# 2015 F=ma Exam: Problem 9

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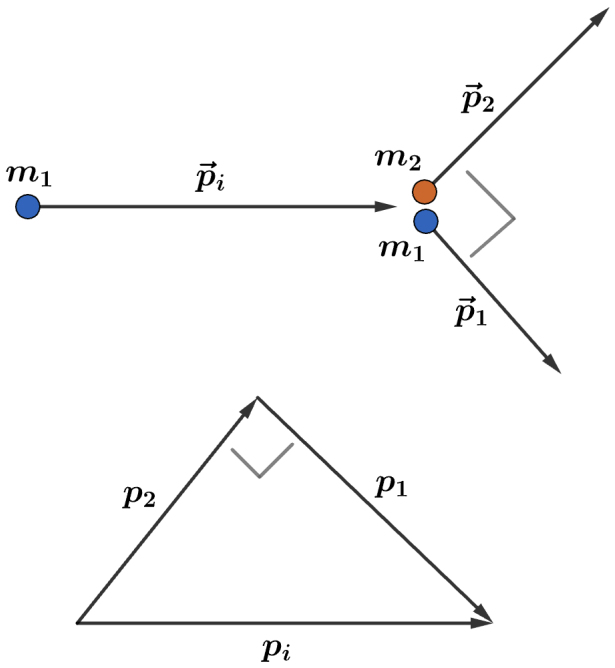


By conservation of linear momentum,

$$\vec{p}_1 + \vec{p}_2 = \vec{p}_i$$

Since $\vec{p}_1$ makes a right angle with $\vec{p}_2$, the three momenta vectors form the sides of a right triangle. Thus,

$$p_1^2 + p_2^2 = p_i^2$$
$$(m_1 v_{1f})^2 + (m_2 v_2)^2 = (m_1 v_{1i})^2$$

Solving for $v_{1f}$,

$$v_{1f}^2 + \frac{m_2^2 v_2^2}{m_1^2} = v_{1i}^2$$

$$v_{1f} = \sqrt{v_{1i}^2 - \left(\frac{m_2 v_2}{m_1}\right)^2} = \sqrt{(5\,\text{m/s})^2 - \left[\frac{0.750\,\text{kg}(4\,\text{m/s})}{0.650\,\text{kg}}\right]^2} = 1.92\,\text{m/s}$$

so the answer is $\boxed{\text{A}}$.