	$L = 5$	
(b)	e.g. George and Yi Wen may both only be assigned to 3	B1 (1)

edexcel

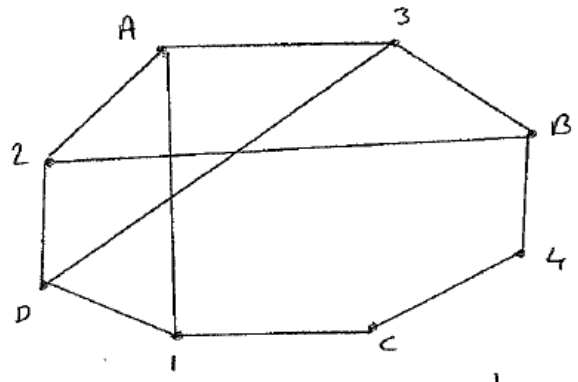
January 2007
6689 Decision D1
Mark Scheme

Question Number	Scheme	Marks
1)	$\left[\frac{1+10}{2}\right] = 6$ Nicky – reject top of list.	M1
	$\left[\frac{7+10}{2}\right] = 9$ Trevor – reject bottom of list	A1
	$\left[\frac{7+8}{2}\right] = 8$ Steve – reject bottom of list	A1
	$[7] = 7$ Preety – reject	A1
	Nigel not in list.	[4]

Question Number	Scheme	Marks
2) (a)	$G - 3 = J - 4 = L - 5$	M1
	change status: $G = 3 - J = 4 - L = 5$	A1
	Improved matching: $E = 2$, $G = 3$, $J = 4$, $L = 5$	B1 (3)
(b)	e.g. George and Yi Wen may both only be assigned to 3	B1 (1)
(c)	$Y - 3 = G - 2 = E - 4 = J - 1$	M1
	change status: $Y = 3 - G = 2 - E = 4 - J = 1$	A1
	complete matching: $E = 4$, $G = 2$, $J = 1$, $L = 5$, $Y = 3$	A1 (3)
		[7]

3) (a) A <u>bipartite</u> graph — B1 (1)

(b) A, 3, B, <u>4, C, 1, D, 2, A</u> — B2,1,0 (2)

(c) 

Redrawing — m1

A1

Identifying that it is <u>not</u> planar — A1√ (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	$(R_1 \div 4)$
<u>s</u>	0	4	0	<u>$-\frac{1}{2}$</u>	1	<u>120</u>	$R_2 - 2R_1$
P	<u>8</u>	−8	0	<u>5</u>	0	<u>400</u>	$R_3 + 20R_1$

m1 A1 — m1 A1√ — A1√ (5)

(b) $P + 8x - 8y + 5r = 400$ — B1√ (1)

(c) Not optimal since there is a negative number in the profit row — B1√ (1)

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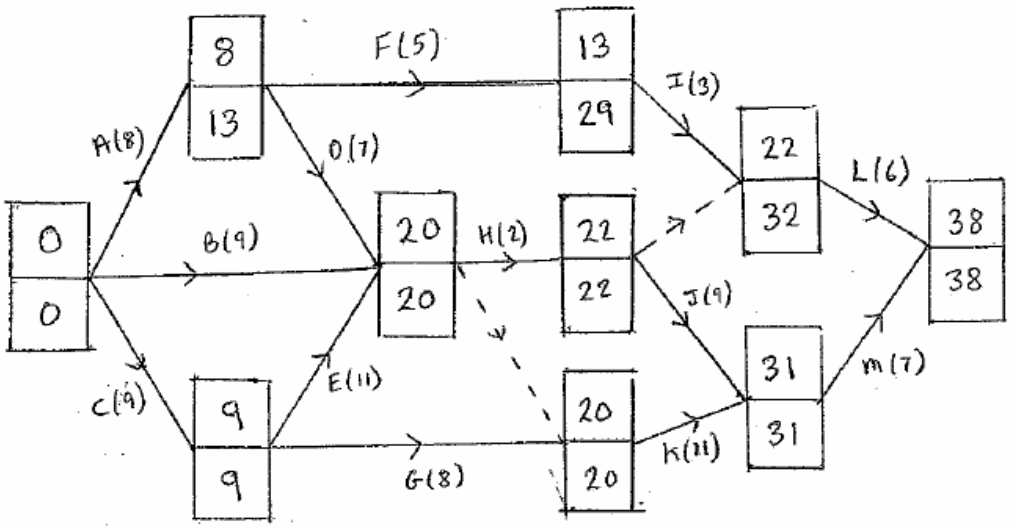
5 (a)	e.g. Each edge contributes 2 to the sum of degrees, hence this sum must be even. Therefore there must be an even (or zero) number of vertices of odd degree Hence there cannot be an odd number of vertices of odd degree	B2, 1, 0 (2)
(b)	CD + FH = 200 + 220 = 420 * CF + DH = 180 + 380 = 560 CH + DF = 400 + 160 = 560 repeat CA, AD and FH	M1 A1 A1 A1 (4)
(c)	length = 4180 + 420✓ = 4600 m	B1✓ (1) 7

