

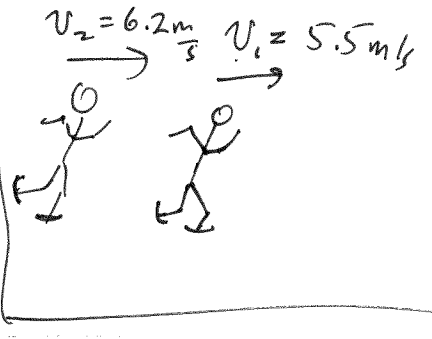
Chapter 9Problem 41

$$v_1 = 5.5 \text{ m/s}$$

$$v_2 = 6.2 \text{ m/s}$$

$$m_1 = 50 \text{ kg}$$

$$m_2 = m_1 + \frac{50\%}{100\%} m_1 = 1.5 m_1 = 75 \text{ kg}$$



What is their final speed when both are moving together?

$$P_o = P_f$$

$$m_1 v_1 + m_2 v_2 = m_1 v_f + m_2 v_f = (m_1 + m_2) v_f$$

$$\begin{aligned}
 v_f &= \frac{m_1 v_1 + m_2 v_2}{m_1 + m_2} = \frac{m_1 v_1 + 1.5 m_1 v_2}{m_1 + 1.5 m_1} \\
 &= \frac{m_1 (v_1 + 1.5 v_2)}{m \cdot 2.5} \\
 &= \frac{v_1 + 1.5 v_2}{2.5} = \frac{5.5 + 1.5(6.2)}{2.5} \\
 &= \boxed{5.92 \text{ m/s}}
 \end{aligned}$$

We could have used the given masses and get the same thing (As long as you know the relationship between masses, you can determine final velocity.)

$$\begin{aligned}
 v_f &= \frac{m_1 v_1 + m_2 v_2}{m_1 + m_2} = \frac{(50 \text{ kg})(5.5 \text{ m/s}) + (75 \text{ kg})(6.2 \text{ m/s})}{50 \text{ kg} + 75 \text{ kg}} \\
 &= \frac{275 + 465}{125} \\
 &= \frac{740}{125} = \boxed{5.92 \text{ m/s}}
 \end{aligned}$$