Answers ⇒ More Practice: Work and Energy

1) $E_S = \frac{1}{2} k x^2$

$= \frac{1}{2} \left(500 \frac{N}{m}\right)(0.05 m)^2$

$= \underline{0.625 J}$

2) $PE_i = KE_f$

$mgh = \frac{1}{2} m v^2$

$h = \frac{v^2}{2g}$

$= \frac{(3.0 m/s)^2}{2(9.8 m/s^2)}$

$= \underline{0.46 m}$

3) ① Find a

$a = ?$

$v_i = 4.0 m/s$

$v_f = 6.5 m/s$

$\Delta t = 2.0 s$

$v_f = v_i + a\Delta t$

$a = \frac{v_f - v_i}{\Delta t}$

$= \frac{6.5 m/s - 4.0 m/s}{2.0 s}$

$a = 1.25 m/s^2$

② Find F_{net}

$F_{net} = ma$

$= (0.900 kg)(1.25 m/s^2)$

$= 1.125 N$

③ Find Δd

$\Delta d = ?$

$v_i = 4.0 m/s$

$v_f = 6.5 m/s$

$\Delta t = 2.0 s$

$\Delta d = \frac{(v_i + v_f)}{2} \Delta t$

$= \frac{(4.0 m/s + 6.5 m/s)}{2} (2.0 s)$

$\Delta d = 10.5 m$

④ $W = F \cdot \Delta d$

$= (1.125N)(10.5m)$

$= \underline{11.8J}$

4) $KE_i = KE_f + E_s$

$KE_f = KE_i - E_s$

$= \frac{1}{2}mv^2 - \frac{1}{2}kx^2$

$= \frac{1}{2}(2.0kg)(6.0m/s)^2 - \frac{1}{2}(2000N/m)(0.15m)^2$

$KE_f = 13.5J$

$KE_f = \frac{1}{2}mv^2$

$v^2 = \frac{2KE_f}{m}$

$= \frac{2(13.5J)}{2.0kg}$

$v^2 = 13.5m^2/s^2$

$v = \underline{3.7m/s}$

5) $KE_i + W_{ap} = PE_f$

$PE_f = \frac{1}{2}mv_i^2 + F \cdot \Delta d$

$= \frac{1}{2}(50kg)(5.0m/s)^2 + (100N)(40m)$

$= 4625J$

$PE = mgh$

$h = \frac{PE}{mg}$

$= \frac{4625J}{(50kg)(9.8m/s^2)}$

$h = \underline{9.4m}$

6) ① Find F_f

$$F_N = F_g$$
$$= 980N$$

$$F_f = \mu F_N$$
$$= (0.2)(980N)$$
$$= 196N$$

$$PE - W_f = KE_f$$

$$KE_f = mgh - F_f \Delta d$$
$$= (100kg)(9.8 \tfrac{m}{s^2})(8.0m) - (196N)(15m)$$
$$= 4900J$$

$$KE_f = \frac{1}{2} m v_f^2$$

$$v_f^2 = \frac{2KE_f}{m}$$

$$= \frac{2(4900J)}{100kg}$$

$$v_f^2 = 98 m^2/s^2$$

$$v_f = \underline{\underline{9.9 m/s}}$$

7) $W_{ap} = PE_f$

$= mgh$

$= (50kg)(9.8 m/s^2)(1.7m)$

$= 833J$

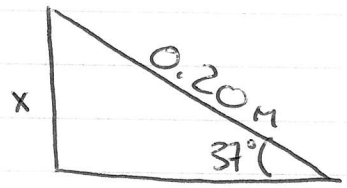
$W_{ap} = F \cdot \Delta d$

$F = \frac{W_{ap}}{\Delta d}$

$= \frac{833 J}{1.0 m}$

$= \underline{\underline{833 N}}$

8)



$\sin 37° = \frac{x}{0.20m}$

$x = 0.20m \sin 37°$

$= 0.12 m$ ← this is how much lower the block will be.

$PE_i = E_s + KE_f$

$KE_f = PE_i - E_s$

$= mgh - \frac{1}{2} kx^2$

$= (2.0kg)(9.8 m/s^2)(0.12 m) - \frac{1}{2}\left(100 \frac{N}{m}\right)(0.2m)^2$

$= 0.352 J$

$KE_f = \frac{1}{2} m v^2$

$v^2 = \frac{2(KE_f)}{m}$

$= \frac{2(0.352J)}{2.0kg}$

$v^2 = 0.352 m^2/s^2$

$v = \underline{\underline{0.59 m/s}}$