

(b) e.g. George and Yi Wen may both only be assigned to 3

B1 (1)

January 2007
6689 Decision D1
Mark Scheme

Question Number	Scheme	Marks
1)	$\left[\frac{1+10}{2} \right] = 6 \text{ Nicky} - \text{reject top of list.}$ $\left[\frac{7+10}{2} \right] = 9 \text{ Trevor} - \text{reject bottom of list}$ $\left[\frac{7+8}{2} \right] = 8 \text{ Steve} - \text{reject bottom of list}$ $[7] = 7 \text{ Preety} - \text{reject}$ <p>Nigel <u>not</u> in list.</p>	<p>M1</p> <p>A1</p> <p>A1</p> <p>A1</p> <p style="text-align: right;">4</p>

Question Number	Scheme	Marks
2) (a)	$G - 3 = J - 4 = L - 5$ <p>change status: $G = 3 - J = 4 - L = 5$</p> <p>improved matching:</p> $E = 2$ $G = 3$ $J = 4$ $L = 5$	<p>M1</p> <p>A1</p> <p>B1 (3)</p>
(b)	e.g. George and Yi Wen may both only be assigned to 3	B1 (1)
(c)	$Y - 3 = G - 2 = E - 4 = J - 1$ <p>change status: $Y = 3 - G = 2 - E = 4 - J = 1$</p> <p>complete matching:</p> $E = 4$ $G = 2$ $J = 1$ $L = 5$ $Y = 3$	<p>M1</p> <p>A1</p> <p>A1 (3)</p> <p style="text-align: right;">7</p>

3) (a) A bipartite graph

(b) A, 3, B, 4, C, 1, D, 2, A

(c) Redrawing

Identifying that it is not planar

B 1 (1)
B 2, 1, 0 (2)
m 1
A 1
A 1 ✓ (3)
6

4) (a)

b.v.	x	y	z	r	s	value	Row ops
z	$\frac{1}{2}$	0	1	$\frac{1}{4}$	0	20	$(R_1 \div 4)$
s	0	4	0	$-\frac{1}{2}$	1	120	$R_2 - 2R_1$
P	<u>8</u>	-8	0	<u>5</u>	0	<u>400</u>	$R_3 + 20R_1$

(b) $P + 8x - 8y + 5r = 400$

(c) Not optimal since there is a negative number in the profit row

m 1 A 1
m 1 A 1 ✓
A 1 ✓ (5)
B 1 ✓ (1)
B 1 ✓ (1)
7

5(a)

e.g. Each edge contributes 2 to the sum of degrees, hence this sum must be even.

Therefore there must be an even (or zero) number of vertices of odd degree

Hence there cannot be an odd number of vertices of odd degree

B2, 1, 0
(2)

(b)

$$CD + FH = 200 + 220 = 420 \text{ m}$$

$$CF + DH = 180 + 380 = 560 \text{ m}$$

$$CH + DF = 400 + 160 = 560 \text{ m}$$

repeat CA, AD and FH

M1 A1

A1

A1

(4)

(c)

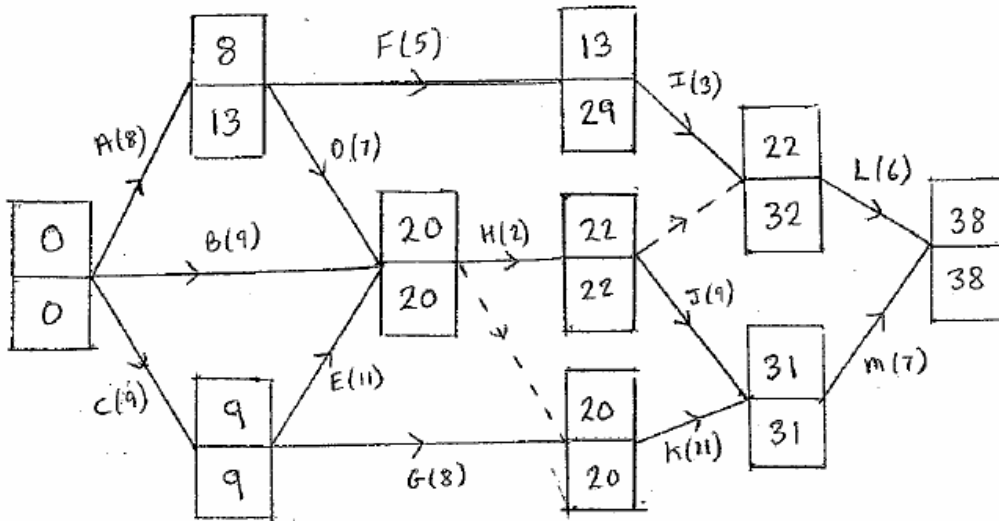
$$\text{length} = 4180 + 420\sqrt{2} = 4600 \text{ m}$$

