

Mark Scheme (Final)

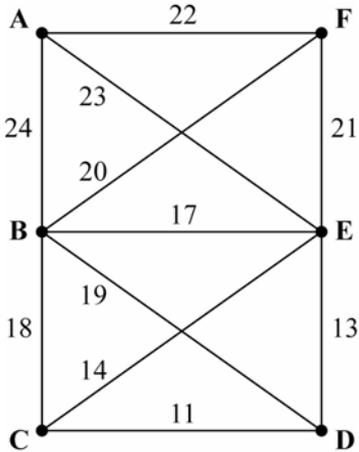
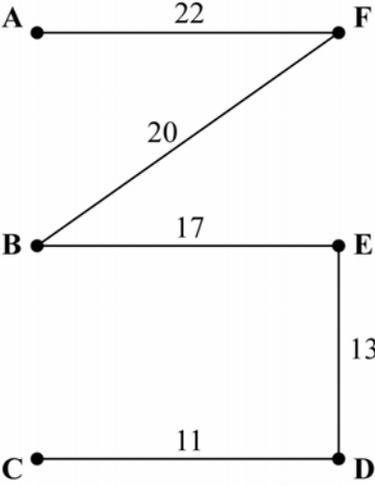
January 2009

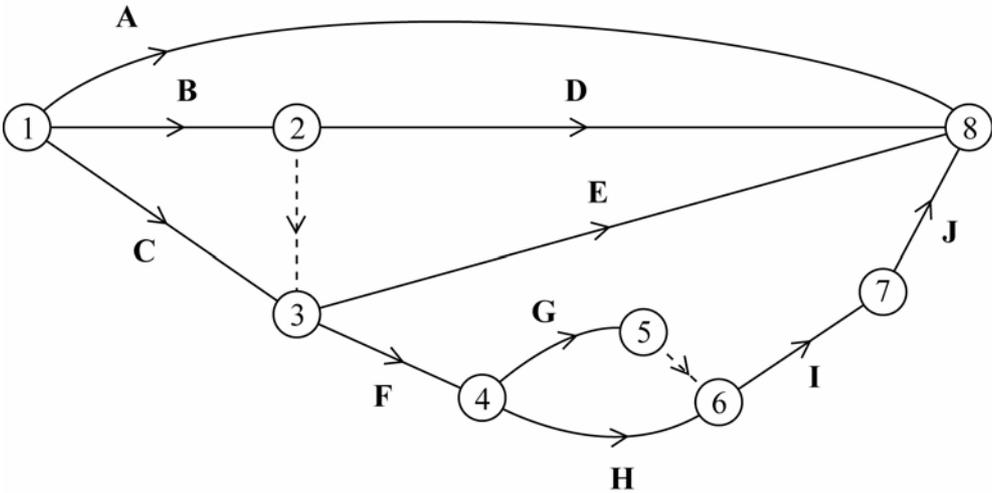
GCE

GCE Decision Mathematics D1 (6689/01)