6) (a) J depends on H alone, but L depends on H and I — B1 (1)

(b)



m1 A1 m1 A1 (4)

(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

m1 A1✓ A1 (3)

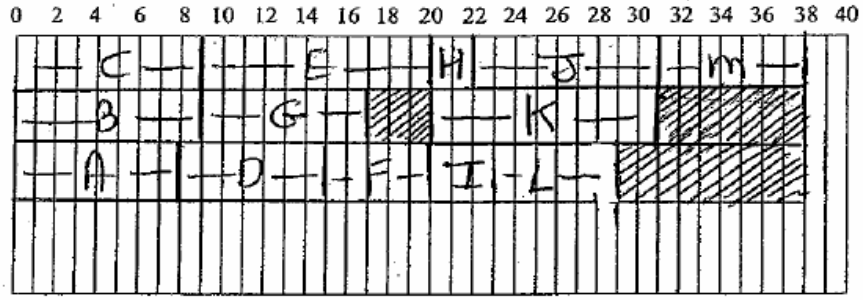
(d) C − E < H − J > m, K > m

m1 A1 (2)

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

m1 A1✓ (2)

(f) e.g.



m1 A1 A1 A1 (4)

19

16

A < F, D C < E, G B, D, E > H B, D, E, G > K J, K > m H, I > L

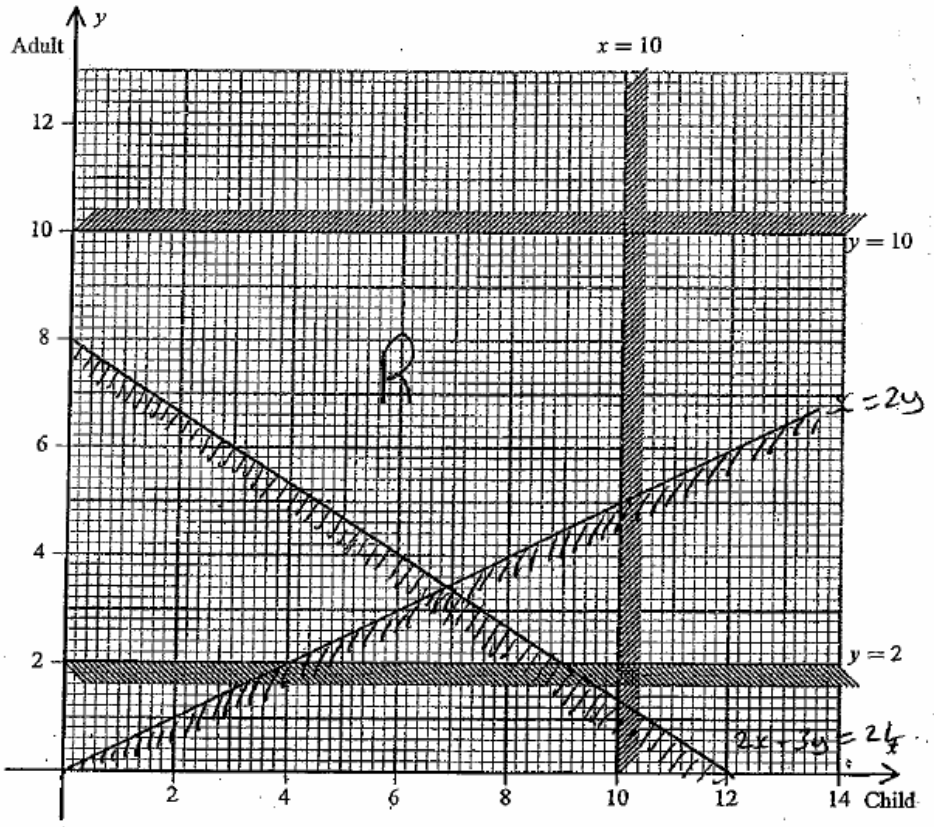
7) (a) To show a strict inequality — B1 (1)

