

General Certificate of Education

Mathematics 6360

MD01 Decision 1

Mark Scheme

2006 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.

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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				
В	mark is independent of M or m marks and is for method and accuracy				
Е	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	or equivalent	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)		

No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded. However, there are situations in some units where part marks would be appropriate, particularly when similar techniques are involved. Your Principal Examiner will alert you to these and details will be provided on the mark scheme.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to candidates showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the candidate to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

Otherwise we require evidence of a correct method for any marks to be awarded.

MD01

			AQA (GCE Mark Scheme, 2006 June series
)1				GCE Mark Scheme, 2006 June series - Thathsoloud
Q	Solution	Marks	Total	Comments
1(a)	B 2 2 2 3 3 4	M1 A1	2	
(b)	Initial A3, B4, C2, E5 D-4+B-2+C No D-5+E-3+A-1 Yes	B1 M1		Starting from D,1 Either
	Complete A1, B4, C2, D5, E3	B1	4	Only solution
	Total	Di	6	Only solution
(2)(a)	18 2 12 7 26 19 16 24 2 18 12 7 26 19 16 24 2 12 18 7 26 19 16 24 2 7 12 18 26 19 16 24 2 7 12 18 26 19 16 24 2 7 12 18 19 26 16 24 2 7 12 16 18 19 26 24 2 7 12 16 18 19 24 26	M1 A1 A1		Shuttle SCA 1 st Pass 3 rd Pass 4 th Pass
(b)	Pass C S 1 1 1 2 2 1 3 3 2	B1 B1 B1	5	All correct SC All C correct B1 or all S correct B1 or 6,4 scores B1

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MD01 (cont)

MD01 (cont)		1		
Q	Solution	Marks	Total	Comments
3(a)(i)	AB 5	M1		SCA
	<i>BD</i> 3	B1		9 edges
	DC 1	A1		$DC3^{rd}$
	DE 4	A1		DE 4 th
	DF 5			
	FG 6			
	GI 10	D.1	_	
	<i>GH</i> 11 <i>HJ</i> 13	B1	5	All correct
	<i>HJ</i> 13			
(ii)	58	B1	1	
(11)	38	DI	1	
(b)(i)	12	M1		SCA
(b)(i)	HS EU H30	M1		3 values at D
		A1		All correct at D
	40 987 26,98	M1		3 values at G
	40 8 19 1	A1		All correct
		B1	6	42 at J – or in script
	V V	D1	O	12 at 5 of in script
	C 6 F ₁₃ I ₃₀			
(ii)	28 + x < 42 O.E.	M1		Allow \leq SC $x \leq 13$ B1
	x < 14 ISW	A1	2	
	Total		14	
4(a)	A, C, D, F odd nodes	B1	17	May be implied
4(a)	AC + DF = 18 + 22 = 40	M1		Way be implied
	AD + CF = 32 + 30 = 62	A2,1,0		
	AF + CD = 12 + 30 = 42	D.1		
	Repeat AC + DF	B1	_	May be implied
	Total $164 + 40 = 204$	B1	6	
(b)	Start/finish A/C	D.1		
	∴ Repeat DF	B1		Or subtract AC
	Total $164 + 22 = 186$	B1	2	
(c)(i)	Shortest pair AF	B1		
	Distance = $164 + 12 = 176$	B1	2	
(ii)	Start/Finish at C/D	B1	1	May be listed in a route
	Total		11	