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

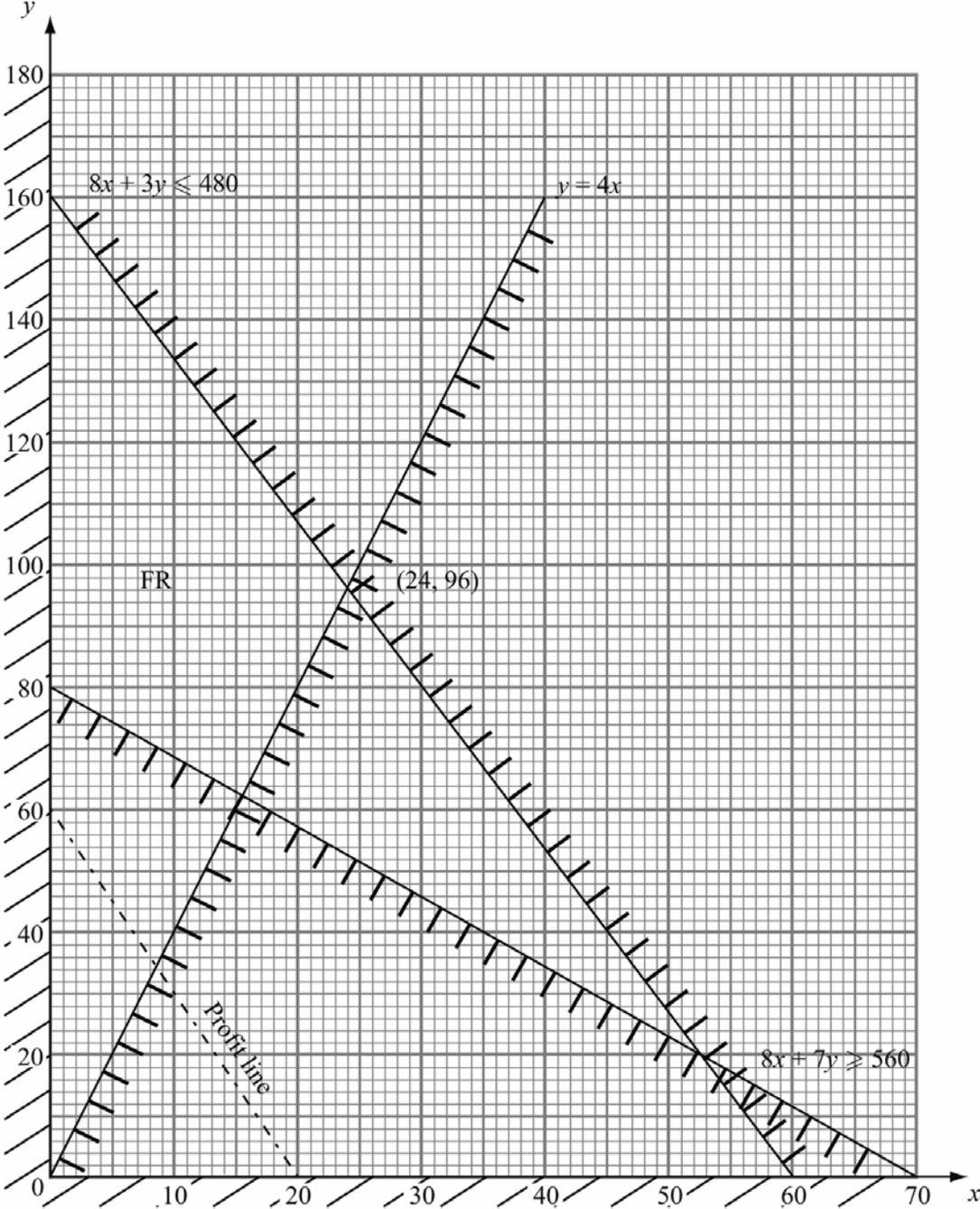
Question Number	Scheme	Marks
Q2 (a)		M1 A1 A1 (3)
(b)	<p>CD, DE, reject CE, BE, reject BC, reject BD, BF, reject EF, AF</p> <p>11 13 14 17 18 19 20 21 22</p>  <p>Weight of tree 83 (m)</p> <p>Notes:</p> <p>(a) 1M1: More than 10 arcs 1A1: all arcs correct 2A1: all values correct</p> <p>(b) 1M1: First three arcs correctly chosen 1A1: All used acrs selected correctly 2A1: All rejected arcs selected in correct order</p> <p>(c) 1B1: CAO for arcs – numbers not needed. NO ft. 2B1: CAO 83, condone units</p>	M1 A1 A1 (3) B1 B1 (2) Total 8