(b) There must be fewer than 10 children
There must be between 2 and 10 adult, inclusive. — B1 B2,1,0 (3)

(c) $2x + 3y \geqslant 24$ — B1
$x \leqslant 2y$ — B1 (2)

(d)

Diagram 1



B1✓ ($2x+3y=24$)
B1✓ ($x=2y$)
B1✓ (shading)
B1 (R)
(4)

(e) Minimum 0 children 8 Adults - 8 passengers
Maximum 9 children 10 Adult - 19 passengers — M1 A1 B1 B1 (4)

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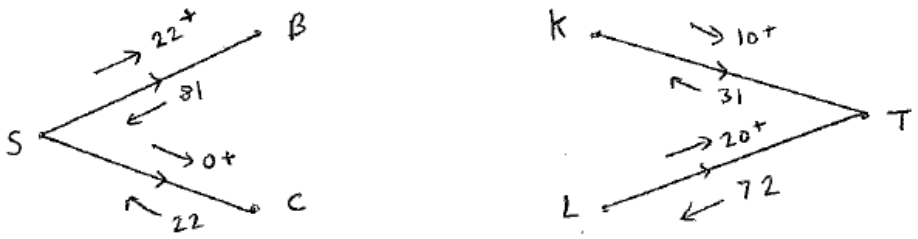
8) (a)



m1 A1
A1
(3)

(b) 103

B1 (1)

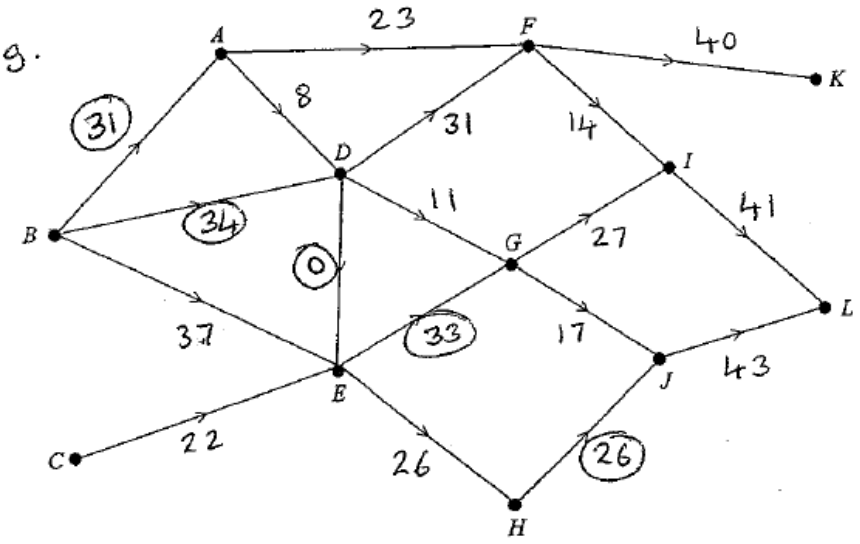
(c) e.g. S B E G I L T - 3
S B E D F K T - 5
S B E H J G D F K T - 4
S B E G D F I L T - 9

m1
A 4,3,2,1,0

(5)

Diagram 3

(d) e.g.



m1 A1
A1

(3)

Flow value 124 (given)

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

m1 A1 (2)

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