44. The velocities of m_1 and m_2 just after the collision with each other are given by Eq. 10-38 and Eq. 10-39 (setting $v_{1i} = 0$).

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

After bouncing off the wall, the velocity of m_2 becomes $-v_{2f}$ (see *a massive target* in §10-5). In these terms, the problem requires

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

which simplifies to

$$2m_2 = -(m_2 - m_1) \implies m_2 = \frac{m_1}{3}\ .$$