2020B F=ma Exam: Problem 24

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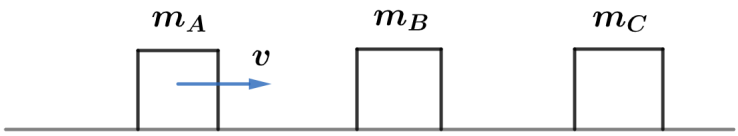

Recall from the elastic collision equations that the velocity of m_B after the collision from m_A is

$$v_B = \frac{2m_A v}{m_A + m_B}$$

and the velocity of m_C after the collision from m_B is

$$v_c = \frac{2m_B v_B}{m_B + m_C} = \frac{4m_A m_B}{(m_A + m_B)(m_B + m_C)} v = \frac{4}{\left(1 + \frac{m_B}{m_A}\right)\left(1 + \frac{m_C}{m_B}\right)} v$$

so taking $m_C \ll m_B \ll m_A$ maximizes $v_c \to 4v$. Thus, the answer is $\boxed{\text{D}}$.