

GCE 2005

January 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.

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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 replaced

do not mark unless it has not been

Alternative solution using a correct or partially correct method

award method and accuracy marks as
appropriate

MAP1

Q	Solution	Marks	Total	Comments
1(a)	Formula for n th term of AP	M1	2	Stated or used Shown, not verified (AG)
	$n = \frac{1}{3}(800 - 101) + 1 = 234$	A1		
1(b)	Formula for sum of AP	M1	3	Stated or used Allow one error here
	$S = \frac{234}{2}(101 + 800)$			
	or $S = \frac{234}{2}(2(101) + 3(233))$... = 105 417	m1 A1		
1(c)	$S = \frac{117}{2}(104 + 800)$		2	Allow one error here
	Or $S = \frac{117}{2}(2(104) + 6(116))$	M1		
	... = 52 884	A1		
Total			7	
2(a)(i)	$y' = 4...$... - $9x^{-2}$	B1 M1A1	3	M1 for kx^{-2}
2(a)(ii)	At SP $4 = 9x^{-2}$	M1	5	OE
	$\Rightarrow x^2 = \frac{9}{4}$	m1		
	SPs are $(\frac{3}{2}, 12)...$...and $(-\frac{3}{2}, -12)$	A1A1 A1		
2(b)(i)	$\int y dx = 2x^2 + 9 \ln x (+ c)$	M1A1	2	M1 if one term correct
2(b)(ii)	Substitutions and subtraction	M1	3	F(2) - F(1) in c's F(x) (not in y or y') Condone one small error, e.g. use of decimals
	Area = $(8 + 9 \ln 2) - 2$	m1		
	= $6 + 9 \ln 2$	A1		
Total			13	

MAP1 (cont)

Q	Solution	Marks	Total	Comments
3(a)	$\tan \frac{\pi}{4} = 1, \tan \frac{3\pi}{4} = -1$	B1B1	2	
(b)(i)	$\tan x = \frac{\sin x}{\cos x}$ $2 \tan^2 x + \tan x - 1 = 0$	M1 A1	2	Stated or used Convincingly shown (AG)
(ii)	$\tan x = -1$ or $\tan x = \frac{1}{2}$	M1A1	2	NMS 2/2 $\tan x = 1$ or $\tan x = -\frac{1}{2}$ M1A0
(iii)	$x \approx 0.464$ or $x = \frac{3\pi}{4} \approx 2.36$	B2,1F	2	B1 for one correct value(AWRT); B2 for both correct and no extras in domain; allow 26.6, 135; ignore values outside domain; ft only for the case $\tan x = 1$ or $\tan x = -\frac{1}{2}$
Total			8	
4(a)	Reasonable sketch (1, 0) clearly indicated	B1 B1	2	with y-axis as asymptote
(b)(i)	$y' = \frac{1}{x}$	B1	1	
(ii)	Grad at $x = 1$ is 1	B1	1	
(c)(i)	Attempt to reflect in $y = x$ Correct shape near (1, 1)	M1 A1	2	Clearly indicated Including tangency; Condone incorrect shape further from (1, 1)
(ii)	e^z appearing in c's solution Complete correct method $f^{-1}(x) = e^{x-1}$	M1 m1 A1	3	Where z is a function of x or y
Total			9	

MAP1 (cont)

Q	Solution	Marks	Total	Comments
5(a)	Arc length formula	M1	2	Stated or used
	Arc length 2π (cm)	A1		Accept unsimplified answers throughout
(b)(i)	Sector area formula	M1	2	Stated or used
	Sector area 6π (cm ²)	A1		Allow AWRT 18.8 or 18.9
(ii)	Appropriate use of $\sin \frac{\pi}{3}$	M1	2	Allow AWRT 15.6
	Triangle area $9\sqrt{3}$ (cm ²)	A1		
(iii)	Segment area $6\pi - 9\sqrt{3}$ (cm ²)	A1F	1	Allow AWRT 3.3 or 3.2 ft wrong answers, dependant on both M1s
(c)	Area = $2(\pi r^2 - \text{segment area})$	M1	3	Allow 226 – twice answer to (b)(iii) AG but condone minor accuracy errors provided answer rounds to 220 (3SF)
	$\dots = 72\pi - (12\pi - 18\sqrt{3}) \text{ cm}^2$	m1		
	$\dots \approx 219.67 \text{ cm}^2 \approx 220 \text{ cm}^2$	A1		
Total			10	

MAP1 (cont)

Q	Solution	Marks	Total	Comments
6(a)(i)	Stretch parallel to x -axis	M1	4	
	...SF $\frac{1}{2}$	A1		
	Translation parallel to y -axis	M1		
	... 1 unit in neg y direction	A1		
(ii)	Range is $f(x) > -1$	B1	1	Condone \geq ; allow any symbol for $f(x)$
(b)(i)	$y' = 2e^{2x}$	M1A1	2	M1 for ke^{2x}
(ii)	$y'' = 4e^{2x}$	A1	1	
(c)(i)	$gf(x) = e^{2x} - 1 $	B1	1	
(ii)	Attempt at reflection in x -axis	M1	2	For $x < 0$ only Sharp point and correct curvature needed; (condone incorrect shape as $x \rightarrow -\infty$)
	Correct graph	A1		
(iii)	For $x < 0$, $gf(x) < 1$	E1	2	
	For $x \geq 0$, $gf(x) = f(x)$			
	So when $gf(x) > 1$, $f(x) > 1$	E1		
	Total		13	
	Total		60	