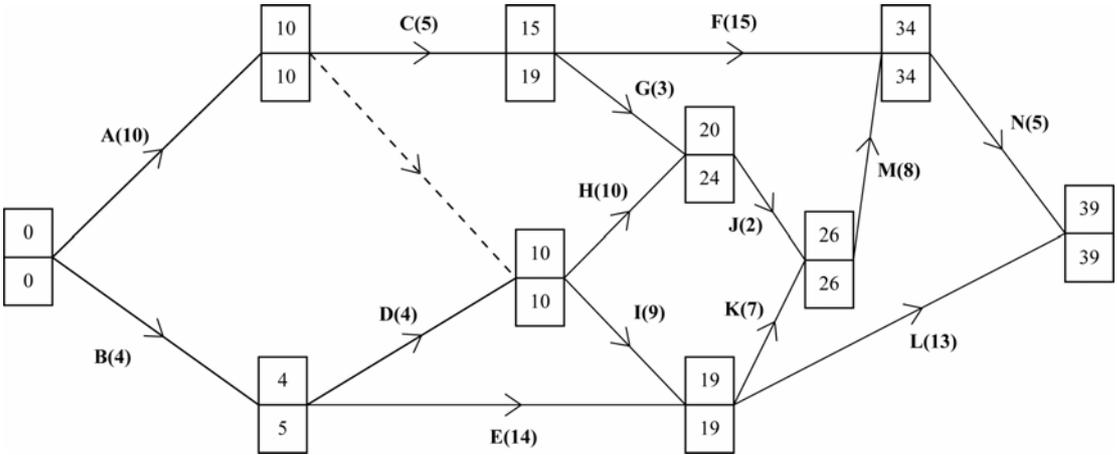
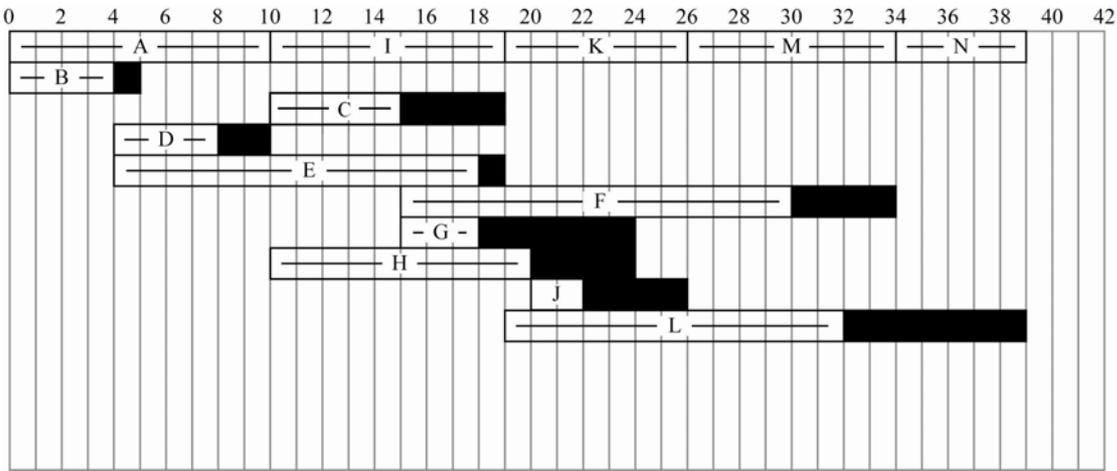
Question Number	Scheme	Marks
<p>Q3</p> <p>(a)</p> <p>(b)</p>	 <p>1st dummy – D depends on B only, but E and F depend on B and C 2nd dummy – G and H both must be able to be described uniquely in terms of the events at each end.</p> <p>Notes:</p> <p>(a) 1M1: one start and A to C and one of D, E or F drawn correctly 1A1: 1st dummy (+arrow) and D, E and F drawn correctly 2A1: G, H, I and J drawn in correct place 3A1: second dummy (+arrow) drawn in a correct place 4A1: cso. all arrows and one finish.</p> <p>(b) 1B1: cao, but B, C, D, E and/or F referred to, generous 2B1: cao, but generous.</p>	<p>M1</p> <p>A1</p> <p>A1</p> <p>A1</p> <p>A1 (5)</p> <p>B1</p> <p>B1 (2)</p> <p>Total 7</p>

