62. In the momentum relationships, we could as easily work with weights as with masses, but because part (b) of this problem asks for kinetic energy – we will find the masses at the outset: $m_1 = 280 \times 10^3/9.8 = 2.86 \times 10^4$ kg and $m_2 = 210 \times 10^3/9.8 = 2.14 \times 10^4$ kg. Both cars are moving in the $+x$ direction: $v_{1i} = 1.52$ m/s and $v_{2i} = 0.914$ m/s.

(a) If the collision is completely elastic, momentum conservation leads to a final speed of

$$V = \frac{m_1 v_{1i} + m_2 v_{2i}}{m_1 + m_2} = 1.26 \text{ m/s} .$$

(b) We compute the total initial kinetic energy and subtract from it the final kinetic energy.

$$K_i - K_f = \frac{1}{2} m_1 v_{1i}^2 + \frac{1}{2} m_2 v_{2i}^2 - \frac{1}{2}(m_1 + m_2) V^2 = 2.25 \times 10^3 \text{ J} .$$

(c) and (d) Using Eq. 10-38 and Eq. 10-39, we find

$$\begin{aligned} v_{2\,f} &= \frac{2m_1}{m_1 + m_2} v_{1\,i} + \frac{m_2 - m_1}{m_1 + m_2} v_{2\,i} = 1.61 \text{ m/s} \quad \text{and} \\ v_{1\,f} &= \frac{m_1 - m_2}{m_1 + m_2} v_{1\,i} + \frac{2m_2}{m_1 + m_2} v_{2\,i} = 1.00 \text{ m/s} . \end{aligned}$$