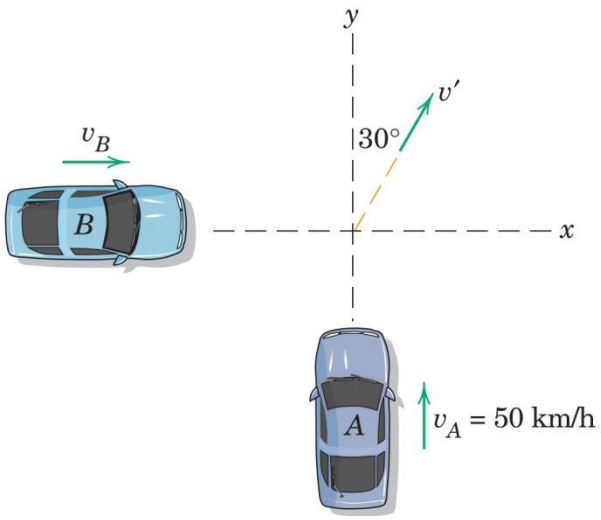
$y = y_0 + v_{y_0} t - \frac{1}{2} g t^2$: $-R \sin 20° = 0 + 3.33 \sin 46.8° t - \frac{9.81}{2} t^2$ (2)

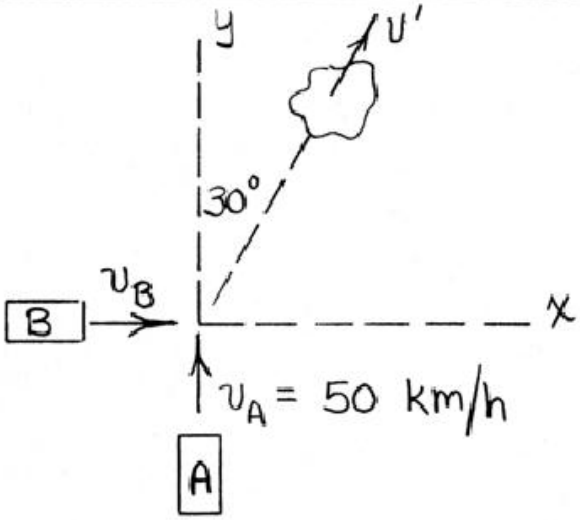
Solve (1) for t & substitute into (2) to obtain

$R = 1.613$ 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.





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

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

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

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

From (2): $v' = 24.7$ km/h

From (1): $v_B = 21.7$ km/h