9. This problem is illustrated in Figure 7.10 on page 128 in the text and in Figure 7.11 on page 129 in the text. The solution involves a direct application of the principle of conservation of momentum. In this case both persons have initial velocities of zero. This means the total momentum before the separation is zero.

$$p_{before} = p_{after}$$

$$0 = m_1 v_1 + m_2 v_2$$

$$0 = (50 \text{ kg}) (3 \text{ m / s}) + (80 \text{ kg}) v_2$$

$$0 = 150 \text{ kg m / s} + (80 \text{ kg}) v_2$$

$$(80 \text{ kg}) v_2 = - 150 \text{ kg m / s}$$

$$v_2 = - 150 / 80 \text{ m / s} = - 1.88 \text{ m / s}$$

The negative sign tells us that the 80 kg person moves off in the opposite direction to that of the 50 kg person, a result that we expect. We also note that the more massive object has a smaller speed than the less massive object, because the two objects must have equal and opposite values of momentum in order for their total momentum to equal the zero momentum the system had before the separation.