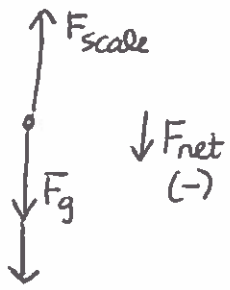
① $m = 75\ kg$

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



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

$-ma = F_{scale} - F_g$

$-ma = F_{scale} - mg$

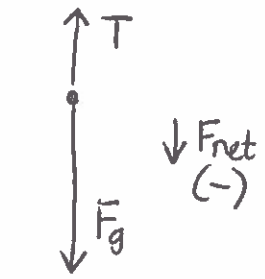
$\therefore F_{scale} = -ma + mg$

$= 75(9.8 - 2.5)$

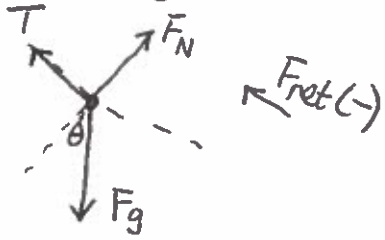
$= 547.5$

$F_{scale} = 550\ N$

② 5.0 kg



7.5 kg



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

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

$= 42.157\ N$

$\sum F = T - F_g$

$-m_1 a = T - m_1 g$

$\therefore T = m_1 g - m_1 a$

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

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

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

$\therefore F_N = mg\cos\theta$

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

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

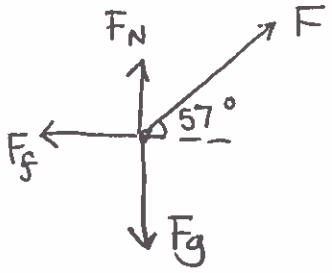
$-m_1 a$ $\qquad$ $-m_1 a$

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

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

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

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) (i) $\Delta p = m\Delta v = m(v-u) = (.0420)(-6.0-12)$

$\Delta p = .756$

$\Delta p = .76\ kg\,m\,s^{-1}$ or Ns

(ii) $\Delta p = F\Delta t$

$\therefore F = \frac{\Delta p}{\Delta t} = \frac{.76}{.040} = 18.9$

$F = 19\ N$

(iii) $\Delta E = KE_f - KE_i = \frac{1}{2}m(v^2-u^2)$

$= \frac{1}{2}(.0420)((-6.0)^2-(12)^2)$

$= -2.268$

$\Delta E = -2.3\ J$

(5) $PE_i = mg\Delta h = (35)(9.8)(7.5) = 2572.5\ J$

$KE_f = \frac{1}{2}mv^2 = \frac{1}{2}(35)(9.2)^2 = 1481.2\ J$

$\Delta E = PE_i - KE_f = 2572.5 - 1481.2 = 1091.3$

$\Delta E = 1100\ J$

(6) W_{net} = area under the curve

$= (8.0\ N)(4.0\ m) + (\tfrac{1}{2})(8.0\ N)(4.0\ m) + (-4.0\ N)(4.0\ m)$

$= 32 + 16 - 16 = 32\ Nm$ or $32\ J$

$P = \frac{\Delta E}{\Delta t} = \frac{W_{net}}{\Delta t} = \frac{32\ J}{180\ s} = .17778$

$\frac{3.0\ min}{1} \left| \frac{60\ s}{1\ min} \right. = 180\ s$

$P = .18\ W$