2015 F=ma Exam: Problem 6

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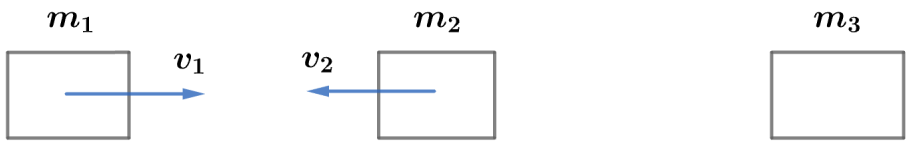

Since there is no net external force on the system, we have conservation of linear momentum p_{tot}. Recall that

$$M_{\text{tot}} v_{\text{CM}} = p_{\text{tot}}$$
$$v_{\text{CM}} = \frac{p_{\text{tot}}}{M_{\text{tot}}}$$

Since linear momentum is conserved, we can compute it at the beginning,

$$p_{\text{tot}} = m_1 v_1 - m_2 v_2$$

We have $M_{\text{tot}} = m_1 + m_2 + m_3$ so

$$v_{\text{CM}} = \frac{m_1 v_1 - m_2 v_2}{m_1 + m_2 + m_3} = \frac{(1.9)(1.7) - (1.1)(2.5)}{1.9 + 1.1 + 1.3}\,\text{m/s} = 0.11\,\text{m/s}$$

Thus, the answer is $\boxed{\text{A}}$.