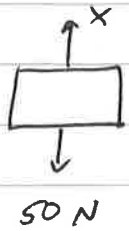
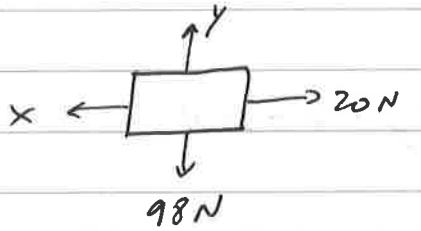
Exercise 3A

(1) (a)



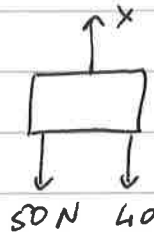
; $\therefore X = 50N$

(b)



; For y: $y = 98N$
For x: $X = 20N$

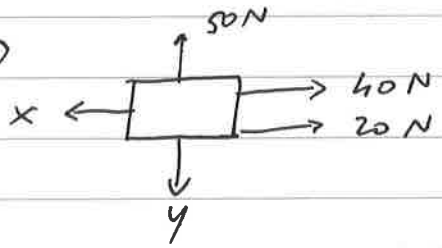
(c)



;

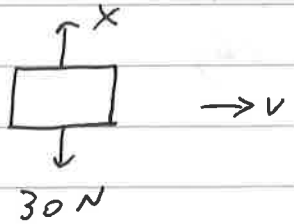
$X = 40N + 50N = 90N$

(d)



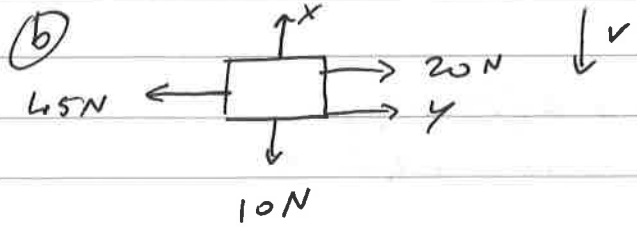
; For X: $X = 40N + 20N = 60N$
For y: $y = 50N$

(2) (a)



; $X = 30N$

(b)



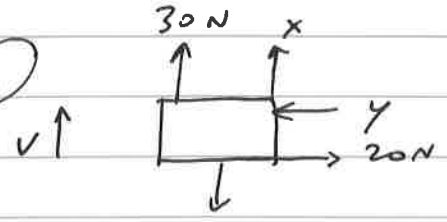
; For y: going left to right

$45N = 20N + y$

$\therefore y = 25N.$

For X: $X = 10N$

(c)



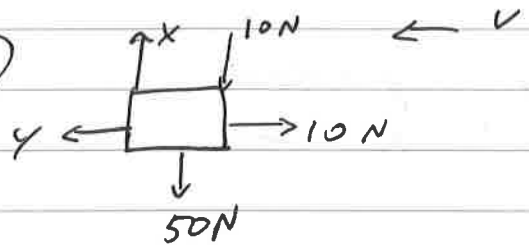
; For y: $y = 20N$

For x: $x + 30N = 70N$

$\Rightarrow x = 40N$

For y: $y = 20N$

(d)



; for y: $y = 10N$

For x: $X = 10N + 50N = 60N$

(3)

5kg → 10N

→→ $a = ?$

$F = ma$

So $10 = 5a$

$\Rightarrow a = 2\ m/s$

(5)

x kg → 24N

→→ $3\ m/s^2$

$F = ma$

So $24 = 3m$

$\Rightarrow m = 8kg$

(7)

2 kg → F

→→ $a = (5\underline{i} + 2\underline{j})\ m/s^2$

$\underline{F} = m\underline{a} \Rightarrow x\underline{i} + y\underline{j} = 2(5\underline{i} + 2\underline{j})$

$= 10\underline{i} + 4\underline{j}\ N$

(9) 2 kg → $2\underline{i} - 3\underline{j} + 4\underline{k}$ N
→ $\underline{i} + 5\underline{j} + 2\underline{k}$ N

$\underline{F} = m\underline{a} \Rightarrow (2\underline{i} - 3\underline{j} + 4\underline{k}) + (\underline{i} + 5\underline{j} + 2\underline{k}) = 2(a\underline{i} + b\underline{j} + c\underline{k})$

$\therefore \; 3\underline{i} + 2\underline{j} + 6\underline{k} = 2(a\underline{i} + b\underline{j} + c\underline{k})$

$\Rightarrow \underline{a} = \frac{3}{2}\underline{i} + \underline{j} + 3\underline{k} \; m/s^2$

(11)

500 g → 3 N

(a) $F = ma \Rightarrow 3 = \frac{1}{2}a \Rightarrow a = 6 \; m/s^2$

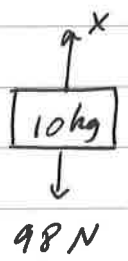
(b) From $v^2 = u^2 + 2as$ we have $\frac{v^2 - u^2}{2a} = s$.

we can use this formula because acceleration is uniform / constant.

