2. $F_g = mg$

$$m = \frac{F_g}{g}$$
$$= \frac{20.0\text{ N}}{9.81\text{ m/s}^2}$$
$$= 2.04\text{ kg}$$

$$E_k = \frac{1}{2}mv^2$$
$$v = \sqrt{\frac{2E_k}{m}}$$
$$= \sqrt{\frac{2(5.00\times10^2\text{J})}{2.04\text{ kg}}}$$
$$= 22.1\text{ m/s}$$

3. $v^2 = v_0^2 + 2ad$

$$= 2\left(2.5\text{ m/s}^2\right)(15.0\text{ m})$$
$$= 75\text{ m}^2/\text{s}^2$$
$$v = 8.66\text{ m/s}$$

$$F_g = mg$$
$$m = \frac{F_g}{g}$$
$$= \frac{10.0\text{ N}}{9.80\text{ m/s}^2}$$
$$= 1.02\text{ kg}$$

$$E_k = \frac{1}{2}mv^2$$
$$= \frac{1}{2}(1.02\text{ kg})(8.66\text{ m/s})^2$$
$$= 38\text{ J}$$

4. $v^2 = v_0^2 + 2ad$

$$= 2\left(9.81\text{ m/s}^2\right)(7.0\text{ m})$$
$$= 137.34\text{ m}^2/\text{s}^2$$
$$v = 11.7\text{ m/s}$$

$$E_k = \frac{1}{2}mv^2$$
$$= \frac{1}{2}(8.0\text{ kg})(11.7\text{ m/s})^2$$
$$= 5.5\times10^2\text{ J}$$

5. $F_g = mg$

$$m = \frac{F_g}{g}$$
$$= \frac{10.0\text{ N}}{9.80\text{ m/s}^2}$$
$$= 1.02\text{ kg}$$

$$E_k = \frac{1}{2}mv^2$$
$$v = \sqrt{\frac{2E_k}{m}}$$
$$= \sqrt{\frac{2(3.00\times10^2\text{J})}{1.02\text{ kg}}}$$
$$= 24.2\text{ m/s}$$

6. $E_k = \frac{1}{2}mv^2$

$E_k \propto v^2$

$E_k \propto 3^2$

$E_k \propto 9$ times

Lesson 5—Work-Energy Theorem

PRACTICE EXERCISES ANSWERS AND SOLUTIONS

The force in these equations is the net force.

1.
$$Fd = \frac{1}{2}m\left(v^2 - v_0^2\right)$$
$$(23.0\text{ N})\left(5.0\times10^{-2}\text{ m}\right) = \frac{1}{2}(0.12\text{ kg})(v^2 - 0)$$
$$v = \sqrt{\frac{2(23.0\text{ N})(5.0\times10^{-2}\text{m})}{0.12\text{ kg}}}$$
$$= 4.4\text{ m/s}$$

2.
$$Fd = \frac{1}{2}m\left(v^2 - v_0^2\right)$$
$$(-3.2\text{ N})d = \frac{1}{2}(1.1\text{ kg})\left(0 - (7.5\text{ m/s})^2\right)$$
$$d = \frac{\frac{1}{2}(1.1\text{ kg})(-56.25\text{ m}^2/\text{s}^2)}{-3.2\text{ N}}$$
$$= 9.7\text{ m}$$

