AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Education

Mathematics 6360

MD01 Discrete 1

Mark Scheme

2005 examination – June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Key to mark scheme and abbreviations used in marking

M	mark is for method		
m or dM	mark is dependent on one or more M marks and is for method		
A	mark is dependent on M or m marks and is for accuracy		
B	mark is independent of M or m marks and is for method and accuracy		
E	mark is for explanation		
√ or ft or F	follow through from previous		
	incorrect result	MC	mis-copy
CAO	correct answer only	MR	mis-read
CSO	correct solution only	RA	required accuracy
AWFW	anything which falls within	FW	further work
AWRT	anything which rounds to	ISW	ignore subsequent work
ACF	any correct form	FIW	from incorrect work
AG	answer given	BOD	given benefit of doubt
SC	special case	WR	work replaced by candidate
OE	OE	FB	formulae book
A2,1	2 or 1 (or 0) accuracy marks	NOS	not on scheme
–*x* EE	deduct *x* marks for each error	G	graph
NMS	no method shown	c	candidate
PI	possibly implied	sf	significant figure(s)
SCA	substantially correct approach	dp	decimal place(s)

Application of Mark Scheme

No method shown:

Correct answer without working	mark as in scheme
Incorrect answer without working	zero marks unless specified otherwise

More than one method / choice of solution:

2 or more complete attempts, neither/none crossed out	mark both/all fully and award the mean mark rounded down
1 complete and 1 partial attempt, neither crossed out	award credit for the complete solution only

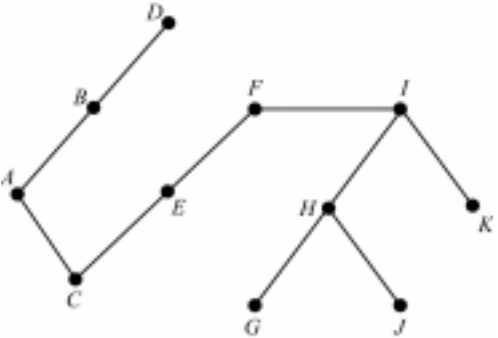|	
Crossed out work	do not mark unless it has not been replaced

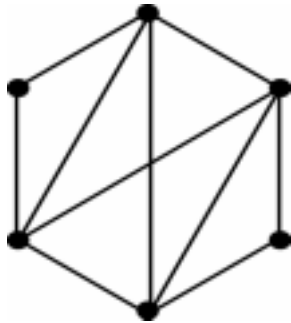|	
Alternative solution using a correct or partially correct method	award method and accuracy marks as appropriate

MD01

Q	Solution	Marks	Total	Comments
1(a)	23 3 17 4 6 19 14 3	M1		SCA
	3 23 17 4 6 19 14 3	A1		1st pass
	3 17 23 4 6 19 14 3	m1		2nd pass
	3 4 17 23 6 19 14 3	A1		3rd pass
	3 4 6 17 23 19 14 3			
	3 4 6 17 19 23 14 3			
	3 4 6 14 17 19 23 3			
	3 3 4 6 14 17 19 23	A1	5	All correct
	Total		**5**	
2(a)		M1 A1	2	Bipartite graph
(b)	Initially KP, MJ, NA	B1		Starting with G, F, S, R
	Paths $G \rightarrow A \rightarrow N \rightarrow F$	M1 A1		1st pass path starting G,F
	$S \rightarrow J \rightarrow M \rightarrow R$	M1 A1		2nd pass path starting S,R Or $G \rightarrow P \rightarrow K \rightarrow F$
	Match GA, NF, SJ, MR, KP Or GP, KF, MR, SJ, NA	B1	6	Or $S \rightarrow A \rightarrow N \rightarrow F$ $G \rightarrow A \rightarrow S \rightarrow J \rightarrow M \rightarrow R$
	Total		**8**	
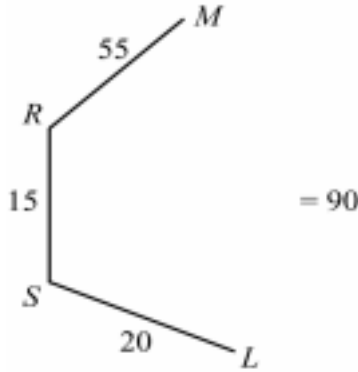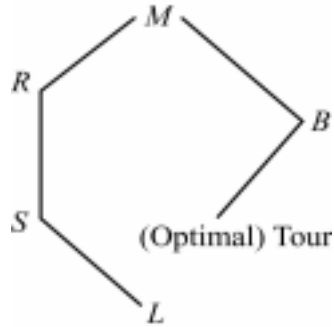
MD01 (cont)