Question Number	Scheme	Marks
Q4	<p>(a) Alternating path $B - 3 = A - 5$ change status $B = 3 - A = 5$</p> <p style="text-align: center;">$A = 5 \quad B = 3 \quad C = 2 \quad D = 1 \quad E = 6 \quad F \text{ unmatched}$</p> <p>(b) e.g. C is the only person able to do 2 and the only person able to do 4. Or D, E and F between them can only be allocated to 1 and 6.</p> <p>(c) Alternating path $F - 6 = E - 1 = D - 2 = C - 4$ change status $F = 6 - E = 1 - D = 2 - C = 4$</p> <p style="text-align: center;">$A = 5 \quad B = 3 \quad C = 4 \quad D = 2 \quad E = 1 \quad F = 6$</p> <p>Notes:</p> <p>(a) 1M1: Path from B to 5. 1A1: Correct path including change status 2A1: CAO my matching, may be drawn but if so 5 lines only and clear.</p> <p>(b) 1B1: Close, a correct relevant, productive statement bod generous 2B1: A Good clear answer generous</p> <p>(c) 1M1: Path from F to 4. No ft. 1A1: Correct path penalise lack of change status once only 2A1: CAO may be drawn but if so 6 lines only and clear</p>	<p>M1 A1</p> <p>A1 (3)</p> <p>B2, 1, 0 (2)</p> <p>M1 A1</p> <p>A1 (3)</p> <p>Total 8</p>

Question Number	Scheme	Marks
Q5	<p>(a) Odd vertices C, D, E, G $CD + EG = 17 + 19 = 36 \leftarrow$ $CE + DG = 12 + 25 = 37$ $CG + DE = 28 + 13 = 41$</p> <p>Length = $543 + 36 = 579$ (km)</p> <p>(b) CE (12) is the shortest So repeat CE (12) Start and finish at D and G</p> <p>Notes: (a) 1B1: cao (may be implicit) 1M1: Three pairings of their four odd nodes 1A1: one row correct 2A1: all correct 3A1ft: $543 + \text{their least} = \text{a number}$. Condone lack of km (b) 1M1ft: Identifies their shortest from a choice of at least 2 rows. 1A1ft: indicates their intent to repeat shortest. 2A1ft: correct for their least.</p>	<p>B1 M1 A1 A1 A1ft (5) M1 A1ft A1ft (3) Total 8</p>

Question Number	Scheme	Marks
<p>Q6</p> <p>(a)</p>	<p>Shortest route: A B C E G H Length: 156 (km)</p> <p>(b) New route: A B E G H Length: 165 (km)</p> <p>Notes: (a) 1M1: Dijkstra's algorithm, small replacing larger in at least one of the sets of working values at C, E, G or H 1A1: Values correct at vertices A to E. 2A1ft: Values correct at vertices F to H, penalise order only once. 3A1: cao 4A1ft: 156ft (b) 1B1: cao ABEGH 2B1: 165 Special Case Accept 166 if ABDGH listed as the path.</p>	<p>M1</p> <p>A1</p> <p>A1ft</p> <p>A1</p> <p>A1ft</p> <p>(5)</p> <p>B1</p> <p>B1</p> <p>(2)</p> <p>Total 7</p>

Question Number	Scheme	Marks
<p>Q7 (a)</p> 	<p>(b) Point testing or Profit line method Minimum point (0, 80); Value of 80 Maximum point (24, 96); Value of 168</p>	<p>B1 B1 B1 (lines) B1 (shading) B1 (R found) B1 (labels) (6)</p> <p>M1 A1 B1 A1 B1 A1 (6)</p> <p>Total 12</p>

