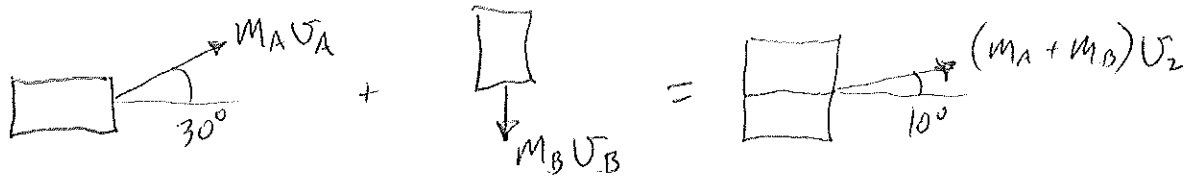


PROB. 13-146

$$v_{A,i} = v_{B,i} = \left(50 \frac{\text{km}}{\text{hr}}\right) \left(\frac{\text{hr}}{3600 \text{ s}}\right) \left(\frac{1000 \text{ m}}{\text{km}}\right) = 13.89 \frac{\text{m}}{\text{s}}$$

$$m_A = 1500 \text{ kg}, \quad m_B = 1200 \text{ kg}$$

a) FIND WHICH CAR WAS GOING FASTER



$$\vec{v}_A = v_A [(\cos 30^\circ) \hat{i} + (\sin 30^\circ) \hat{j}] = (0.866 v_A) \hat{i} + (0.5 v_A) \hat{j}$$

$$\vec{v}_B = (-v_B) \hat{j}$$

$$\vec{v}_2 = v_2 [(\cos 10^\circ) \hat{i} + (\sin 10^\circ) \hat{j}] = (0.9848 v_2) \hat{i} + (0.1736 v_2) \hat{j}$$

$$\sum m \vec{v}_i + \sum \text{IMP}_{i-2} = \sum m \vec{v}_2$$

$$\text{NO EXTERNAL FORCE} \therefore \sum m \vec{v}_i = \sum m \vec{v}_2$$

$$m_A \vec{v}_{A,i} + m_B \vec{v}_{B,i} = (m_A + m_B) \vec{v}_2$$

X-DIRECTION:

$$m_A (0.866 v_A) = (m_A + m_B) (0.9848 v_2)$$

$$v_A = \frac{1.137 (m_A + m_B) v_2}{m_A} = \frac{1.137 (1500 + 1200)}{1500} \cdot v_2 = 2.047 v_2$$

Y-DIRECTION:

$$m_A (0.5 v_A) - m_B v_B = (m_A + m_B) (0.1736 v_2)$$

$$v_B = 0.5 \left(\frac{m_A}{m_B}\right) \left[\frac{1.137 (m_A + m_B) v_2}{m_A}\right] - \left(\frac{m_A + m_B}{m_B}\right) (0.1736 v_2)$$

PROB. 13-146 CONT.

$$V_B = 0.5686 \left[ \frac{(M_A + M_B) V_2}{M_B} \right] - 0.1736 \left[ \frac{(M_A + M_B) V_2}{M_B} \right]$$

$$V_B = 0.3950 \left[ \frac{(M_A + M_B) V_2}{M_B} \right] = \frac{0.395(1500 + 1200)}{(1200)} \cdot V_2 = 0.8887 V_2$$

$$V_A > V_B$$

b) FIND  $V_A$  FOR  $V_B = 50 \frac{\text{KM}}{\text{HR}}$

$$V_A = 2.047 V_2$$

$$V_B = 0.8887 V_2 \Rightarrow V_2 = \frac{V_B}{0.8887}$$

$$V_A = \left( \frac{2.047}{0.8887} \right) V_B = \left( \frac{2.047}{0.8887} \right) \left( 50 \frac{\text{KM}}{\text{HR}} \right) = 115.2 \frac{\text{KM}}{\text{HR}}$$