Q	Solution			Marks	Total	Comments
3(a)						
	AB	or	20	M1		SCA
	AC		25	B1		10 edges
	BD		30	A1		BD third
	CE		35	A1		CE fourth
	EF		40			
	FI		35			
	HI		30	A1	5	All correct
	IK		35			
	HG		40			
	HJ		45			
(b)	335			B1	1	
(c)				B1 M1 A1	3	10 edges
(d)	Add AE		+40	M1		Adding AE, deleting CE/CA
	Delete CE		−35			
	Extra		+5	A1	2	15 with no working (M1, A0)
			Total		**11**	

MD01 (cont)

Q	Solution	Marks	Total	Comments
4(a)(i)	21	B1	1	
(ii)	6	B1	1	
(iii)	7	B1	1	
(b)(i)	All vertices are even	E1	1	OE
(ii)	n odd	E1	1	
(c)		M1 A1	 2	Graph with 6 vertices
	Total		**7**	
5(a)(i)	$\begin{array}{ccc} X & K & Y \\ \hline 2 & 1 & 5 \\ 5 & 2 & 4.1 \\ 4.1 & 3 & 4.001 \\ 4.001 & 4 \end{array}$	M1 A1 A1 A1	 4	SCA (either part) $Y = 5$ $Y = 4.1$ All correct
(ii)	$\begin{array}{ccc} X & K & Y \\ \hline -6 & 1 & -4.33(3) \\ -4.33(3) & 2 & -4.01(3) \\ -4.01(3) & 3 & -4.000 \\ -4.000 & 4 \end{array}$	A1 A1 A1	 3	$Y = -4.33\ (\ldots)$ Can be fractions $Y = -4.01\ (\ldots)$ All correct
(b)	Continuous loop	B1	1	
	Total		**8**	
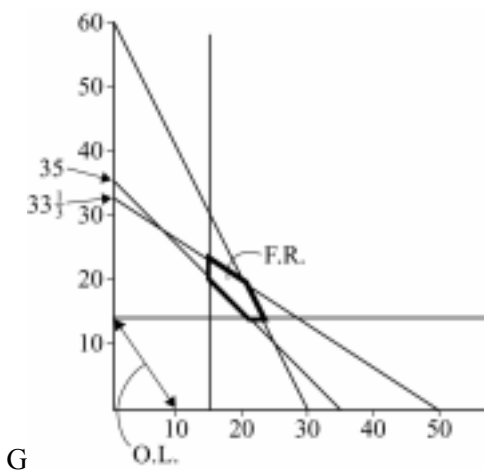
MD01 (cont)

Q	Solution	Marks	Total	Comments
6(a)(i)	$S \to R \to M \to B \to L \to S$ 15 55 25 50 20 = 165	M1 A1	 2	Adding 5 numbers
(ii)	$S \to R \to L \to B \to M \to S$ 15 25 50 25 90 = 205	M1 M1 A1 B1	 4	Tour Visits all vertices Correct order
(b)	 Choose 25, 50 (or BM, BL) Total 165	M1 m1 A1 m1 A1	 5	SCA (mst and 2 edges) 3 edges Correct mst
(c)		B1F E1	 2	ft if M1 awarded in (b) Either
	Total		**13**	

MD01 (cont)

Q	Solution	Marks	Total	Comments
7(a)				If reverse M1 SCA M1 2 values at W A1 both correct M1 2 values at R A1 all correct B1 400
		M1		SCA
		A1		2 correct values at G
		M1		2 values at C
		M1		2 values at T
		A1		All correct
		A1	6	400 at L
(ii)	*R S G W M C L*	B1	1	
(b)	Possible *R C L* = 410 *R S G W T L* = 415 Extra time = 10 minutes *R C L*	M1 A1 B1	 3	Considering **both** routes 410 and 415
	Total		**10**	

MD01 (cont)

Q	Solution	Marks	Total	Comments
8(a)	Milky $12x + 18y \leq 600$ $\Rightarrow 2x + 3y \leq 100$	 B1	 1	
(b)	$x \geq 15, \quad y \geq 15$ $x + y \geq 35$ $20x + 10y \leq 600$ $(P =) 1.5x + y$	B1 B1 B1 B1	 4	 OE
(c)	 G	 B1 B1×3 B1 B1	 6	 $x \geq 15, \quad y \geq 15$ Other 3 lines Feasible Region Objective Line
(d)	Considering one of their extreme points $P = 50$	M1 A1	 2	
	Total		13	
	Total		75	