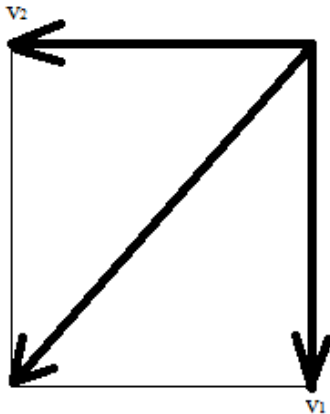


A 1500-kg blue convertible is travelling south, and a 2000-kg red sports utility vehicle is travelling west. If the momentum of the system consisting of the two cars is 8000kg•m/s directed at 60° west of south, what is the speed of each car?



The momentum of the two car system can be found from equations:

$$\begin{cases} (m_1 v_1)^2 + (m_2 v_2)^2 = p^2 \\ \cos(60) = \frac{v_2}{v} \end{cases}$$

$$\begin{cases} (m_1 v_1)^2 + (m_2 v_2)^2 = p^2 \\ \frac{1}{2} = \frac{(m_1 + m_2)v_2}{p} \end{cases}$$

$$v_2 = \frac{p}{2(m_1 + m_2)} = \frac{8000 \text{ kgm/s}}{2(1500 \text{ kg} + 2000 \text{ kg})} \cong 1.14 \text{ m/s}$$

From the first equation:

$$v_1 = \frac{1}{m_1} \sqrt{p^2 - (m_2 v_2)^2}$$

$$v_1 = \frac{1}{1500 \text{ kg}} \sqrt{(8000 \text{ kgm/s})^2 - (2000 \text{ kg} * 1.14 \text{ m/s})^2} \cong 5.11 \text{ m/s}$$

Answer: $v_1 \cong 5.11 \text{ m/s}$, $v_2 \cong 1.14 \text{ m/s}$