p 98 1-15 odd 23, 27, 67, 77, 81

① $F = ma = (60.0\,kg)(1.25\,ms^{-2}) = \underline{75.0\,N}$

③ $F = ma = (960\,kg)(1.20\,ms^{-2}) = \underline{1200\,N}$

⑤ (a) Weight $= mg = (20.0\,kg)(9.81\,ms^{-2}) = 196\,N$

$F_N = 196\,N$

(b) $F_N = ma = (20.0\,kg + 10.0\,kg)(9.81\,ms^{-2}) = 294\,N$

$F_N = ma = (10.0\,kg)(9.81\,ms^{-2}) = 98.1\,N$

⑦ $F = ma$

$= (7 \times 10^{-3}\,kg)(9765.6\,ms^{-2})$

$F = \underline{68.4\,N}$

$u = 0$

$v = 125\,ms^{-1}$

$s = 0.8\,m$

$a = ?$

$v^2 = u^2 + 2as$

$a = \dfrac{v^2 - u^2}{2s} = \dfrac{(125\,ms^{-1})^2}{2(.8\,m)} = 9765.6\,ms^{-2}$

⑨ $F = ma$

$m = 0.140\,kg$

$F = (0.140\,kg)(-5568.68\,ms^{-2})$

$F = -780.\,N$

$u = 35\,ms^{-1}$

$v = 0$

$s = 0.11\,m$

$a = ?$

$v^2 = u^2 + 2as$

$a = \dfrac{-u^2}{2s} = \dfrac{-(35\,ms^{-1})^2}{2(.11\,m)} = -5568.18\,ms^{-2}$

(11) $u = 0$
$s = 407\,m$
$t = 6.40\,s$

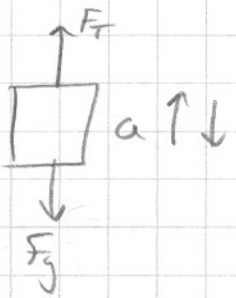
$s = ut + \frac{1}{2}at^2$

$a = \frac{2s}{t^2} = \frac{2(407\,m)}{(6.40\,s)^2} = 19.87\,ms^{-2}$

$= 2g$

$F = ma$
$= (485\,kg)(19.87\,ms^{-2}) = \underline{9640\,N}$

(13) $\Sigma F = ma$



$F_T - F_g = ma$
$F_T = ma + F_g$
$= ma + mg$
$= (-4850\,kg)(0.068)(9.81\,ms^{-2}) + (4850\,kg)(9.81\,ms^{-2})$
$= \underline{44\,300\,N}$ max

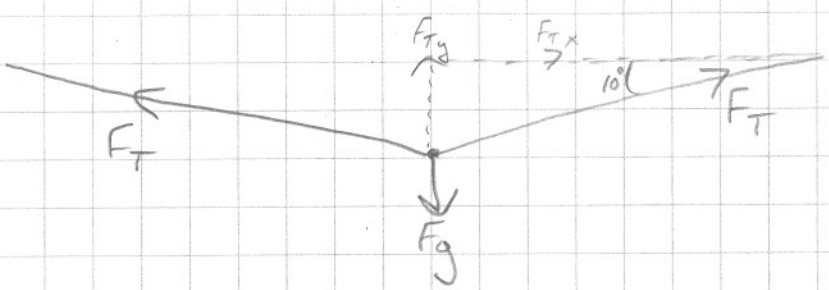
$F_{net} = ma$
$F_T - F_g = ma$
$F_T = ma + F_g$
$= ma + mg$
$= (4850\,kg)(0.0680)(9.81\,ms^{-2}) + (4850\,kg)(9.81\,ms^{-2})$
$= \underline{50\,800\,N}$ max

(15) $F_{Net} = ma$
$F_N - F_g = ma$
$.75mg - mg = ma$

$a = -.25g = \underline{-2.45\,ms^{-2}}$

The elevator starts to move <u>down</u>.

