

① a) H V L A N J S T P

H L A J N V S T P

A H L J N S P T V

A H J L N P S T V

A H J L N P S T V

sublists 'size 1' so stop.

b)

1. Alice

2. Hajra

3. June

4. Leisham

5. Nicky

6. Paul

7. Sharon

8. Tom

9. Vicky

$$\frac{1+9}{2} = 5 \quad 5 = \text{Nicky}$$

discard 1-5

$$\frac{6+9}{2} = 7.5 \quad 8 = \text{Tom}$$

discard 8-9

$$\frac{6+7}{2} = 6.5 \quad 7 = \text{Sharon}$$

discard 7

$$6 = \text{Paul} \quad \therefore \text{Found.}$$

PG2  
②

a) DE, FG, CD, (BD), EG, EFrej, CFrej  
AC, ABrej, GH (7 edges so stop)

b)

	A	B	C	D	E	F	G	H
A	-	31	30	-	-	-	-	-
B	31	-	-	24	-	-	-	38
C	30	-	-	22	24	29	-	-
D	-	24	22	-	18	-	-	34
E	-	-	24	18	-	28	26	-
F	-	-	29	-	28	-	21	-
G	-	-	-	-	26	21	-	33
H	-	38	-	34	-	-	33	-

Matrix 1

c) AC, CD, DE, DB, EG, FG, GH

d) weight = 30 + 22 + 24 + 18 + 26 + 21 + 33 = 174m

③

a) lower bound =  $\frac{41+28+42+31+36+32+29}{60}$   
= 3.983 so 4 bins

b) 

<u>Bin1</u>	<u>Bin2</u>	<u>Bin3</u>	<u>Bin4</u>	<u>Bin5</u>	<u>Bin6</u>
41	28	42	36	32	29
	31				

c) 

<u>Bin1</u>	<u>Bin2</u>	<u>Bin3</u>	<u>Bin4</u>	<u>Bin5</u>
31	32	41	42	36
29	28			

PG3

d) Because 5 of the statues weigh more than 30kg and as these cannot be paired with each other there will need to be at least 5 crates.

④ a) Odd nodes B, C, E, G

$$BC = 10.4 \quad BE = 8.3 \quad BG = 14.9$$

$$EG = \frac{10.1}{20.5} \quad CQ = \frac{16.1}{24.4} \quad CE = \frac{11.9}{26.8}$$

Repeat BA, AC, EG

b) Possible route: ACFQDEQEBCA

$$\text{length} = 73.3 + 20.5 = \underline{\underline{93.8 \text{ km}}}$$

c) Now only BE will need to be repeated so the new length will be:

$$73.3 + 10 + 8.3 = 91.6 \text{ km}$$

so it will be shorter by 2.2 km.

⑤ a)  $G-3 = E-2 = A-4 = S-6$

$$\text{c.s } G=3 - E=2 - A=4 - S=6$$

improved match: A=4

C unmatched

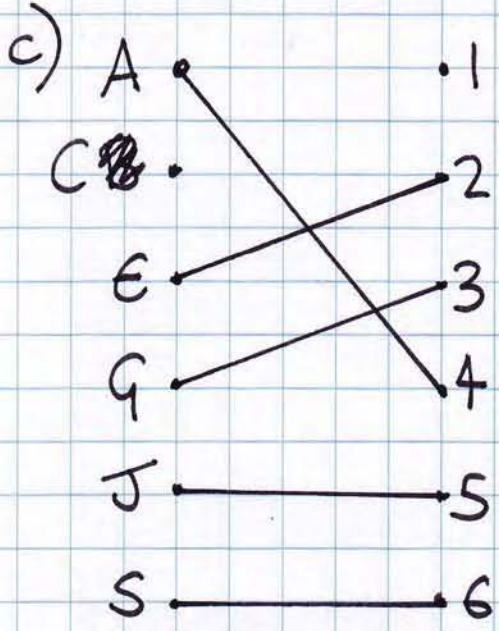
$$\cancel{E}=2$$

$$G=3$$

$$F=5$$

$$S=6$$

b) A complete match is impossible as J and C can only do task 5.



