① $PE = mgh$
$m = 5kg$
$h = 10m$
$g = 9.8 m/s^2$

$PE = 5(9.8)10$
$PE = 490J$

② $KE = \frac{1}{2}mv^2$
$m = 500kg$
$v = 11 m/s$

$KE = \frac{1}{2}(500)(11)^2$
$KE = 30250J$

③ $PE = mgh$
$m = 30kg$
$h_i = 5m$
$h_f = 12m$

$PE_i = 30(9.8)5 = 1470J$
$PE_f = 30(9.8)12 = 3528J$
$\Delta PE = 3528 - 1470 = 2058J$

④ $W = Fd$
$f = ma$
$a = 9.8 m/s^2$
$m = 2kg$
$d = 1.5m$

$f = 2(9.8) = 19.6N$
$W = 19.6(1.5) = 29.4J$

⑤ $W = Fd$
$F = 5N$
$d = 8m$

$W = 5(8) = 40J$

⑥ $W = Fd$
$f = ma$
$P = W/t$
$a = 9.8 m/s^2$
$m = 50kg$
$d = 0.5m$
8 times
$t = 10s$

$f = 50(9.8) = 490N$
$W = 490(0.5) = 245J$
8 times $\rightarrow 245 \times 8 = 1960J$ in $10s$
$P = W/t = \frac{1960}{10} = 196W$

⑦ $PE = mgh$
$KE = \frac{1}{2}mv^2$
$TE = PE + KE$
$g = 9.8 m/s^2$
$TE = 75,000J$
$m = 100kg$
$v = 5 m/s$

$KE = \frac{1}{2}(100)(5)^2 = 1250J$
$75,000 = PE + 1250$
$PE = 73,750J$
$73,500 = 100(9.8)h$
$75m = h$

(8) $PE = mgh$
$KE = \frac{1}{2}mv^2$
$m = 90\,kg$
$h = 50\,m$
$g = 9.8\,m/s^2$

$PE = 90(9.8)(50) = 44100\,J$ ← This is all KE at the bottom
$KE = 44100\,J$
$44100 = \frac{1}{2}(90)v^2$
$31.3\,m/s = v$

(9) $PE = mgh$
$KE = \frac{1}{2}mv^2$
$g = 9.8\,m/s^2$
$m = 2\,kg$
$h_i = 3\,m$
$h_f = 1\,m$

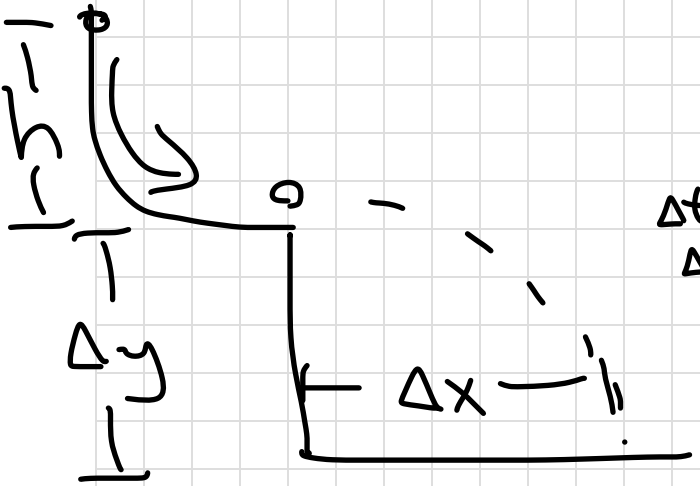
$PE_i = 2(9.8)3 = 58.8\,J$
$PE_f = 2(9.8)1 = 19.6\,J$
$KE = 58.8 - 19.6 = 39.2\,J$

(10) $PE = mgh$
$KE = \frac{1}{2}mv^2$
$g = 9.8\,m/s^2$
$R = 10\,m$
$v_i = 5\,m/s$

Initial: $m(9.8)(10) + \frac{1}{2}m5^2$ = Final: $m(9.8)(0) + \frac{1}{2}mv_f^2$
All the m's cancel out
$980 + 12.5 = \frac{1}{2}v_f^2$
$45\,m/s = v_f$

(11) $PE = mgh$
$KE = \frac{1}{2}mv^2$
$\Delta y = v_i\Delta t + \frac{1}{2}a(\Delta t)^2$
$\Delta x = v_i\Delta t + \frac{1}{2}a(\Delta t)^2$
$m = 0.05\,kg$
$h = 1.3\,m$
$\Delta y = 0.75\,m$

$PE = 0.05(9.8)(1.3)$
$PE = 0.637\,J$ ← This will all turn into KE by the bottom of the ramp
$0.637 = \frac{1}{2}(0.05)v^2$
$5\,m/s = v$



X
$v_i = 5\,m/s$
$a = 0\,m/s^2$
$\Delta x = ?$
$\Delta t = 0.39\,s$ ←
$\Delta x = v_i\Delta t + \frac{1}{2}a(\Delta t)^2$
$\Delta x = 1.95\,m$

Y
$v_i = 0\,m/s$
$a = -9.8\,m/s^2$
$\Delta y = 0.75\,m$
$\Delta y = v_i\Delta t + \frac{1}{2}a(\Delta t)^2$
$\Delta t = 0.39\,s$

(12) Initial velocity in the X direction

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

$$\sqrt{2gh_r} = v$$

Time it takes for the object to hit the ground

$$h_t = \frac{1}{2}(9.8)t^2$$

$$\sqrt{\frac{h_t}{4.9}} = t$$

Distance the object travels horizontally

$$d = \sqrt{2gh_r}\left(\sqrt{\frac{h_t}{4.9}}\right)$$

$$d = \sqrt{\frac{2(9.8)h_r h_t}{4.9}}$$

$$d = \sqrt{\frac{4}{\cancel{8}}h_r h_t}$$

$$d = 2\sqrt{h_r h_t}$$