Reviewing Work and Energy Homework Solutions

p. 181 #4

(a) $m = 2.75\,kg$ $\Delta d = 1.37\,m$ $\theta = 0^o$ $W = ?$

$W = (F\cos\theta)\Delta d = (m\,g\cos\theta)\Delta d$

$$W = (2.75\,kg)(9.80\frac{m}{s^2})(\cos 0^o)(1.37\,m) = 36.9\,J$$

(b) The work done by the applied force must be equal in magnitude to the frictional force.

$m = 2.75\,kg$ $\Delta d = 1.07\,m$ $\mu_k = 0.549$ $\theta = 0^o$ $W = ?$

$W = (F\cos\theta)\Delta d = (\mu_k\,m\,g\cos\theta)\Delta d$

$$W = (0.549)(2.75\,kg)(9.80\frac{m}{s^2})(\cos 0^o)(1.07\,m) = 15.8\,J$$

p. 181 #5 $m = 24.5\,kg$ $\vec{F} = 14.2\,N\,[22.5^o\ below\ the\ horizontal]$

$\Delta d = 14.8\,m$ $W = ?$

$$W = (F\cos\theta)\Delta d = (14.2\,N)(\cos 22.5^o)(14.8\,m) = 194\,J$$

p. 186 #4 $m = 0.045\,kg$ $v_1 = 0\frac{m}{s}$ $v_2 = 43\frac{m}{s}$ $\Delta d = 0.020\,m$

(a) $W = ?$

$$W = \Delta E_k = \frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2$$

$$W = \frac{1}{2}(0.045\,kg)(43\frac{m}{s})^2 - \frac{1}{2}(0.045\,kg)(0\frac{m}{s^2}) = 41.6\,J \text{ or } 42\,J$$

(b) $F = ?$

$W = F\,\Delta d \ \rightarrow\ F = \dfrac{W}{\Delta d}$ (The angle between the force and the displacement is zero.)

$$F = \frac{41.6\,J}{0.020\,m} = 2100\,N$$

p. 186 #5 $m = 0.027\,kg$ $F = 95\,N$ $\Delta d = 0.31\,m$ $v_2 = ?$

$$W = \Delta E_k$$

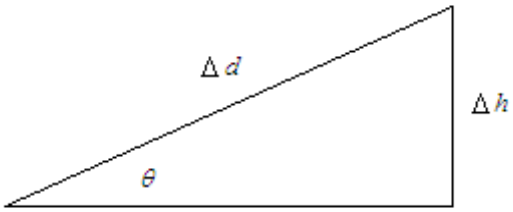
$$F\,\Delta d = \frac{1}{2} m v_2^2 \qquad \text{(since the initial speed is zero)}$$

$$\sqrt{\frac{2F\,\Delta d}{m}} = v_2$$

$$\sqrt{\frac{2(95\,N)(0.31\,m)}{0.027\,kg}} = v_2$$

$$47\,\frac{m}{s} = v_2$$

p. 191 #4 $m = 68.5\,kg$ $\Delta d = 2560\,m$ $\theta = 13.9^o$ $\Delta E_g = ?$



First, calculate the vertical lift: $\Delta h = \Delta d \sin\theta = (2560\,m)\sin 13.9^o = 615\,m$

$$E_g = m\,g\,\Delta h = (68.5\,kg)\left(9.80\,\frac{m}{s^2}\right)(615\,m) = 4.13\times10^5\,J$$