1. $g = \frac{GM}{R^2}$ $g_x = \frac{GM}{R^2}$ $g_Y = \frac{G(2M)}{\left(\frac{R}{2}\right)^2}$

$g_Y = \frac{2GM}{\frac{R^2}{4}}$

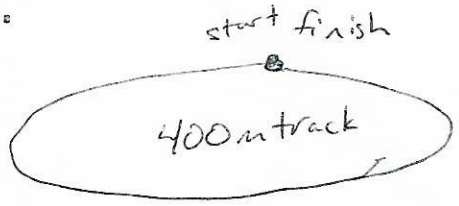
$g_Y = 8GM$

$\boxed{g_Y = 8g_x}$

2. $\frac{1.0\,cm}{10.\,cm} + \frac{1.0\,cm}{10.\,cm} + \frac{1.0\,cm}{10.\,cm}$ Volume $10 \times 10 \times 10 = 1000\,cm^3$

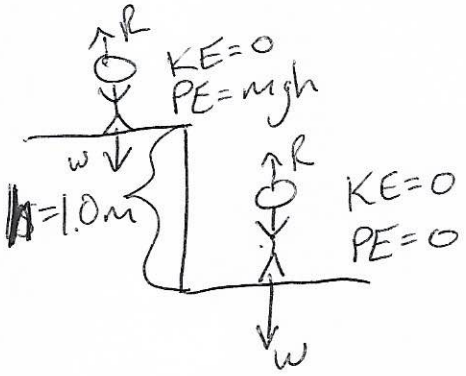
$10\% + 10\% + 10\% = \frac{30\%}{\%\ error}$

$1000\,cm^3\,(30\%) = \boxed{3.0 \times 10^2\,cm^3}$

3. 


$S = \boxed{0\,m}$

distance $= 2 \times 400\,m = \boxed{800\,m}$

4. 


$\Delta E = \Delta PE$

$\Delta E = mgh = 99\,kg\left(9.81\,\frac{m}{s^2}\right)(1.0\,m)$

$E = 971.19\,J \Rightarrow \boxed{970\,J}$

5. $eff = \frac{P_{out}}{P_{in}}$ $P = \frac{W}{t} = \frac{Fs}{t}$

$eff = 30\%$

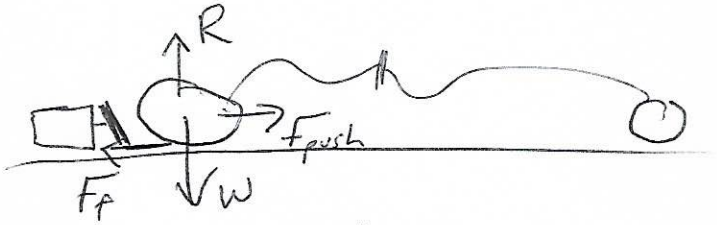
$t \leq 60s$

$s = 85m$

$P_{out} = \frac{(1030.05N)(85\,m)}{60s}$

$P_{out} = 1459.2375\,J$

$P_{in} = \frac{P_{out}}{eff}$ $\frac{1459.2375}{.30} = 4864.125\,J$ $\boxed{= 4900\,J}$




$W_{min} \Rightarrow F_{net} = 0$

$F_{push} = F_f$

$F_f = \mu R = \mu mg = 1030.05\,N$

$(0.42)(250kg)\left(9.81\,\frac{m}{s^2}\right)$