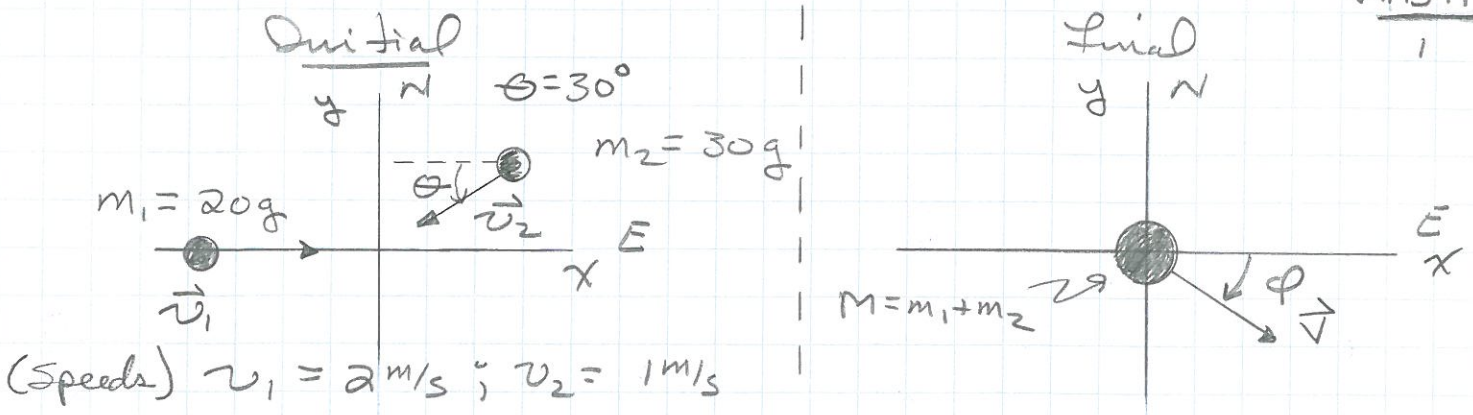

(Speeds) $v_1 = 2\ m/s$; $v_2 = 1\ m/s$

System = m_1 & m_2

Conserve momentum:

x-component

$$P_{xi} = P_{xf}$$

(components) $m_1 v_{1x} + m_2 v_{2x} = M V_x$

(speeds) $m_1 v_1 - m_2 v_2 \cos\theta = M V_x$

So: $V_x = \dfrac{m_1 v_1 - m_2 v_2 \cos\theta}{(m_1 + m_2)} = 0.280 \dfrac{m}{s}$

y-component:

$$P_{yi} = P_{yf}$$

(components) $m_1 v_{1y} + m_2 v_{2y} = M V_y$

(speeds) $0 - m_2 v_2 \sin\theta = M V_y$

So: $V_y = \dfrac{-m_2 v_2 \sin\theta}{(m_1 + m_2)} = -0.3\ m/s$

∴ Speed, $V = \sqrt{V_x^2 + V_y^2} = \underline{0.4103\ m/s}$

and

$$\varphi = \tan^{-1}\left(\frac{|V_y|}{V_x}\right) = \underline{46.97^\circ}$$

South of East.