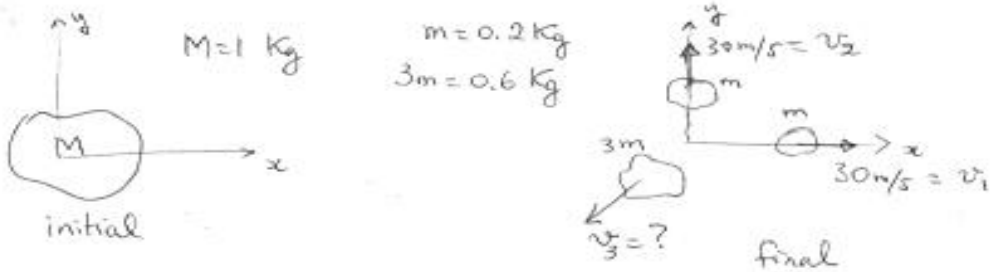
Physics 101-Rec
Quiz # 8

Instructor: Dr. Mekki

Name: Key Id#: Sect.#:

A 1.0-kg object at rest explodes, breaking into three pieces of masses 0.20, 0.20, and 0.60 kg. The Two pieces, having equal mass, fly off perpendicular to each other, one along the positive x-axis and the other along the positive y-axis with the same speed of 30 m/s. Find the speed of the third (0.60-kg) piece.



Linear momentum is conserved!

$$\vec{P}_i = \vec{P}_f \Rightarrow \begin{cases} P_{xi} = P_{xf} & (1) \\ P_{yi} = P_{yf} & (2) \end{cases}$$

(1) $\Rightarrow$ $M V_x = m V_{1x} + m V_{2x} + 3m V_{3x}$

$0 = 0.2 \times 30 + 0 + 0.6 \times V_{3x}$

$\Rightarrow V_{3x} = -\frac{6}{0.6} = -10$ m/s

(2) $\Rightarrow$ $M V_y = m V_{1y} + m V_{2y} + 3m V_{3y}$

$0 = 0 + 0.2 \times 30 + 0.6 \times V_{3y}$

$\Rightarrow V_{3y} = -10$ m/s

$\vec{v}_3 = -10\hat{i} - 10\hat{j}$ m/s

Speed $= |\vec{v}_3| = 14.1$ m/s