Question Number	Scheme	Marks
<p>Q8</p> <p>(a)</p>  <p>(b) A, I, K, M, N; Length 39</p> <p>(c) Float on F is $34 - 15 - 15 = 4$ Float on G is $24 - 15 - 3 = 6$</p> <p>(d)</p>  <p>(e) e.g. At time $14 \frac{1}{2}$ there are 4 tasks I, E, H and C must be happening.</p>	<p>M1 A1</p> <p>M1 A1</p> <p>(4)</p> <p>B2,1,0; B1 (3)</p> <p>M1 A1 B1 (3)</p> <p>M1 A1 M1 A1 (4)</p> <p>B2,1,0 (2)</p> <p>Total 16</p>	

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(a) Other correct solutions:

Choosing middle left

M	L	J	H	K	T	R	I
H	M	L	J	K	T	R	I
H	J	I	K	M	L	T	R
H	I	J	K	L	M	T	R
H	I	J	K	L	M	R	T
H	I	J	K	L	M	R	T

Choosing first

M	L	J	H	K	T	R	I
L	J	H	K	I	M	T	R
J	H	K	I	L	M	R	T
H	I	J	K	L	M	R	T
H	I	J	K	L	M	R	T

If you see any sorting in reverse alphabetical order annotate and send to review.

(b) 'Sticky' pivot solution (max M1A1A0A0) would look like this:

1st choice Lauren reject right

2nd choice John reject right

3rd choice Imogen reject right

4th choice Imogen reject right

Into loop, probably declare that Hugo is not Imogen or Hannah.

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Notes:

- (a) 1B1: 1 line drawn accurately, with a ruler, in terms of x and y .
2B1: 2 lines drawn accurately, with a ruler, in terms of x and y .
3B1: 3 lines drawn accurately, with a ruler, in terms of x and y . (30, 120)
4B1: Shading correct for at least two lines in x and y .
5B1: CAO Locating R correctly – bounded by three lines in x and y .
6B1: At least two lines labelled correctly. (Labels correct even if lines not)
- (b) 1M1ft: Some evidence of a correct method. Attempt at point testing (at least $n-1$ points identified) or profit line (gradient close to overlay). Generous.
1A1: All my points (see below) correctly tested in their region, correct profit line.
1B1: CAO Finds minimum point i.e. (0, 80).....
2A1: CAO.....and value of F i.e. $F = 80$
2B1: CAO Finds maximum point i.e. (24, 96).....
3A1: CAO.....and value of F i.e. $F = 168$

$$* F(0, 80) = 80$$

$$* F(0, 160) = 160$$

$$* F(24, 96) = 168$$

$$* F(15\frac{5}{9}, 62\frac{2}{9}) = 108\frac{8}{9} \quad \text{accept } F(15, 62) \text{ or } F(16, 62) \text{ towards M mark, but not A mark}$$

$$F(52\frac{1}{2}, 20) = 177\frac{1}{2}$$

$$F(60, 0) = 180$$

$$F(70, 0) = 210$$

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- (a) 1M1: Top boxes completed generally increasing left to right.
1A1: CAO.
2M1: Bottom boxes completed generally decreasing right to left.
2A1: CAO
- (b) 1B1: Critical activities correct condone one omission or extra. Condone dummy
2B1: Critical activities cao condone dummy
3B1: 39
- (c) 1M1ft: Correct calculation seen – all three numbers at least once.
1A1: One float correct
1B1: CAO Two correct floats (even if method not seen)
- (d) 1M1: At least 9 activities placed, at least 4 floats visible (cascade not scheduling)
1A1: All critical activities correct CAO
2M1: All 14 activities placed, at least 7 floats visible (cascade not scheduling)
2A1: All non-critical activities correct CAO
- (e) 1B1: A correct, useful, relevant statement. Possibly one of two below. bod. Generous.
2B1: Time stated and 4 activities named correctly. Alternatives ok.
Attempts to schedule in (e) get B0 B0