Assignment 4, part A.

A1 a) $v_0 = 20$, $v_f = 0$, $a = -9.81$.

So $d = \frac{0^2 - 20^2}{-2 \cdot 9.81} = 20.39\text{m}$.

b) $t = \frac{0 - 20}{-9.81} = 2.04\ \text{ms}^{-1}$.

A2. Acceleration is being caused by a force

$\vec{F} = 920 \times 3 = 2760\text{N}$

(in the direction of the acceleration.)

A3. average acceleration is $\frac{\Delta v}{\Delta t} = \frac{\left(\frac{60 \times 1000}{60 \times 60}\right)}{8} = 2.08\ \text{ms}^{-2}$.

So $\vec{F} = 950 \times 2.08 = 1976\ \text{N}$.

A4. The total energy within a closed system (i.e. a system with no external forces acting on it) is constant.

A5. a) $v_0 = 0$ $d = 12 - 1.7 = 10.3\text{m}$ $a = 9.81$.

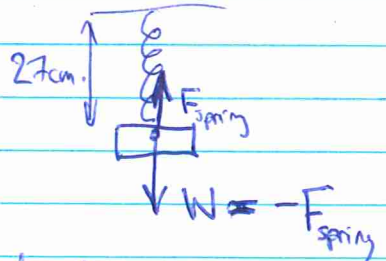
So $v_f = \sqrt{0^2 + 2 \cdot 9.81 \cdot 10.3}$

$= 14.22\ \text{ms}^{-1}$.

b) $p = 270 \times 14.22 = 3838\ \text{Ns}$.

c) $t = \frac{14.22 - 0}{9.81} = 1.45\text{s}$.

A6. a)



b) Let k be the spring constant; so $k = \frac{4.9}{0.05} = 98\ \text{Nm}^{-1}$.

By equilibrium condition, $gm = W = F_{spring} = 0.27 \times 98$

$\Rightarrow m = \frac{0.27 \times 98}{9.81} = 2.70\text{kg}$.

A7. (a) Circumference $\Rightarrow$ $C = 2\pi \cdot 5 = 31.42\,m$.

So speed at edge is $\frac{\Delta x}{\Delta t} = \frac{31.42}{360} = 0.087\,ms^{-1}$.

(b) $\vec{F}_{cent} = \frac{mv^2}{r} = \frac{65 \times 0.087^2}{5} = 0.010\,N$.