

# REVIEW - IMPULSE-MOMENTUM

$$1) a) m_L = 3m_s$$

$$m_L v_{iL} = (m_L + m_s) v_f$$

$$3m_s v_{iL} = (3m_s + m_s) v_f$$

$$\cancel{3m_s} v_{iL} = \cancel{4m_s} v_f$$

$$v_f = \frac{3}{4} v_{iL}$$

b)

$$m_L = 2m_s$$

$$m_L v_{iL} = (m_L + m_s) v_f$$

$$2m_s v_{iL} = (2m_s + m_s) v_f$$

$$\cancel{2m_s} v_{iL} = \cancel{3m_s} v_f$$

$$v_f = \frac{2}{3} v_{iL}$$

$$c) 4m_L = m_s \quad v_f = \frac{4}{5} v_{iL}$$

$$\begin{array}{lll} 2. \text{ a)} \quad \underline{1} \rightarrow \text{light cart} & m_1 = 1 \text{ kg} & v_{1i} = 0.6 \text{ m/s} \\ & m_2 = 3 \text{ kg} & v_{2i} = 0 \text{ m/s} \\ & & \underline{2} \rightarrow \text{heavy cart} \end{array}$$

$$\text{a)} \quad v_{1f} = 0 \text{ m/s}$$

$$m_1 v_{1i} = m_2 v_{2f}$$

$$\begin{aligned} v_{2f} &= \frac{m_1 v_{1i}}{m_2} \\ &= \frac{(1.0 \text{ kg})(0.6 \text{ m/s})}{3 \text{ kg}} \\ &= 0.2 \text{ m/s} \end{aligned}$$

$$\begin{aligned}
 3. \text{ a) } \bar{J} &= \Delta \bar{p} \\
 &= m \Delta \bar{v} \\
 &= m (\bar{v}_f - \bar{v}_i) \\
 &= (12 \text{ kg}) (0 \text{ m/s} - 8.5 \text{ m/s}) \\
 &= -102 \text{ kg} \cdot \text{m/s}
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } \bar{J} &= \bar{F} \Delta t \\
 \bar{F} &= \frac{\bar{J}}{\Delta t} \\
 &= \frac{-102 \text{ kg} \cdot \text{m/s}}{0.008 \text{ s}} \\
 &= -12750 \text{ N}
 \end{aligned}$$

$$\begin{aligned}
 \text{c) } \bar{F} \Delta t &= m \Delta \bar{v} \\
 \bar{F} &= \frac{m (\bar{v}_f - \bar{v}_i)}{\Delta t} \\
 &= \frac{(12 \text{ kg}) (-8.5 \text{ m/s} - 8.5 \text{ m/s})}{0.008 \text{ s}} \\
 &= -25,500 \text{ N}
 \end{aligned}$$