

16. We choose our positive direction in the direction of the rebound (so the ball's initial velocity is negative-valued:  $\vec{v}_i = -5.2$  m/s).

(a) The speed of the ball right after the collision is

$$\begin{aligned}v_f &= \sqrt{\frac{2K_f}{m}} \\&= \sqrt{\frac{2\left(\frac{1}{2}K_i\right)}{m}} \\&= \sqrt{\frac{\frac{1}{2}mv_i^2}{m}} \\&= \frac{v_i}{\sqrt{2}} \approx 3.7 \text{ m/s} .\end{aligned}$$

(b) With  $m = 0.15$  kg, the impulse-momentum theorem (Eq. 10-4) yields

$$\vec{J} = m\vec{v}_f - m\vec{v}_i = (0.15)(3.7) - (0.15)(-5.2) = 1.3$$

in SI units (N·s).

(c) Eq. 10-8 leads to  $F_{\text{avg}} = J/\Delta t = 1.3/0.0076 = 1.8 \times 10^2$  N.