1 (cont Q Solution Marks Total Comme 5(a)(i) 7	series maths cloud
(ii) 7	
(b)(i) Missing values (PF 3) any 2 values correct	
(b)(i) Missing values (PF 3) any 2 values correct	
(ii) FTPOMF $= 8\frac{1}{4} \text{ ISW}$ (iii) FTMPOF $= 7$ (iv) Delete F $\begin{bmatrix} PF & 3 \\ 3 & \text{any 2 values correct} \\ 0 & 3\frac{1}{4} \\ 0 & \text{other 2 values correct} \\ 0 & 1 \\ 1 & 1 \\ 1 & 1 \\ 1 & 1 \\ 1 & 1 \\ 1 & 1 \\ 1 & 1 \\ 1 & 1 \\ 1 & 1 \\ 2 & 1 \\ 1 & 1 \\ 1 & 1 \\ 2 & 1 \\ 1 & 1 \\ 1 & 1 \\ 2 & 1 \\ 1 & 1 \\ 1 & 1 \\ 2 & 1 \\ 2 & 1 \\ 3 & 1 \\ 4 & 1 & 1 \\ 3 & 1 & 1 \\ 4 & 1 & 1 \\ 3 & 1 & 1 \\ 4 & 1 & 1 & 1 \\ 3 & 1 & 1 \\ 4 & 1 & 1 & 1 $	
(ii) FTPOMF $= 8\frac{1}{4} \text{ ISW}$ (iii) FTMPOF $= 7$ (iv) Delete F $\begin{bmatrix} PF & 3 \\ 3 & \text{any 2 values correct} \\ 0 & 3\frac{1}{4} \\ 0 & \text{ther 2 values correct} \\ 0 & 1 \\ 1 & 2 \\ 1 & 1 \\ 1 & 2 \\ 1 & 2 \\ 1 & 2 \\ 1 & 3 \\ 1 & 3 \\ 1 & 3 \\ 1 & 3 \\ 1 & 3 \\ 1 & 3 \\ 1 & 3 \\ 1 & 3 \\ 1 & 3 \\ 1 & 3 \\ 2 & 3 \\ 2 & 3 \\ 3 &$	
(ii) FTPOMF $= 8\frac{1}{4} \text{ ISW}$ B1 $= 8\frac{1}{4} \text{ ISW}$ B1 $= 7$ (iv) Delete F B1 $= 2$ B1 $= 1$ B1 $= 1$ M1 M1 Visits all vertices Correct order M1 A1 MST – letters or number 3 edges	
(ii) FTPOMF $= 8\frac{1}{4} \text{ ISW}$ B1 1 (iii) FTMPOF $= 7$ M1 Tour Visits all vertices Correct order $= 7$ (iv) Delete F $= 1 $	
$= 8\frac{1}{4} \text{ ISW}$ $= 8\frac{1}{4} \text{ ISW}$ $\text{(iii)} \text{FTMPOF}$ $= 7$ $\text{(iv)} \text{Delete F}$ $\frac{P}{A1} = 0$ $\frac{1}{A1} = 0$	
(iii) FTMPOF =7 (iv) Delete F M1 M1 A1 B1 4 Tour Visits all vertices Correct order M1 A1 MST – letters or number 3 edges	
M1 Visits all vertices Correct order	
= 7	
(iv) Delete F B1 4 MST – letters or number 3 edges	
(iv) Delete F M1 A1 MST – letters or number 3 edges	
M1 MST – letters or number 3 edges	
A1 3 edges	
	ers
Al Correct	
M <	
11/2	
T	
Add $1\frac{1}{4} + 2$ m1 Adding 2 edges from F	
$\begin{bmatrix} Add & 1 - + 2 \\ = 6\frac{3}{4} \end{bmatrix}$ $SC = 6\frac{3}{4}$ $SC = 6\frac{3}{4}$ $SC = 6\frac{3}{4}$	

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MD01 (cont)