$$C-5 = J-4 = A-2 = E-6 = S-1$$

$$c.s \ C=5 - J=4 - A=2 - E=6 - S=1$$

complete match:  $A=2, C=5, E=6, G=3, J=4$   
 $S=1.$

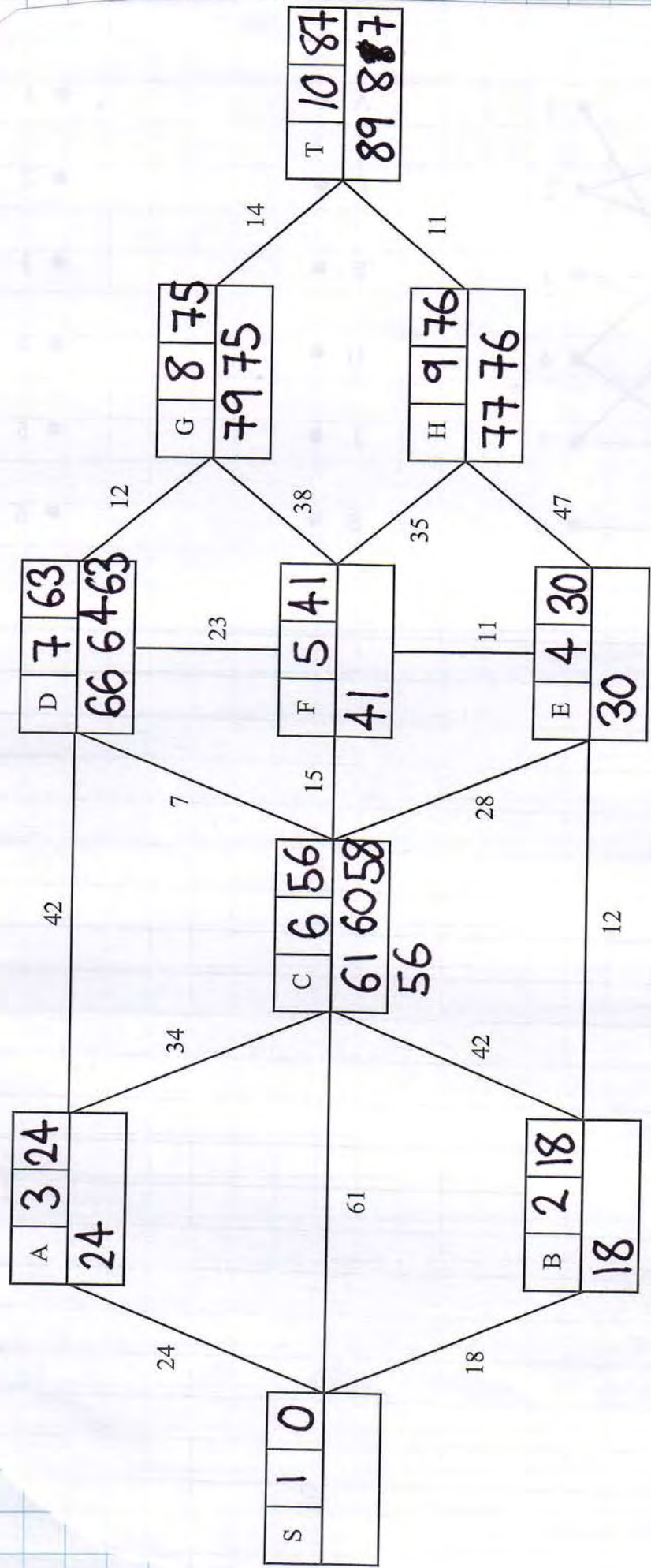
⑥ a) see page 5.

b) Work back from T to S subtracting the edge weights from the final values to determine the route

e.g.  $87 - 11 = 76 \quad T \rightarrow H$   
 $76 - 35 = 41 \quad H \rightarrow F \quad \text{and so on.}$

c) EFHT

PG 5 (6a)



SBFEFHT

Route S to T:

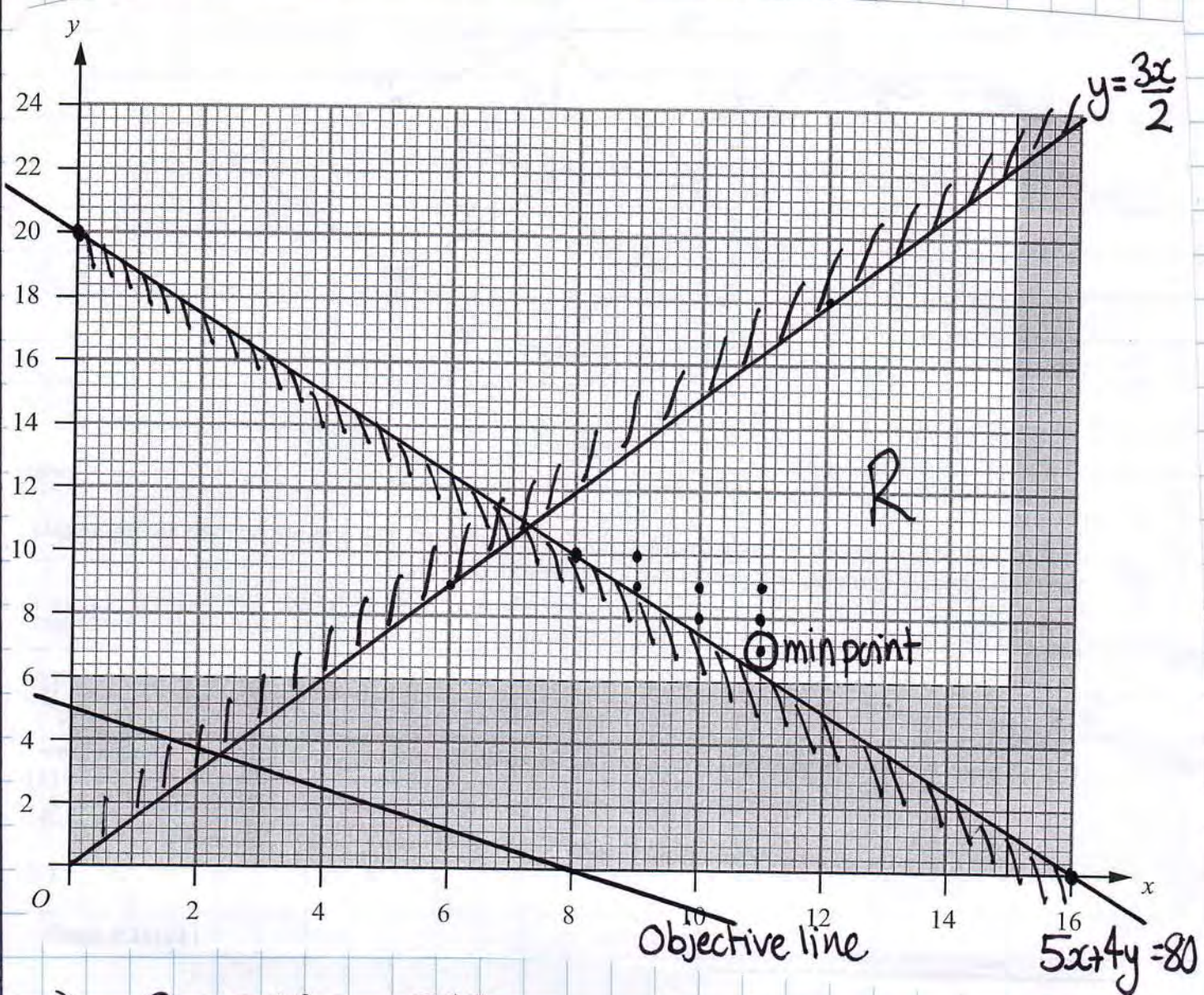
87mins.

Time taken for route:

pg 6  
Q7

a) As  $y > 6$  does not include 6.

