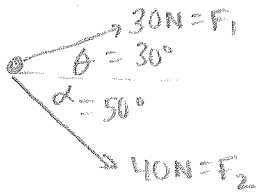
p. 83 # 1, 2, 3, 5

1.



$F_{1x} = F_1 \cos\theta$
$= (30N)(\cos 30°)$
$= 26.0N$

$F_{2x} = F_2 \cos\alpha$
$= (40N)(\cos 50°)$
$= 25.7N$

$\vec{F}_{TOTAL} = ?$

$F_{x\text{-}TOTAL} = F_{1x} + F_{2x}$
$= 51.7N$

$F_{1y} = F_1 \sin\theta$
$= (30N)\sin 30°$
$= 15.0N$

$F_{2y} = F_2 \sin\alpha$
$= (40N)(\sin 50°)$
$= 30.6\ N$

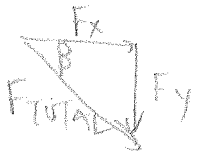
$F_{y\text{-}TOTAL} = -F_{1y} + F_{2y}$
$= 15.6N$

$F_{TOTAL} = \sqrt{(F_x)^2 + (F_y)^2}$
$= \sqrt{(51.7N)^2 + (15.6\ N)^2}$
$= 54\ N$

$\tan\beta = \frac{F_y}{F_x}$

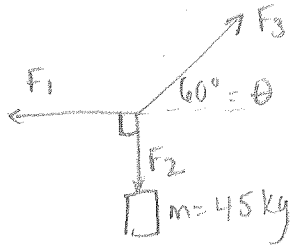
$\tan\beta = \frac{15.6\ N}{51.7N}$

$\beta = 17°$



$\therefore \vec{F}_{TOTAL} = 54\ N\ [E\ 17°S]$.

2.



$F_{3x} = F_3 \cos\theta$ $\quad F_{3y} = F_3 \sin\theta$

If the system is in equilibrium (at rest):

$F_1 = F_{3x}$, $F_2 = mg = F_{3y}$

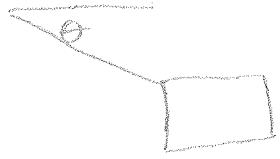
$F_2 \quad mg = F_{3y} = F_3 \sin\theta \Rightarrow F_3 = \frac{mg}{\sin\theta}$

Sub into F_{3x}:

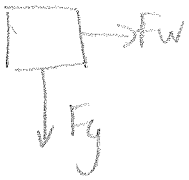
$F_1 = F_3 \cos\theta$
$= \frac{mg}{\sin\theta} \cos\theta$

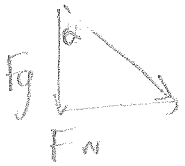
p. 83 # 1, 2, 3, 5

3. $m = 2.5\,kg$
$F = ?$
$\theta = ?$
$F_w = 12\,N$



FBD





$$F_{TOTAL} = \sqrt{(F_g)^2 + (F_w)^2}$$

$$= \sqrt{((2.5\,kg)(9.8\,m/s^2))^2 + (12\,N)^2}$$

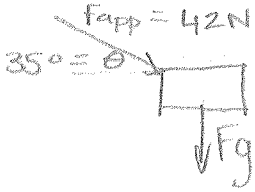
$$= 27\,N$$

$$\tan\theta = \frac{F_g}{F_w} = \frac{(2.5\,kg)(9.8\,m/s^2)}{12\,N}$$

$$\theta = 64°$$

$\therefore F = 27\,N\,[E\ 64°S]$

5a)



$m = 18\,kg$
$\Delta d = 5.0\,m$
$v_i = 0\,m/s$

b) $a = ?$

$$F_{NET} = ma \Rightarrow a = \frac{F_{NET}}{m}$$

$$a = \frac{F_x}{m} = \frac{F\cos\theta}{m}$$

$$a = \frac{(42\,N)\cos 35°}{18\,kg}$$

$$a = 1.9\,m/s^2$$

p. 83 # 1, 2, 3, 5

5c) $F_N = ?$

$F_{NET\,y} = 0 = F_N + F_y - F_g$

$F_N = F_g + F_y$

$= mg + F\cos\theta$

$= (18\,kg)(9.8\,m/s^2) + (42\,N)\cos 35°$

$= 210\,N$

d) $v_2 = ?$

$v_2^2 = v_1^2 + 2a\Delta d$

$v_2 = \sqrt{(0\,m/s)^2 + 2(1.9\,m/s^2)(5.0\,m)}$

$= 4.4\,m/s$