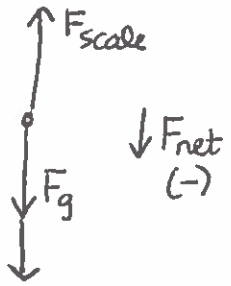
① $m = 75\ kg$

$a = +2.5\ m/s^2$



$\sum F = F_{net} = F_{scale} - F_g$

$-ma = F_{scale} - F_g$

$-ma = F_{scale} - mg$

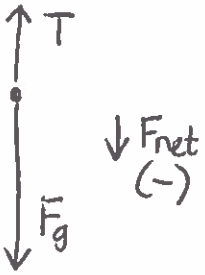
$\therefore F_{scale} = -ma + mg$

$= 75(9.8 - 2.5)$

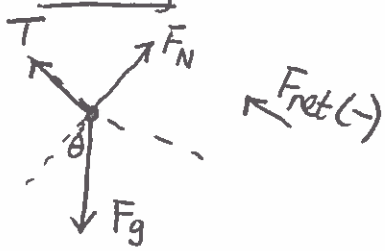
$= 547.5$

$F_{scale} = 550\ N$

② 5.0 kg



7.5 kg



$m_1 g = (5.0)(9.8) = 49\ N$

$m_2 g \sin\theta = (7.5)(9.8)\sin(35)$

$= 42.157\ N$

$\sum F = T - F_g$

$-m_1 a = T - m_1 g$

$\therefore T = m_1 g - m_1 a$

$\sum F_x = m_2 g \sin\theta - T$

$-m_2 a = m_2 g \sin\theta - T$

$\sum F_y = F_N - mg\cos\theta$

$\therefore F_N = mg\cos\theta$

$-m_2 a = m_2 g \sin\theta - (m_1 g - m_1 a)$

$-m_2 a = m_2 g \sin\theta - m_1 g + m_1 a$

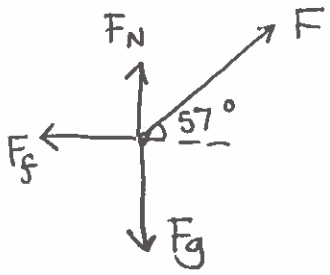
$-m_1 a$ $\quad -m_1 a$

$(-m_1 - m_2)\, a = m_2 g \sin\theta - m_1 g$

$a = \dfrac{m_2 g \sin\theta - m_1 g}{(-m_1 - m_2)} = \dfrac{(7.5)(9.8)\sin 35 - (5.0)(9.8)}{(-5.0 - 7.5)}$

$a = .55\ m/s^2$

③



$$\Sigma F_x = F\cos 57 - F_f = 0$$

$$\therefore F\cos 57 = \mu F_N$$

$$\Sigma F_y = F\sin 57 + F_N - F_g = 0$$

$$\therefore F_N = F_g - F\sin 57$$

$$F\cos 57 = \mu(F_g - F\sin 57)$$

$$F\cos 57 = \mu F_g - F\sin 57\,\mu$$

$$+F\sin 57\,\mu \qquad +F\sin 57\,\mu$$

$$F(\cos 57 + \sin 57\,\mu) = \mu F_g$$

$$\frac{F(\cos 57 + \sin 57\,\mu)}{(\cos 57 + \sin 57\,\mu)} = \frac{\mu F_g}{(\cos 57 + \sin 57\,\mu)}$$

$$F = \frac{\mu F_g}{(\cos 57 + \sin 57\,\mu)} = \frac{(.27)(11)(9.8)}{\cos 57 + (\sin 57)(.27)}$$

$$F = 37.747$$

$$\boxed{F = 38\ \text{N}}$$

④ $F = \frac{Kq_1q_2}{r^2}$ $F\uparrow,\ q_1q_2\uparrow \Rightarrow cq \propto cF$ (c is a factor)

$F\downarrow,\ r\uparrow \Rightarrow cr \propto \frac{1}{c^2}F$

(i) $2r \Rightarrow \frac{1}{2^2}F = \frac{1}{4}F$

0.200 N

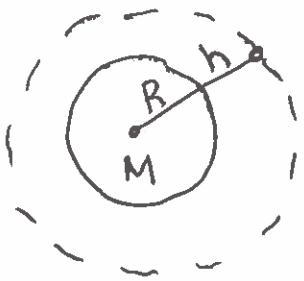
(ii) $3q_1 \Rightarrow 3F$

2.40 N

(iii) $(2q_1) \Rightarrow 2F$
$(2q_2) \Rightarrow 2F$
$3r \Rightarrow \frac{1}{3^2}F = \frac{1}{9}F$
$\Big\} \frac{2\cdot 2}{9}F = \frac{4}{9}F$

.356 N

⑤



$M = 5.97\times10^{24}\,Kg$
$r = R + h = 7.38\times10^{6}\,m$
$R = 6.38\times10^{6}\,m$
$h = 1000.0\,Km$ $(1000.0\times10^{3}\,m)$
$G = 6.67\times10^{-11}\,Nm^2/Kg^2$

$g = \frac{F_g}{m} = \frac{G\cancel{m}M}{r^2\cancel{m}}$

$g = \frac{GM}{r^2}$ $g = a_c$

$a_c = \frac{v^2}{r}$

$\frac{GM}{r^2} = \frac{v^2}{r}$

$\therefore GM = v^2r^2$

$v = \sqrt{\frac{GM}{r}}$

$v = \sqrt{\frac{(6.67\times10^{-11})(5.97\times10^{24})}{(7.38\times10^{6})}}$

$v = 7345.509$

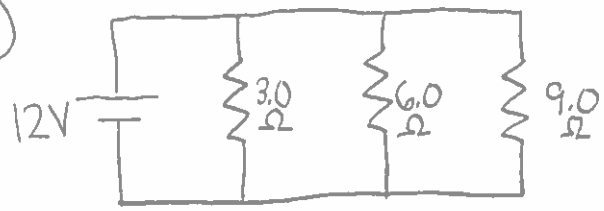
(a) **$v = 7350\ m/s$**

(b) $v = \frac{s}{t} = \frac{2\pi r}{T}$

$\therefore T = \frac{2\pi r}{v} = \frac{2\pi(7.38\times10^{6})}{(7350)} = 6308.830961\,s$

$= \boxed{105\ min}$

⑥



(i) $R_T = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)^{-1}$

$= \left(\frac{1}{3} + \frac{1}{6} + \frac{1}{9}\right)^{-1}$

$= 1.636363$

$\boxed{R_T = 1.6\,\Omega}$

(ii) $V_T = V_1 = V_2 = V_3$

$\boxed{V_{3.0\Omega} = 12\,V}$

(iii) $V = IR$

$\therefore I = \frac{V}{R} = \frac{12\,V}{6.0\,\Omega}$

$\boxed{I = 2.0\,A}$

(iv) $P = IV$; $V = IR$

$\therefore I = \frac{V}{R}$

$P = \left(\frac{V}{R}\right)V$

$P = \frac{V^2}{R} = \frac{(12)^2}{9.0} =$

$\boxed{P = 16\,W}$