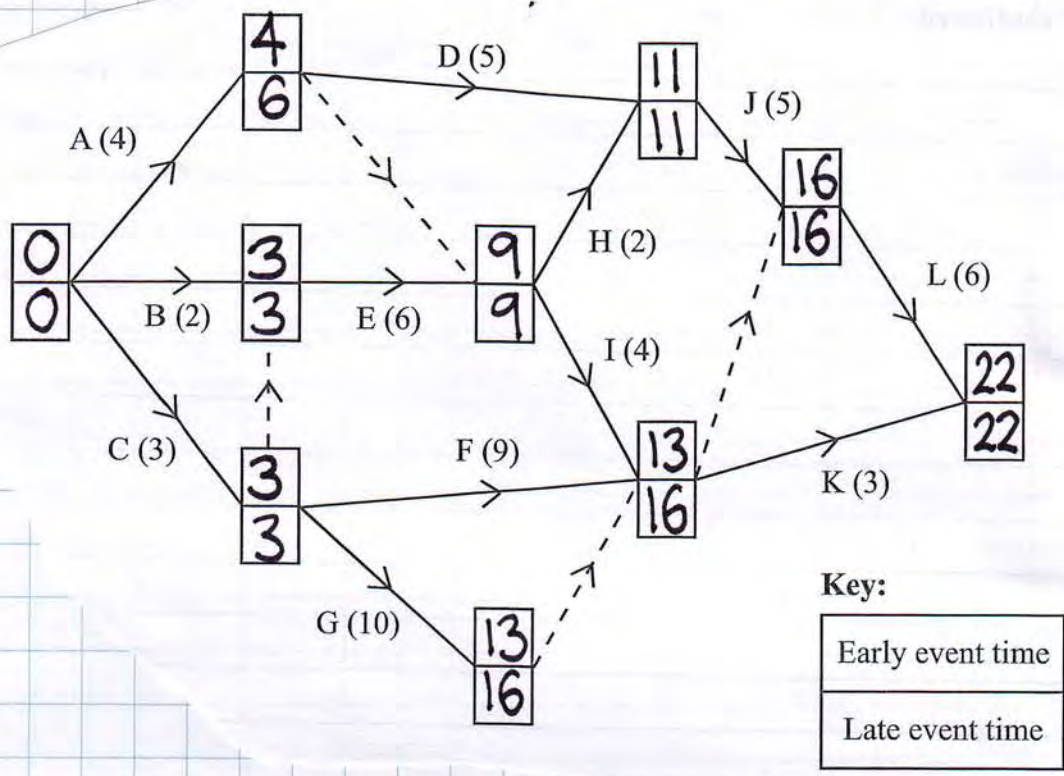
b)



c)  $C = 500x + 800y$   
(Draw  $500x + 800y = 40000$ )

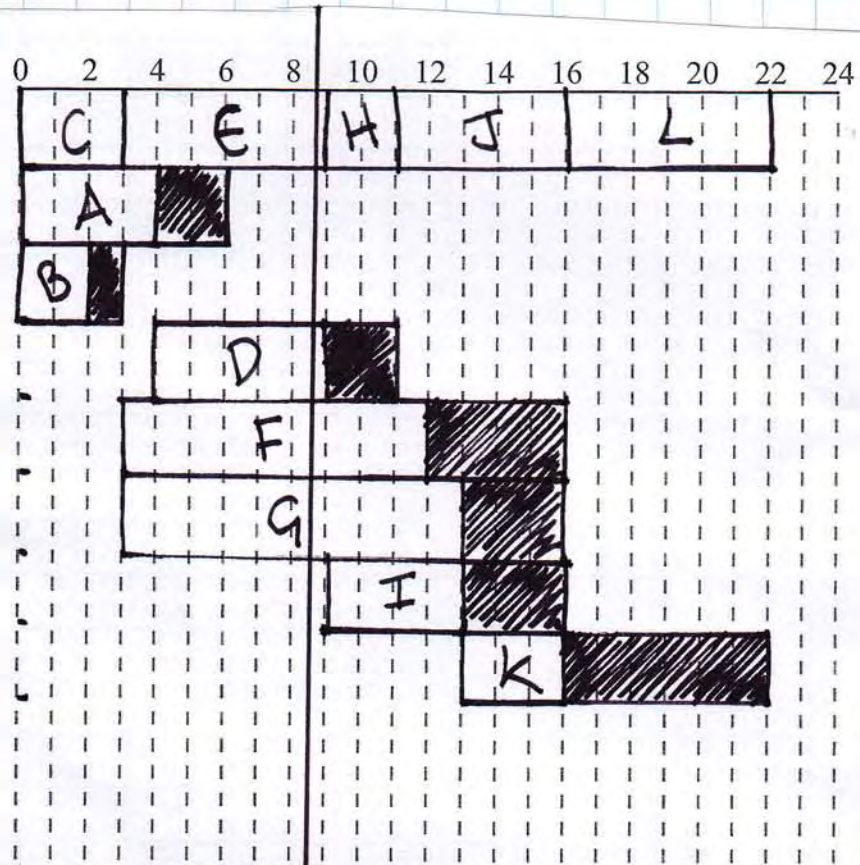
d)  $(11, 7) \Rightarrow C = 500 \times 11 + 800 \times 7$   
£11100

PG 7  
8 a)



b) CEHJL

c)



d) At day 8.5 there must be 4 tasks happening (E, D, F, G) so the lower bound is 4.