

GCE

Mathematics (MEI)

Advanced Subsidiary GCE

Unit 4771: Decision Mathematics 1

Mark Scheme for January 2013

PMT

Question	Answer	Marks	Guidance
1 (i)	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	M1 A1 B1 B1 B1	Dijkstra (if working values correct at D) working values order of labelling labels
(ii)	B 5 D A 15 18 F C E Time 52 minutes	B1 B1 B1 [3]	methodology indicated correct min connector

Q	uestio	n		Answer	Marks	Guidance
2	(i)		bipartite		B1	cao
	(**)		100		[1]	11 6 200
	(ii)		100		M1	allow for 200
					[2]	cao
	(iii)		A •	V		
				···		
			Charming •	Cinderella	B 1	Darcy correct
			Darcy	Ugly sister 1	D1	Elizabeth correct
			E	Ugly sister 2	B1	Panto characters correct
			F	Ugly sister 3	DI	Tanto characters concer
			G •	Elizabeth		
			Н	X		
				Y		
			J	Z	[3]	
	(iv)		58			$18 + (8 \times 5)$
					M1	allow for 98
					A1	cao
	(iv)		J •	Z	[3] M1 A1 [2]	18 + (8 × 5) allow for 98 cao

Q	Question		Answer		Marks	Guidance
3	(i)		Step 1	x = 0.44	B1	cao
			Step 2	oldr = 1		
			Step 345	i = 1, j = 0.5, k = 0.5		
			Step 6	change = 0.22		
			Step 7	newr = 1.22	B1	set-up (i.e. as far as 1.22)
			Step 9	oldr = 1.22		
			Steps 10 11 12	i = 2, j = -0.5, k = -0.125	B1	3 steps correct
			Step 13	change = -0.0242		
			Step 14	newr = 1.1958	B1	new estimate (1.1958)
			Step 15	change = 0.0242		
			Step 9	oldr = 1.1958		
			Steps 10 11 12	i = 3, j = -1.5, k = 0.0625		
			Step 13	change = 0.005324		
			Step 14	newr = 1.201124		
			Step 15	change = 0.005324		
			Step 9	oldr = 1.201124	B1	iteration (to 1.201124)
			Steps 10 11 12	i = 4, j = -2.5, k = -0.03906		
			Step 13	change = -0.0014641		
			Step 14	newr = 1.1996599		
			Step 15	change = 0.0014641		
			Step 17	1.1996599	B1	iteration and end
					[6]	
	(ii)		1 - 0.22 - 0.024	2 - 0.005324 - 0.0014641 = 0.7490119	M1	use of -0.44
					Al	as shown
						SC1 (cao) for algorithm
					[0]	repeated or answer only
					[2]	

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Q	uestior	n	Answer	Marks	Guidance
4	(i) & (ii)	n	Answer Answer Answer Answer A = 5 = 10 A = 5 = 10 A = 5 = 10 B = 5 O = 0 C = 15 = 15 D = 30 = 30 B = 35 = 35 = 35 B = 35 = 35 = 35 = 35 B = 35 = 35 = 35 = 35 = 35 B = 35 = 35 = 35 = 35 = 35 = 35 = 35 = 3	Marks M1 A1 A1	Guidance 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)
			Minimum completion time = 155 minutes Critical activities are C, D, E, F, G, J, K and M	B1 B1 [6]	cao cao
4	(iii)		eg Kate C C D D E1 F1 F1 F1 F1 H1 K1 K1	B1 B1	ABCD rest watch for M's after K's and L's
			215 minutes (3 hours and 35 minutes)	B1 [3]	cao
4	(iv)		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	B1 B1 [2]	cao reasoning

Question		Answer	Marks	Guidance
5	(i)	e.g. $0 \rightarrow 0$	M1	either 0.2 for 1 or 0.3 for
			Δ 1	2 all proportions correct
		$\begin{array}{ccc} 1, 2 & \rightarrow 1 \\ 2 & 4 & 5 & > 2 \end{array}$	AI	an proportions correct
		$5, 4, 5 \rightarrow 2$		
		$\begin{array}{ccc} 0, 7 & \rightarrow 3 \\ 8 & 9 & 5 \end{array}$		
			[2]	
5	(ii)	random number 5 3 0 2 4 7 9 1 1 8	M1	8 outcomes correct
		number of occupants 2 2 0 1 2 3 4 1 1 4	A1	all correct
			[2]	
5	(iii)	e.g. $0, 1 \rightarrow \text{child}$	B1	must use all 10 digits
		$2-9 \rightarrow \text{adult}$	543	cao
_	(•)		[1]	
5	(IV)	random child (C) or number adult (A) 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 occ1 6 A 5 2 1 C 1 C 5 A 6 A 2 A occ2 2 A 6 A 5 2 1 C 1 C 5 A 6 A 2 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 number of children = 5 9 10 3 10 6 A 0 5 1 C <	M1 A1	8 chairs OK all OK
5	(v)	40 children and 120 adults	<u> </u>	$FT \rightarrow by 8$
5	(•)	to enharch and 120 addits	[1]	1 1 × Uy 8
5	(vi)	e.g. $00-06 \rightarrow 0$	M1	ignore some
		$07-13 \rightarrow 1$	A1	proportions correct
		$14-34 \rightarrow 2$	A1	efficient
		$35-55 \rightarrow 3$		
		$56-90 \rightarrow 4$		
		91 – 99 ignore and "redraw"		
			[3]	

Q	uestion	Answer	Marks Guidance
5	(vii)	random number 23 65 07 99 37 45	M1 3 OK
		number of occupants 2 4 1 – 3 3	A1 all correct FT
			[2]
5	(viii)		
		chair 1 2 3 4 5	
		0cc1 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	
		number of children $= 4$	
		number of adults $= 9$	B1 FT all correct
		64 children and 144 adults	B1 FT × by 16
			[2]
5	(ix)	greater reliability or more representative	B1
			[1]

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Question	Answer		Guidance
6 (i)	e.g. Let x be the number of hats which Jean knits Let y be the number of scarves which Jean knits $1.5x + 3y \le 75$, i.e. $x + 2y \le 50$ $4x + 2.5y \le 100$, i.e. $8x + 5y \le 200$ $x \le 20$ and $y \le 20$ 40	B1 B1 B1 B1 B1	<u>must</u> say "number of" or vice-versa of course simplification not required both
	scarves - y (10, 20) (10, 20) (13, 64, 18, 18) (13, 64, 18, 18) (17, 27) (10, 20) (13, 64, 18, 18) (10, 20) (13, 64, 18, 18) (10, 20) (10, 20	B1 B1 B1 B1	lines (cao) shading follow any set of two horizontal, two vertical and two negatively inclined lines which give a hexagon in the bottom left corner.

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