



GCE

Mathematics (MEI)

Advanced Subsidiary GCE

Unit 4771: Decision Mathematics 1

Mark Scheme for January 2013

Question	Answer	Marks	Guidance
1 (i)	<p>Route ... ABDCF Time ... 51 minutes</p>	<p>M1 A1 B1 B1</p> <p>B1</p> <p>[5]</p>	<p>Dijkstra (if working values correct at D) working values order of labelling labels</p> <p>route and time</p>
1 (ii)	<p>Time ... 52 minutes</p>	<p>B1 B1</p> <p>B1</p> <p>[3]</p>	<p>methodology indicated correct min connector</p> <p>cao</p>

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2	(i)	bipartite	B1 [1]	cao
	(ii)	100	M1 A1 [2]	allow for 200 cao
	(iii)		B1 B1 B1 [3]	Darcy correct Elizabeth correct Panto characters correct
	(iv)	58	M1 A1 [2]	18 + (8 × 5) allow for 98 cao

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<p>4 (i) & (ii)</p>	<p>Minimum completion time = 155 minutes Critical activities are C, D, E, F, G, J, K and M</p>	<p>M1 A1 A1 A1 A1 [5] M1 A1 M1 A1 B1 B1 [6]</p>	<p>activity on arc single start and end A, B, C OK J, K, L OK rest OK forward pass (must have at least one join correct) backward pass (must have at least one burst correct) cao cao</p>																																																																																																																								
<p>4 (iii)</p>	<p>eg</p> <table border="1"> <tr> <td>Kate</td><td>C</td><td>C</td><td>C</td><td>D</td><td>D</td><td>D</td><td>E1</td><td>F1</td><td>F1</td><td>F1</td><td>F1</td><td>F1</td><td>F1</td><td>H1</td><td>H1</td><td>H1</td><td>H1</td><td>H1</td><td>H1</td> </tr> <tr> <td>Pete</td><td>A</td><td>B</td><td></td><td></td><td></td><td></td><td>E2</td><td>F2</td><td>F2</td><td>F2</td><td>F2</td><td>F2</td><td>F2</td><td>H2</td><td>H2</td><td>H2</td><td>H2</td><td>H2</td><td>H2</td> </tr> </table> <table border="1"> <tr> <td>cont.</td><td>G1</td><td>G1</td><td>G1</td><td>G1</td><td>G1</td><td>G1</td><td>I1</td><td>I1</td><td>I1</td><td>J1</td><td>J1</td><td>J1</td><td>J1</td><td>K1</td><td>K1</td><td>K1</td><td>K1</td><td>K1</td><td>K1</td> </tr> <tr> <td>cont.</td><td>G2</td><td>G2</td><td>G2</td><td>G2</td><td>G2</td><td>G2</td><td>I2</td><td>I2</td><td>I2</td><td>J2</td><td>J2</td><td>J2</td><td>J2</td><td>K2</td><td>K2</td><td>K2</td><td>K2</td><td>K2</td><td>K2</td> </tr> </table> <table border="1"> <tr> <td>cont.</td><td>L1</td><td>L1</td><td>L1</td><td>M1</td><td>M1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>cont.</td><td>L2</td><td>L2</td><td>L2</td><td>M2</td><td>M2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table> <p>215 minutes (3 hours and 35 minutes)</p>	Kate	C	C	C	D	D	D	E1	F1	F1	F1	F1	F1	F1	H1	H1	H1	H1	H1	H1	Pete	A	B					E2	F2	F2	F2	F2	F2	F2	H2	H2	H2	H2	H2	H2	cont.	G1	G1	G1	G1	G1	G1	I1	I1	I1	J1	J1	J1	J1	K1	K1	K1	K1	K1	K1	cont.	G2	G2	G2	G2	G2	G2	I2	I2	I2	J2	J2	J2	J2	K2	K2	K2	K2	K2	K2	cont.	L1	L1	L1	M1	M1															cont.	L2	L2	L2	M2	M2															<p>B1 B1 B1 [3]</p>	<p>ABCD rest ... watch for M's after K's and L's cao</p>
Kate	C	C	C	D	D	D	E1	F1	F1	F1	F1	F1	F1	H1	H1	H1	H1	H1	H1																																																																																																								
Pete	A	B					E2	F2	F2	F2	F2	F2	F2	H2	H2	H2	H2	H2	H2																																																																																																								
cont.	G1	G1	G1	G1	G1	G1	I1	I1	I1	J1	J1	J1	J1	K1	K1	K1	K1	K1	K1																																																																																																								
cont.	G2	G2	G2	G2	G2	G2	I2	I2	I2	J2	J2	J2	J2	K2	K2	K2	K2	K2	K2																																																																																																								
cont.	L1	L1	L1	M1	M1																																																																																																																						
cont.	L2	L2	L2	M2	M2																																																																																																																						
<p>4 (iv)</p>	<p>Two more people would be needed, so that the H's and I's could be done at the same time as the F's and G's, and so that the two L's could be done at the same time as the two K's</p>	<p>B1 B1 [2]</p>	<p>cao reasoning</p>																																																																																																																								