B1 ✓ (1)

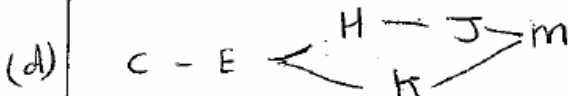
7

6) (a) J depends on H alone, but L depends on H and I

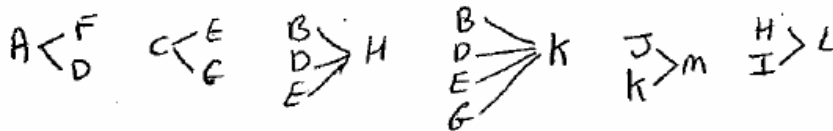
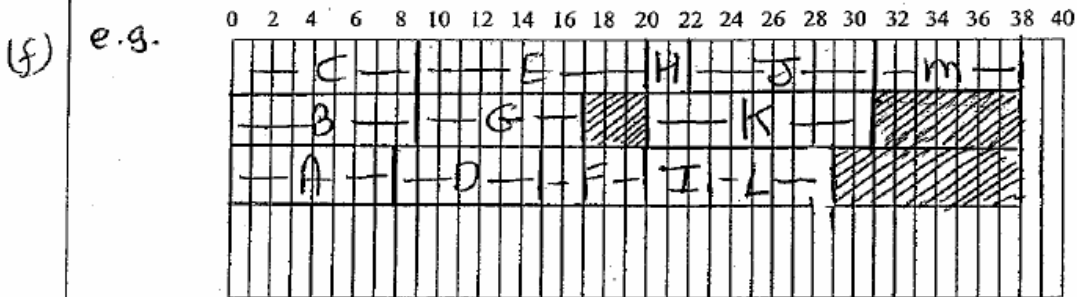
(b)



(c) Total float on D = 20 - 7 - 8 = 5
 Total float on E = 20 - 11 - 9 = 0
 Total float on F = 29 - 5 - 8 = 16



(e) $\frac{95}{38} = 2.5$ so 3 workers



B I
(1)

m i A I

m i A I
(4)

m i A I
A I
(3)

m i A I
(2)

m i A I
(2)

m i A I

A I
A I
(4)

