

GCE 2004

November Series



Mark Scheme

Mathematics A

(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.

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.

Further copies of this Mark Scheme are available to download from the AQA Website:
www.aqa.org.uk

Copyright © 2005 AQA and its licensors. All rights reserved.

COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales 3644723 and a registered charity number 1073334. Registered address AQA, Devas Street, Manchester. M15 6EX.

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

award method and accuracy marks as
appropriate

MAP1

Q	Solution	Marks	Total	Comments
1(a)	Sector area formula stated Area = $15 \text{ (cm}^2\text{)}$	M1 A1	2	or used Allow AWRT 14.9 or 15.0
(b)	Arc length formula stated Length of one arc = 3 (cm) Perimeter = 16 (cm)	M1 A1 A1F	3	or used Allow AWRT 15.9 or 16.0 ft one small error
Total			5	
2(a)(i)	f is odd (reason)	E2, 1	2	E1 for partial reason
(ii)	Period is π	B1	1	Allow 180
(b)(i)	Equation is $(y =) 3 \sin 2x$	B2, 1	2	B1 for e.g. $y = 3 \sin x$
(ii)	Attempt to replace x by $x \pm \frac{\pi}{2}$ Equation is $(y =) 3 \sin 2\left(x - \frac{\pi}{2}\right)$	M1 A1F	2	OE; ft wrong answer to (i)
Total			7	
3(a)(i)	$y' = 1 - 25x^{-2}$ $y'' = 50x^{-3}$	M1A1 m1A1F	4	M1 if at least one non-zero term correct m1 for kx^{-3} ; ft numerical error in y'
(ii)	At SP $25x^{-2} = 1$ SP is (5, 110)	m1 A1A1	3	
(iii)	At SP $y'' = 0.4$ So SP is a minimum	A1F E1F	2	ft numerical error in y'' ft wrong value of y'' at SP
(b)	Min occurs at $x = 5$ Min cost is £11 000	B1F B1F	2	ft wrong x value at SP ft wrong y value at SP; units needed here
Total			11	

MAP1 (cont)

Q	Solution	Marks	Total	Comments
4(a)(i)	Values 8, 32	B1	2	AG
	Verification of $u_3 = 128$	B1		
(ii)	Ratio is 4	B1	1	Condone "ratio is 1 : 4"
(iii)	Formula for sum of GP stated	M1	3	or used
	$S_n = \frac{8(4^{20} - 1)}{4 - 1}$	m1		Condone one wrong substitution here
	$\dots = \frac{8}{3}(4^{20} - 1)$	A1		convincingly shown (AG)
(b)(i)	$v_1 = \log_2 8 = 3$	B1	1	OE; AG but accept assertion that $\log_2 8 = 3$
(ii)	Use of at least one log law	M1	3	convincingly shown (AG)
	Use of $\log_2 4 = 2$	m1		
	$v_n = 1 + 2n$	A1		
Total			10	
5(a)	$\tan x = \frac{\sin x}{\cos x}$	M1	3	stated or used
	Multiplying both sides by $\cos x$	m1		in equation $\sin x = x \tan x$
	$\sin x (\cos x - x) = 0$	A1		Convincingly shown (AG)
(b)	$\sin x \neq 0$ at P , so $\cos x - x = 0$	E1	1	
(c)	Condition not necessary (reason)	E2,1	2	$x = 0$ or $\sin x = 0$ must be mentioned for E2; E1 if 'not necessary' clearly explained
(d)(i)	$f(0.7) \approx 0.065$, $f(0.8) \approx -0.103$	B1B1	3	OE; B1 for each value condone 0.06 or 0.07 and -0.1
	Sign change, so root between	E1		OE
(ii)	Attempt to find $f(0.75)$	M1	2	This must be the first new calculation shown
	$f(0.75) \approx -0.018$ so root is closer to 0.7	A1		Condone AWRT -0.02
Total			11	

MAP1 (cont)

Q	Solution	Marks	Total	Comments
6(a)	Intersections $(\ln 3, 0), (0, -2)$	B1B1	2	Allow AWRT 1.10 or 1.09 for $\ln 3$
(b)(i)	$\int y \, dx = e^x - 3x (+c)$	B1B1	2	B1 for each term
(ii)	Substitution of $x = \ln 3$ Answer $2 - 3 \ln 3$	M1 A1	2	in c's integral (not y or y') Allow AWRT -1.30
(iii)	$\dots \approx -1.30$, so area is $+1.30$	E1	1	AG, condone vagueness provided -1.30 seen
(c)(i)	Range of f is $f(x) > -3$	B1	1	Allow any symbol for $f(x)$; condone \geq
(ii)	Domain of f^{-1} is $x > -3$ Range is all real numbers	B1F B1	2	ft wrong answer to (ii); any symbol
(iii)	$\ln z$ appearing in solution Complete correct method $f^{-1}(x) = \ln(x+3)$	M1 m1 A1	3	Where z is any function of x or y ; not \ln^z NMS 3/3, or 2/3 for $\ln x + 3$
(d)(i)	Sketch of modulus function	B1	1	
(ii)	Attempt to reflect in x -axis All clear and correct	M1 A1	2	Only for $x < \ln 3$ with sharp point and correct curvature; condone wrong shape as $x \rightarrow -\infty$
	Total		16	
	Total		60	