10. We use Eq. 8-17, representing the conservation of mechanical energy (which neglects friction and other dissipative effects).

    (a) In the solution to exercise 2 (to which this problem refers), we found $U_i = mgy_i = 196$ J and $U_f = mgy_f = 29$ J (assuming the reference position is at the ground). Since $K_i = 0$ in this case, we have

    $$\begin{aligned} K_i + U_i &= K_f + U_f \\ 0 + 196 &= K_f + 29 \end{aligned}$$

    which gives $K_f = 167$ J and thus leads to

    $$v = \sqrt{\frac{2K_f}{m}} = \sqrt{\frac{2(167)}{2.00}} = 12.9 \text{ m/s} .$$

    (b) If we proceed algebraically through the calculation in part (a), we find $K_f = -\Delta U = mgh$ where $h = y_i - y_f$ and is positive-valued. Thus,

    $$v = \sqrt{\frac{2K_f}{m}} = \sqrt{2gh}$$

    as we might also have derived from the equations of Table 2-1 (particularly Eq. 2-16). The fact that the answer is independent of mass means that the answer to part (b) is identical to that of part (a).

    (c) If $K_i \neq 0$, then we find $K_f = mgh + K_i$ (where K_i is necessarily positive-valued). This represents a larger value for K_f than in the previous parts, and thus leads to a larger value for v.