

GCE 2004

June Series



Mark Scheme

Mathematics A

Unit MAP1

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.

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Dr Michael Cresswell Director General

Key to Mark Scheme

M	mark is for	method
m	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	
CAO	correct answer only	
AWFW	anything which falls within	
AWRT	anything which rounds to	
AG	answer given	
SC	special case	
OE	or equivalent	
A2,1	2 or 1 (or 0) accuracy marks	
-x EE	deduct x marks for each error	
NMS	no method shown	
PI	possibly implied	
SCA	substantially correct approach	
c	candidate	
SF	significant figure(s)	
DP	decimal place(s)	

Abbreviations used in Marking

MC – x	deducted x marks for mis-copy
MR – x	deducted x marks for mis-read
ISW	ignored subsequent working
BOD	given benefit of doubt
WR	work replaced by candidate
FB	formulae booklet

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 appropriate

award method and accuracy marks as

MAP1

Q	Solution	Marks	Total	Comments
1(a)	Formula for sum of AP All numbers substituted Sum is 20 100	M1 m1 A1	3	Stated or used Condone one error here NMS 3/3
(b)(i)	Values are 6, 14, 22, 30	B2, 1	2	B1 for one error, eg – 2 , 6, 14, 22
(ii)	Any clear correct method Sum is $2 \times 20100 = 40\ 200$	M1 A1F	2	ft wrong answer to (a); NMS 2/2
Total			7	
2(a)	Arc length formula $P = 8(\theta + 2)$	M1 A1	2	stated or used (θ in radians) Convincingly shown (AG)
(b)	Sector area formula $A = 32\theta$	M1 A1	2	Stated or used (θ in radians)
(c)	$32\theta = 8(\theta + 2)$ Solving to give $\theta = \frac{2}{3}$	M1 m1A1F	3	Condone mixture of deg and rad here Allow $\frac{16}{24}$; ft numerical error in (b); NMS 2/3
Total			7	
3(a)	$y(0) = 6, y(1) = -1$ Sign change, so root between	B1B1 E1	3	
(b)(i)	$y' = 2\left(\frac{3}{2}x^{\frac{1}{2}}\right) \dots$ $\dots = 9$ $y'' = 3\left(\frac{1}{2}x^{-\frac{1}{2}}\right)$	M1A1 B1 M1A1	5	M1 for $kx^{\frac{1}{2}}$ M1 for $kx^{-\frac{1}{2}}$ as deriv of 1st term
(ii)	At SP $3x^{\frac{1}{2}} = 9$ So $x = 9$ and $y = -27$	M1 A1F A1	3	Or B1 for $x = 9$ verified, then B1 for $y = -27$ ft numerical error in y'
(iii)	At SP $y'' = \frac{1}{2}$ This is positive, so minimum	B1 E1F	2	ft wrong value for y'' at SP
Total			13	

MAP1 (Cont)

Q	Solution	Marks	Total	Comments
4(a)	$\ln(pq) = \ln p + \ln q$	B1	1	
(b)	$\ln(p^2q^3) = 2 \ln p + 3 \ln q$	B1	1	
(c)	$\ln\left(\frac{p}{q}\right) = \ln p - \ln q$	B1	1	
(d)	$\ln\sqrt{\frac{p}{q}} = \frac{1}{2} \ln p - \frac{1}{2} \ln q$	B1F	1	ft wrong answer to (c)
Total			4	
5(a)(i)	$r = \frac{345}{230} = 1.5$	B1	1	Convincingly shown but condone verification (AG)
(ii)	3 rd term = 517.5 4 th term = 776.25	B1 B1	2	Allow 517 or 518 Allow AWRT 776 or 777 SC B1 for answers 776(.25) and 1164(.375)
(b)	1801 value from 4 th term i.e. (AWRT) 7 760 000 to 3 SF or 7 770 000	M1 A1F	2	ft c's value for 4 th term in (a) (ii) NMS 2/2 for c's answer $\times 10\ 000$
Total			5	
6(a)	$\sin^2 x + \cos^2 x \equiv 1$ So at P/Q $\sin^2 x + \sin x - 1 = 0$	M1 A1	2	Stated or used convincingly shown (AG)
(b)(i)	$\sin x = \frac{-1 \pm \sqrt{5}}{2}$	M1A1	2	NMS 2/2 for AWRT 0.618 and AWRT -1.62
(ii)	Pos value is 0.618(03) -1.62 < -1 so impossible	A1 E1	2	Convincingly shown (AG) Allow 'sin x can't be neg in given domain'
(c)	Attempt at $\sin^{-1} 0.618$ x – coord of P is 0.67 x – coord of Q is 2.48	M1 A1 A1F	3	PI by answer in radians or degrees Allow AWRT 0.67 or 0.66 AWRT 2.48 or 2.47 or 142; ft wrong co-ordinate for P
Total			9	

MAP1 (Cont)

Q	Solution	Marks	Total	Comments
7(a)(i)	$\int(e^{2x} + 1)dx = \frac{1}{2}e^{2x} + x (+ c)$	M1A1 A1	3	M1 for at least one term correct
(ii)	Substitution and subtraction	M1		In c's integral (not in y or y') Subtraction the right way round
	$\int_0^{\ln 2}(e^{2x+1}) dx = (2 + \ln 2) - \frac{1}{2}$	A1		Allow if the first term (2) is correct
	$= \frac{3}{2} + \ln 2$	A1	3	Convincingly shown (AG)
(b)(i)	$x = 0 \Rightarrow y = 2$	B1	1	
(ii)	Use of $e^{\ln 2} = 2$ or $e^{\ln 4} = 4$ $x = \ln 2 \Rightarrow y = 5$	M1 A1	2	NMS 2/2 for AWRT 5.00
(c)(i)	Range of f is $2 \leq f(x) \leq 5$	B1F	1	ft wrong answers in (b); condone $<$ for \leq ; allow any notation for $f(x)$
(ii)	Sketch of f with correct domain Sketch of inverse fn correct	B1 B1	2	Ignore anything outside domain; curve must intersect positive x -axis
(iii)	$\ln z$ appearing in solution Complete method $f^{-1}(x) = \frac{1}{2} \ln(x - 1)$	M1 m1 A1	3	Where z is any function of x or y correctly bracketed and in terms of x ; NMS 3/3
	Total		15	
	Total		60	