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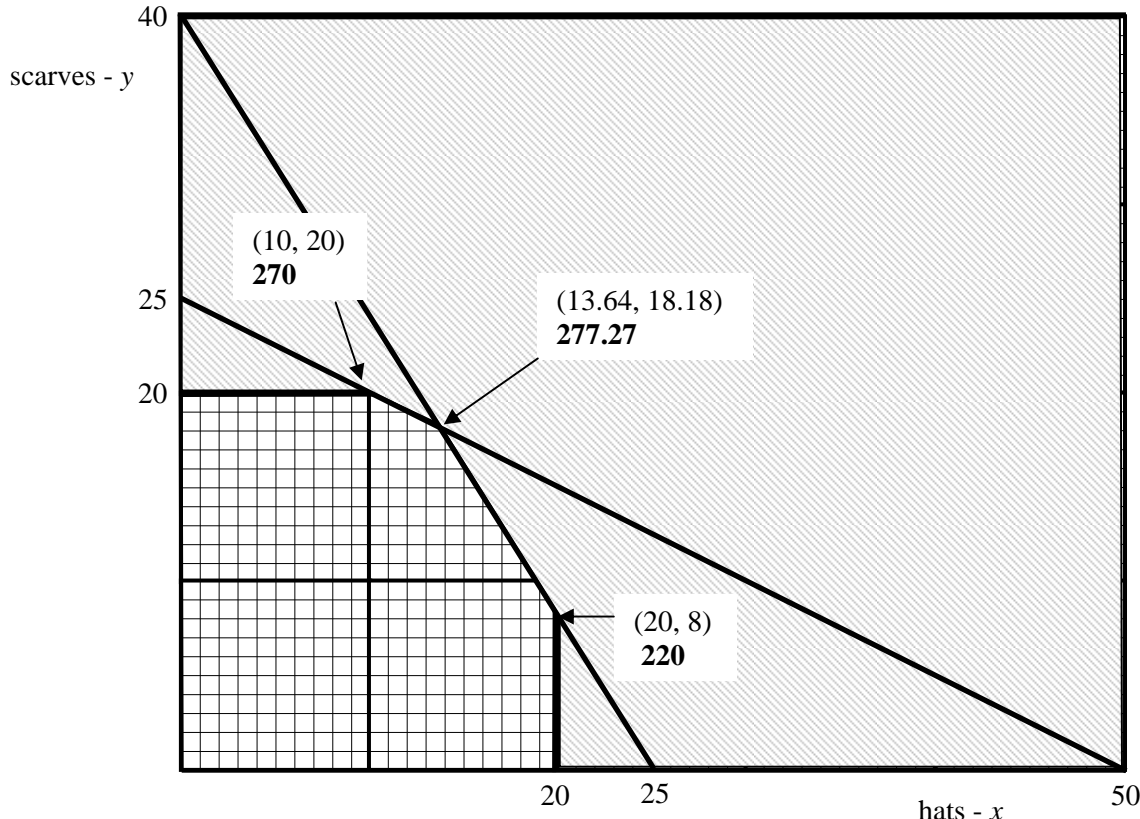
Question		Answer	Marks	Guidance																																																																																											
5	(i)	e.g. 0 → 0 1, 2 → 1 3, 4, 5 → 2 6, 7 → 3 8, 9 → 4	M1 A1 [2]	either 0.2 for 1 or 0.3 for 2 all proportions correct																																																																																											
5	(ii)	random number 5 3 0 2 4 7 9 1 1 8 number of occupants 2 2 0 1 2 3 4 1 1 4	M1 A1 [2]	8 outcomes correct all correct																																																																																											
5	(iii)	e.g. 0, 1 → child 2 - 9 → adult	B1 [1]	must use all 10 digits cao																																																																																											
5	(iv)	random number child (C) or adult (A) <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>chair</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>occ1</td> <td>6</td> <td>A</td> <td>0</td> <td>C</td> <td>9</td> <td>6</td> <td>A</td> <td>2</td> <td>A</td> <td>9</td> <td>A</td> <td>1</td> <td>C</td> <td>5</td> <td>A</td> <td>6</td> <td>A</td> <td>2</td> <td>A</td> </tr> <tr> <td>occ2</td> <td>2</td> <td>A</td> <td>6</td> <td>A</td> <td>5</td> <td>2</td> <td>1</td> <td>C</td> <td>1</td> <td>C</td> <td>4</td> <td>A</td> <td>8</td> <td>1</td> <td></td> <td>9</td> <td>A</td> <td></td> <td></td> </tr> <tr> <td>occ3</td> <td>3</td> <td></td> <td>7</td> <td></td> <td>2</td> <td>1</td> <td></td> <td>3</td> <td></td> <td>6</td> <td>A</td> <td>6</td> <td>A</td> <td>5</td> <td></td> <td>3</td> <td></td> <td>5</td> <td>A</td> </tr> <tr> <td>occ4</td> <td>3</td> <td></td> <td>1</td> <td></td> <td>1</td> <td>2</td> <td></td> <td>8</td> <td></td> <td>0</td> <td></td> <td>6</td> <td>A</td> <td>0</td> <td></td> <td>5</td> <td></td> <td>1</td> <td>C</td> </tr> </tbody> </table> <p style="margin-left: 40px;">number of children = 5 number of adults = 15</p>	chair	1	2	3	4	5	6	7	8	9	10	occ1	6	A	0	C	9	6	A	2	A	9	A	1	C	5	A	6	A	2	A	occ2	2	A	6	A	5	2	1	C	1	C	4	A	8	1		9	A			occ3	3		7		2	1		3		6	A	6	A	5		3		5	A	occ4	3		1		1	2		8		0		6	A	0		5		1	C	M1 A1 [2]	8 chairs OK all OK
chair	1	2	3	4	5	6	7	8	9	10																																																																																					
occ1	6	A	0	C	9	6	A	2	A	9	A	1	C	5	A	6	A	2	A																																																																												
occ2	2	A	6	A	5	2	1	C	1	C	4	A	8	1		9	A																																																																														
occ3	3		7		2	1		3		6	A	6	A	5		3		5	A																																																																												
occ4	3		1		1	2		8		0		6	A	0		5		1	C																																																																												
5	(v)	40 children and 120 adults	B1 [1]	FT... × by 8																																																																																											
5	(vi)	e.g. 00 - 06 → 0 07 - 13 → 1 14 - 34 → 2 35 - 55 → 3 56 - 90 → 4 91 - 99 ignore and "redraw"	M1 A1 A1 [3]	ignore some proportions correct efficient																																																																																											