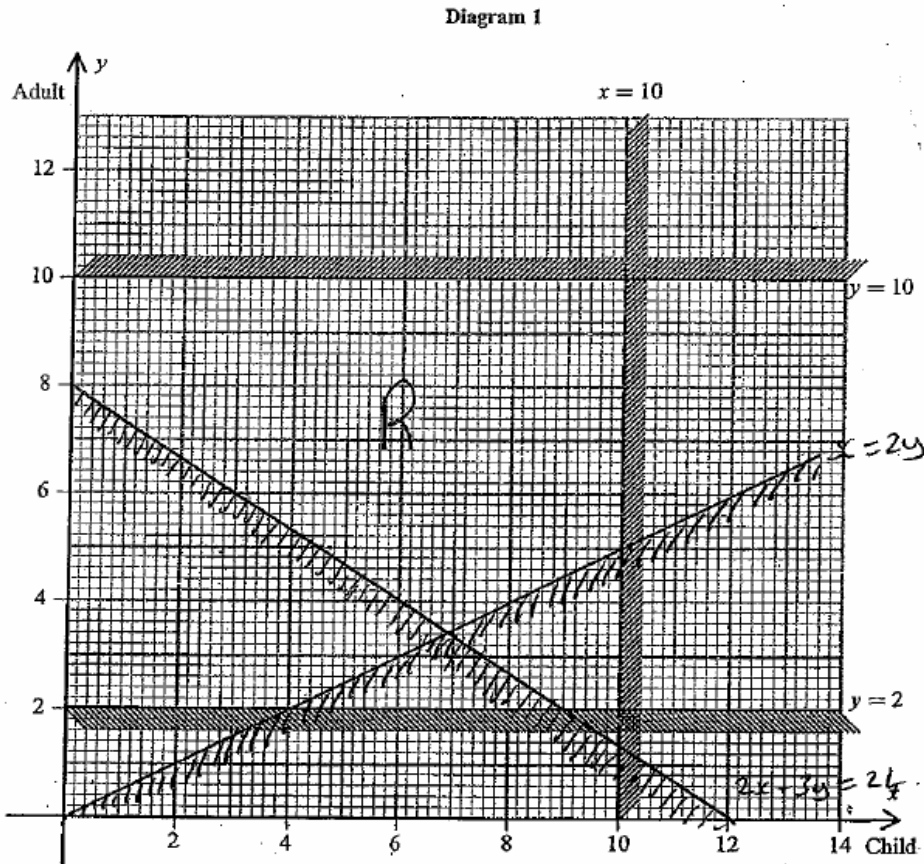
16

7) (a) To show a strict inequality

(b) There must be fewer than 10 children
 There must be between 2 and 10 adults, inclusive.

(c) $2x + 3y \geq 24$
 $x \leq 2y$

(d)



(e) minimum 0 children 8 Adults - 8 passengers
 maximum 9 children 10 Adults - 19 passengers

B1 (1)
 B1
 B2, 1, 0 (3)

B1
 B1 (2)

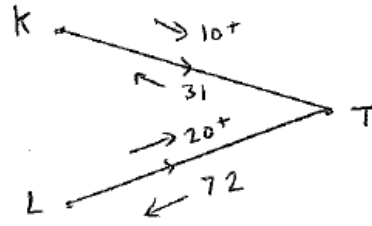
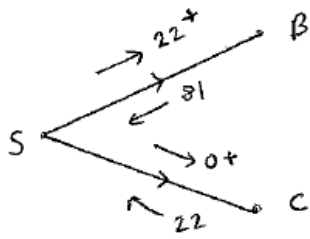
B1 ✓
 (2x+3y=24)
 B1 ✓
 (x=2y)
 B1 ✓ (shading)
 B1 (R)

(4)

m1 A1
 B1 B1
 (4)

14

8) (a)



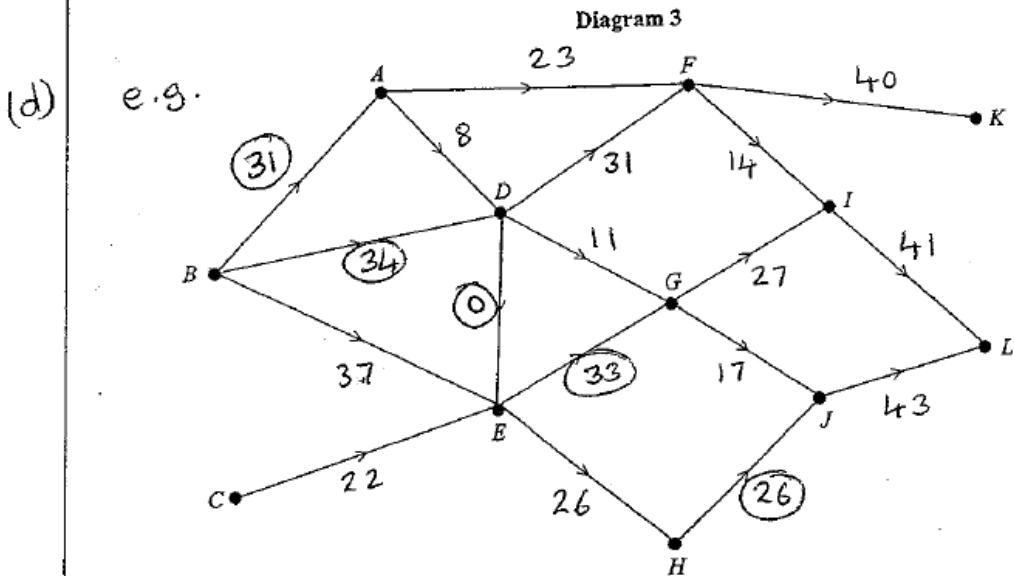
mi A1
A1
(3)

(b) 103

B1 (1)

(c) e.g. SBEGILT - 3
SBEDFKT - 5
SBEHJGDFKT - 4
SBEGDFILT - 9

mi
A4,3,2,1
(5)



mi A1
A1
(3)

Flow value 124 (given)

(e) Max flow = min cut
cut through AB, BD, DE, EG, HJ

mi A1 (2)
14