Problem

An object A moving with velocity v collides with a stationary object B. After the collision, A is moving with velocity $\frac{1}{2}v$ and B with velocity $\frac{3}{2}v$. Find the ratio of their masses. If instead of bouncing apart, the two bodies stuck together after the collision, with what velocity would they move?

Solution

Elastic case

$$\begin{aligned} m_a v &= m_a \frac{v}{2} + m_b \frac{3v}{2} \\ \frac{m_a}{m_b} &= 3 \end{aligned}$$

Ratio of masses is 3.

Inelastic case

$$\begin{aligned} m_a v &= (m_a + m_b) v_f \\ v_f &= \frac{m_a}{m_a + m_b} v \\ &= \frac{3}{3+1} v \\ &= \frac{3v}{4} \end{aligned}$$

Velocity after collision is $\frac{3v}{4}$.