6(a) $10 \le x \le 80$	MD01 (cont)				9
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		Solution	Marks	Total	Comments
S Y S 100 20x + 60y \(\) 3000 \(\) OE (maximise) (\(P = \) 2x + y \\ A S OE (maximise) (\(P = \) 2x + y \\ A S OE (maximise) (\(P = \) 2x + y \\ A S OE (maximise) (\(P = \) 2x + y \\ A S OE (maximise) (\(P = \) 2x + y \\ A S OE (maximise) (\(P = \) 2x + y \\ A S OE (maximise) (\(P = \) 2x + y \\ A S OE (maximise) (\(P = \) 2x + y \\ A OE (maximise) (\(O = \) 3x + y \\ A OE	6(a)				Strict inequalities –1 (or using p, c)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		-	ВІ		
(b) (b) (b) (c) Max at (80,20) P = £180 (d) P = $x + 4y$ Max at (30,40) P = £190 Total (ii) $n \ge m - 1$ (b) (maximise) (P =) $2x + y$ B1 B1 May be seen in (b) or (c) For "x lines" and "y lines" For each other line M1 – ve gradient (100,0) M1 – ve gradient (100,0) Feasible region correct to within 1 squar Objective line Considering an extreme point in their region Using (30,40) (\pm square) Total 16 7(a)(i) $m - 1$ B1 1 (ii) $n \ge m - 1$ B2 B1 for > or $(n > m)$ OE M1 A1 2 M1 A1 2 M1 A1 2 M1 A1 A1 A1 A1 A1 A1 A1 A1 A1		-	B1		
(b) B1 M1A1 M1A1 B1 M1A1 M1A1 B1 B1 To For "x lines" and "y lines" For each other line M1—ve gradient (100,0) B1 B1 B1 To For each other line M1—ve gradient (100,0) Feasible region correct to within 1 square Objective line Considering an extreme point in their region Considering an extreme point in their region Total Total Total Total B1 B1 Total B1 B1 Total B1 CC B1 for > or $(n > m)$ OE M1 A1 M1 A1 M2 M3 M4 M5 M6 M1 M6 M1 M7 M8 M1 M8 M8		•			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		(maximise)(P =) 2x + y	B1	5	May be seen in (b) or (c)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(b)	1	R1		For "r lines" and "v lines"
M1 M1 M1 M1 M1 M1 Feasible region correct to within 1 square	(0)				The state of the s
B1 B1 7 Feasible region correct to within 1 square Objective line (c) Max at $(80,20)$ M1 2 Considering an extreme point in their region (d) $P = £180$ M1 2 Using $(30,40)$ ($±$ square) (d) $P = £190$ A1 2 Total 16 7(a)(i) $m-1$ B1 1 (ii) $n \ge m-1$ B2 2 B1 for $>$ or $(n > m)$ OE (b) $m(=n)$ B1 1 (c) M1 2 $m = 6$ and eulerian All correct		40	M1A1		` /
B1 R					
B1 7 Objective line 7		30-			
B1 7 Objective line 7					Feasible region correct to within 1 square
(c) Max at $(80,20)$ M1		20-	B1	7	
(c) Max at $(80,20)$ M1					
(c) Max at $(80,20)$ M1 Al 2 Considering an extreme point in their region (d) $P = x + 4y$ Max at $(30,40)$ M1 Using $(30,40)$ (\pm square) Total (i) $n \ge m - 1$ B1 1 (ii) $n \ge m - 1$ B2 2 B1 for $>$ or $(n > m)$ OE (b) $m(=n)$ M1 Al 2 $m = 6$ and eulerian All correct		10-			
(c) Max at $(80,20)$ M1 Al 2 Considering an extreme point in their region (d) $P = x + 4y$ Max at $(30,40)$ M1 Using $(30,40)$ (\pm square) Total (i) $n \ge m - 1$ B1 1 (ii) $n \ge m - 1$ B2 2 B1 for $>$ or $(n > m)$ OE (b) $m(=n)$ M1 Al 2 $m = 6$ and eulerian All correct					
P = £180		0 20 40 60 80			
P = £180	(a)	May at (80.20)	M1		Considering an extreme point in their
(d) $P = x + 4y$	(6)			2	
Max at $(30, 40)$ $P = £190$ Total Total 16 7(a)(i) $m-1$ B1 1 (ii) $n \ge m-1$ B2 2 B1 for $>$ or $(n > m)$ OE (b) $m(=n)$ B1 1 (c) M1 A1 2 $m = 6$ and eulerian All correct		r = 1100	111	_	
P = £190	(d)				
Total 16 7(a)(i) $m-1$ B1 1 (ii) $n \ge m-1$ B2 2 B1 for > or $(n > m)$ OE (b) $m(=n)$ B1 1 (c) M1 A1 2 $m = 6$ and eulerian All correct				2	Using (30,40) (\pm square)
7(a)(i) $m-1$ B1 1 (ii) $n \ge m-1$ B2 2 B1 for > or $(n > m)$ OE (b) $m(=n)$ B1 1 (c) M1 A1 2 $m = 6$ and eulerian All correct			Al		
(ii) $n \ge m-1$ B2 2 B1 for $>$ or $(n > m)$ OE (b) $m(=n)$ B1 1 (c) M1 A1 2 $m = 6$ and eulerian All correct	7(a)(i)		B1		
(c) $m(=n)$ B1 1 $m=6$ and eulerian All correct					
(c) $M1$ $A1$ 2 $m=6$ and eulerian All correct	(ii)	$n \ge m-1$	B2	2	B1 for $>$ or $(n > m)$ OE
(c) $M1$ $A1$ 2 $m=6$ and eulerian All correct	(L)		D.1	1	
A1 2 All correct	(b)	m(=n)	ы	1	
A1 2 All correct	(0)	A	М1		m = 6, and outarion
	(c)			2	
Total 6					
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