

73. (a) The momentum conservation equation (for this completely inelastic collision) $m_A \vec{v}_A + m_B \vec{v}_B = (m_A + m_B) \vec{V}$ can be written in terms of weights by multiplying through by g :

$$w_A \vec{v}_A + w_B \vec{v}_B = (w_A + w_B) \vec{V} .$$

Our \hat{i} direction is West and \hat{j} is South, so we have (with weights in kN and speeds in km/h)

$$\begin{aligned} \vec{V} &= \frac{(12.0) (64.4 \hat{i}) + (16.0) (96.6 \hat{j})}{12.0 + 16.0} \\ &= 27.6 \hat{i} + 55.2 \hat{j} \end{aligned}$$

which implies that the final speed is 61.7 km/h.

- (b) And the angle for the final velocity is $\tan^{-1}(55.2/27.6) = 63.4^\circ$ South of West.