

87. (First problem in **Cluster 1**)

Instead of using V for final speed in completely inelastic collisions (as is used in Eq. 10-18), we use $v_{1f} = v_{2f}$, since that facilitates comparison of the results of parts (a) and (b). When we make comparisons, we assume $v_{1i} > 0$.

(a) When they stick together, we have

$$v_{1f} = v_{2f} = \frac{m_1}{m_1 + m_2} v_{1i} .$$

(b) Eq. 10-30 and Eq. 10-31 provide the elastic collision results:

$$\begin{aligned} v_{1f} &= \frac{m_1 - m_2}{m_1 + m_2} v_{1i} \\ v_{1f} &= \frac{2m_1}{m_1 + m_2} v_{1i} \end{aligned}$$

from which it is evident that $v_{1f \text{ elastic}} < v_{1f \text{ inelastic}}$ and $v_{2f \text{ elastic}} > v_{2f \text{ inelastic}}$.