$\therefore \; \frac{7^2 - 1^2}{2 \times 6} = s = 4 \; m$

(12)

(a)



; $F = ma$

$\therefore \; X - 98 = 10 \times 2 = 20$

$\therefore \; X = 118 \; N$

(b)

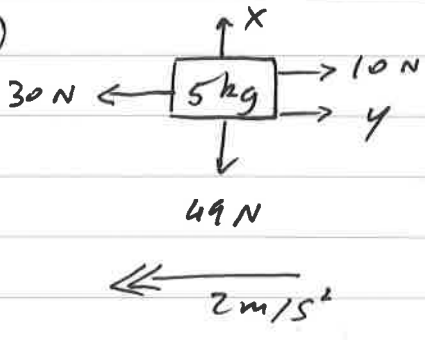
; $F = ma$

$\therefore 98 - X = 10 \times 2 = 20$

$\therefore X = 98 - 20 = 78\ N$

(c) & (d) : left as Exercise

(e)



; For X : Body only moves horizontally

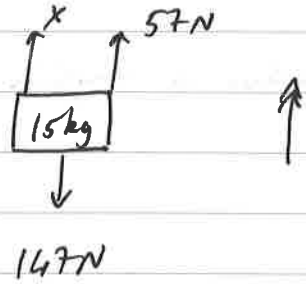
$\therefore X = 49\ N$

For y : $F = ma$

$\Rightarrow 30 - (10 + y) = 5 \times 2 = 10$

$\therefore y = 10\ N$

(f)

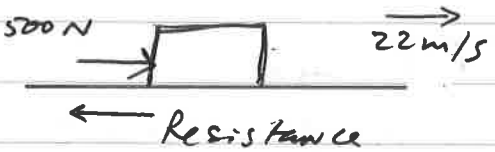


; $F = ma$

$\therefore x + 57 - 147 = 15 \times 10 = 150$

$\therefore X = 240\ N.$

(13)

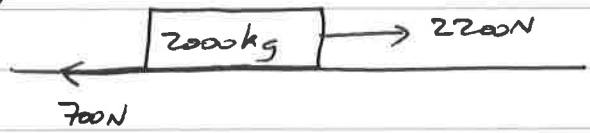


;

For car to move at a constant velocity, any force Exerted by car is cancelled by an equal & opposite Force

$\therefore$ Resistance = 500N

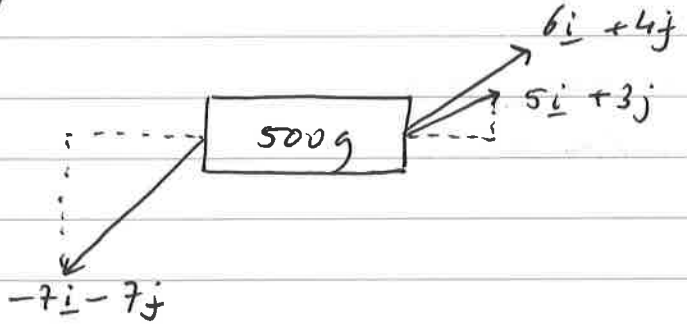
(15)



$F = ma$: Net Force $= 2200 - 700 = 1500N$

So $a = \frac{1500}{2000} = 0.75 m/s^2$

(17)



Net Force

$\underline{F} = 6\underline{i} + 4\underline{j} + 5\underline{i} + 3\underline{j} - 7\underline{i} - 7\underline{j}$

$= 4\underline{i}$

So $\underline{F} = m\underline{a} \Rightarrow 4\underline{i} = 0.5(x\underline{i} + y\underline{j})$

$\therefore 4\underline{i} = 0.5x\underline{i} + 0.5y\underline{j}$

hence $x = 8$ & $y = 0$

So acceleration is $\underline{a} = 8\underline{i}\ m/s^2$

(19) Net Force $\underline{F} = \Sigma$ all forces.