(23)



$F_{net} = 0$

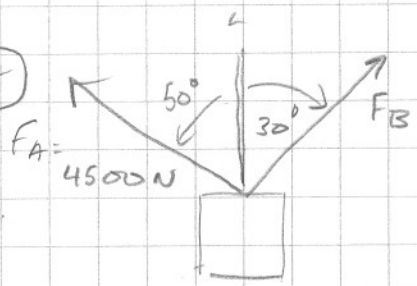
$F_{Ty} = F_T \sin 10°$

$2F_{Ty} - F_g = 0$

$2F_T \sin 10° - mg = 0$

$$F_T = \frac{mg}{2 \sin 10°} = \frac{(50\,kg)(9.81\,m/s^2)}{2 \sin 10} = \underline{1410\ N}$$

(27)



$|F_{Ax}| = |F_{Bx}|$

$4500N \sin 50° = F_B \sin 30°$

$\underline{F_B = 6900\ N}$

$F_A + F_B = F_{Ay} + F_{By} = 4500N \cos 50° + 6900N \cos 30°$

$= \underline{8900\ N}$

(67) $F = ma$

$= (70kg)(30)(9.81ms^{-2}) = 20601N = \underline{20\,000N}$

$u = 100kmh^{-1} = 27.78ms^{-1}$

$v = 0$

$a = -30(9.81ms^{-2})$

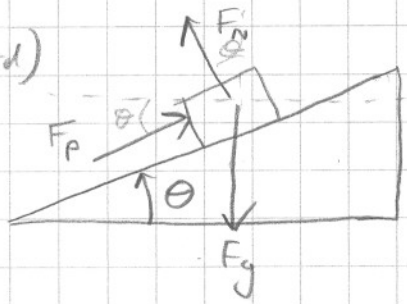
$s = ?$

$v^2 = u^2 + 2as$

$s = \frac{v^2 - u^2}{2a} = \frac{-(27.78ms^{-1})^2}{2(-30)(9.81ms^{-2})} = 1.31 = \underline{1m}$

(77) Method A (Hard)

(easy method follows)



$\Sigma F_x = 0$

$F_{px} + F_{Nx} = 0$

$20\cos\theta - F_N\sin\theta = 0$

$F_N = \frac{20\cos\theta}{\sin\theta}$

$\Sigma F_y = 0$

$F_{py} + F_{Ny} - F_g = 0$

$20\sin\theta + F_N\cos\theta - mg = 0$

$F_N = \frac{mg - 20\sin\theta}{\cos\theta}$

$\frac{20\cos\theta}{\sin\theta} = \frac{mg - 20\sin\theta}{\cos\theta}$

$20\cos^2\theta = mg\sin\theta - 20\sin^2\theta$

$20\cos^2\theta + 20\sin^2\theta = mg\sin\theta$

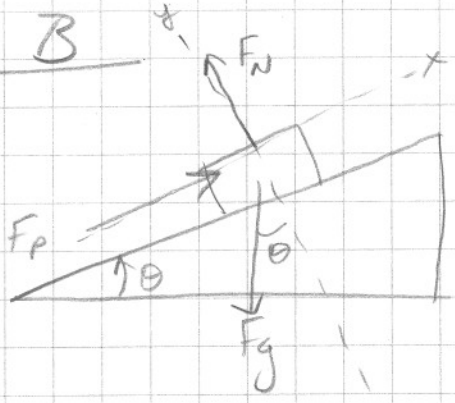
$20(\cos^2\theta + \sin^2\theta) = mg\sin\theta$

$20 = mg\sin\theta$

$\sin\theta = \frac{20}{mg} = \frac{20}{(30kg)(9.81ms^{-2})}$

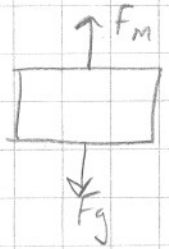
$\underline{\theta = 4^\circ}$

77. Method B
(Easy)



$$\Sigma F_x = 0$$
$$F_p - F_g \sin\theta = 0$$
$$\sin\theta = \frac{F_p}{F_g} = \frac{F_p}{mg} = \frac{20N}{(30kg)(9.81ms^{-2})}$$
$$\theta = 4°$$

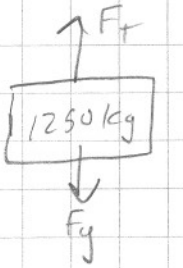
81 (a)



$$m = 7650kg + 1250kg$$
$$= 8900kg$$

$$\Sigma F = ma$$
$$F_m - F_g = ma$$
$$F_m = ma + mg$$
$$= (8900kg)(0.8ms^{-2}) + (8900kg)(9.81ms^{-2})$$
$$F_m = 94000N$$

(b)



$$\Sigma F = ma$$
$$F_T - F_g = ma$$
$$F_T = ma + mg$$
$$= (1250kg)(.8ms^{-2}) + (1250kg)(9.81ms^{-2})$$
$$F_T = 13000N$$

(c) The F_T in the cable has to be the force on the helicopter
$\therefore F = 13000N$