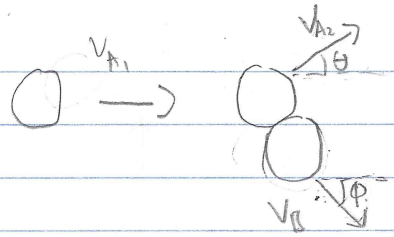
15.3 conservation of linear momentum 15-35



A pool ball is shot at another ball at a velocity of 2 m/s. After the collision, the initial ball is sent 25° off its initial trajectory, at 1 m/s. determine the 2nd balls velocity and angle ϕ.

$$m_1 v_i = m_1 v_f + m_2 v_f \qquad v_i = v_{f_1} + v_{f_2}$$

$m_1 = m_2$

$$\Sigma x \quad m_1 v_i = m_1 v_{f_1} \cos\theta + m_2 v_{f_2} \cos\phi$$

$$\Sigma y \quad 0 = m_1 v_{f_1} \sin\theta - m_2 v_{f_2} \sin\phi$$

$$v_i = v_{f_1} \cos\theta + v_{f_2} \cos\phi \qquad v_i - v_{f_1} \cos\theta = v_{f_2} \cos\phi$$

$$v_{f_1} \sin\theta = v_{f_2} \sin\phi \qquad v_{f_2} = \frac{v_{f_1} \sin\theta}{\sin\phi}$$

$$\tan\phi = \frac{v_{f_1} \sin\theta}{(v_i - v_{f_1} \cos\theta)} \qquad \phi = 21.127$$

$$v_{f_2} = 1.1725$$