So $\underline{F} = m\underline{a} \Rightarrow a\underline{i} + b\underline{j} + c\underline{k} + 2\underline{i} - 3\underline{j} + \underline{k} = 2(4\underline{i} + \underline{k})$

$\therefore i(a+2) + j(b-3) + k(c+1) = 8\underline{i} + 2\underline{k}$

$\Rightarrow a + 2 = 8, \therefore a = 6$

$b - 3 = 0, \therefore b = 3$

$c + 1 = 2, \therefore c = 1$

(21)

$\rightarrow$: 15 m/s $\rightarrow$ 20 m/s in 10 s

From $V = u + at$ we have $\frac{V-u}{t} = a$

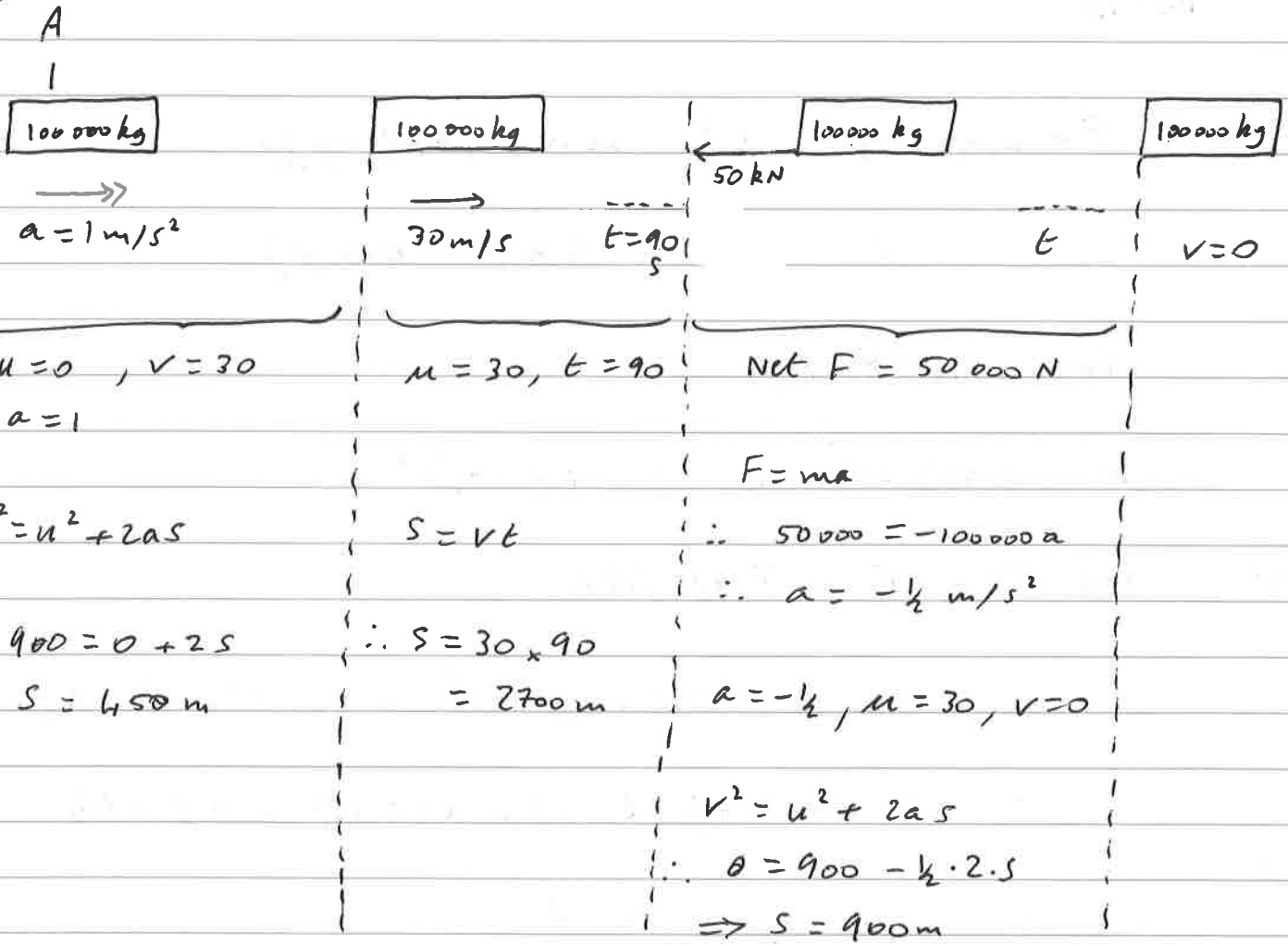
So $\frac{20-15}{10} = 0.5 \text{ m/s}^2$

Net Force $= F - 270$

So by $F = ma$: $F - 270 = 1000 \times 0.5$

$\Rightarrow$ $F = 770$ N

(23)



So total distance $s = 450 + 2700 + 900 = 4050$ m