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Question		Answer	Marks	Guidance																																																							
5	(vii)	random number 23 65 07 99 37 45 number of occupants 2 4 1 – 3 3	M1 A1 [2]	3 OK all correct FT																																																							
5	(viii)	<table border="1" style="margin-left: 20px;"> <thead> <tr> <th>chair</th> <th colspan="2">1</th> <th colspan="2">2</th> <th colspan="2">3</th> <th colspan="2">4</th> <th colspan="2">5</th> </tr> </thead> <tbody> <tr> <td>occ1</td> <td>1</td> <td>C</td> <td>9</td> <td>A</td> <td>6</td> <td>A</td> <td>8</td> <td>A</td> <td>1</td> <td>C</td> </tr> <tr> <td>occ2</td> <td>2</td> <td>A</td> <td>2</td> <td>A</td> <td>8</td> <td></td> <td>0</td> <td>C</td> <td>8</td> <td>A</td> </tr> <tr> <td>occ3</td> <td>6</td> <td></td> <td>3</td> <td>A</td> <td>2</td> <td></td> <td>2</td> <td>A</td> <td>1</td> <td>C</td> </tr> <tr> <td>occ4</td> <td>4</td> <td></td> <td>6</td> <td>A</td> <td>1</td> <td></td> <td>9</td> <td></td> <td>4</td> <td></td> </tr> </tbody> </table> <p style="margin-left: 20px;"> number of children = 4 number of adults = 9 64 children and 144 adults </p>	chair	1		2		3		4		5		occ1	1	C	9	A	6	A	8	A	1	C	occ2	2	A	2	A	8		0	C	8	A	occ3	6		3	A	2		2	A	1	C	occ4	4		6	A	1		9		4		B1 B1 [2]	FT ... all correct FT ... × by 16
chair	1		2		3		4		5																																																		
occ1	1	C	9	A	6	A	8	A	1	C																																																	
occ2	2	A	2	A	8		0	C	8	A																																																	
occ3	6		3	A	2		2	A	1	C																																																	
occ4	4		6	A	1		9		4																																																		
5	(ix)	greater reliability or more representative	B1 [1]																																																								

Question	Answer	Marks	Guidance
<p>6 (i)</p>	<p>e.g. Let x be the number of hats which Jean knits Let y be the number of scarves which Jean knits $1.5x + 3y \leq 75$, i.e. $x + 2y \leq 50$ $4x + 2.5y \leq 100$, i.e. $8x + 5y \leq 200$ $x \leq 20$ and $y \leq 20$</p> 	<p>B1 B1 B1 B1 B1</p> <p>B1 B1 B1 B1</p> <p>B1</p> <p>[10]</p>	<p><u>must</u> say “number of” or vice-versa of course simplification not required both</p> <p>lines (cao)</p> <p>shading ... follow any set of two horizontal, two vertical and two negatively inclined lines which give a hexagon in the bottom left corner.</p>

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Question		Answer	Marks	Guidance
6	(ii)	Objective = $7x + 10y$ Best non-integer point Solution ... (12, 19) 274 , (13, 18) 271 or (14, 17) 268 So 12 hats and 19 scarves	B1 M1 A1 B1 [4]	objective considering profits at their three points as indicated cao cao
6	(iii)	10 hats and 20 scarves £34	B1 B1 [2]	cao FT ... <i>their answer</i> – 240