GCE 2004
November Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Mathematics A
(MAP1)

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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	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	M1		or used
	Area = 15 (cm^2)	A1	2	Allow AWRT 14.9 or 15.0
(b)	Arc length formula stated	M1		or used
	Length of one arc = 3 (cm)	A1		
	Perimeter = 16 (cm)	A1F	3	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 $x \pm \frac{\pi}{2}$	M1		
	Equation is $(y=)\ 3\sin 2\left(x - \frac{\pi}{2}\right)$	A1F	2	OE; ft wrong answer to (i)
	Total		**7**	
3(a)(i)	$y' = 1 - 25x^{-2}$	M1A1		M1 if at least one non-zero term correct
	$y'' = 50x^{-3}$	m1A1F	4	ml for kx^{-3}; ft numerical error in y'
(ii)	At SP $25x^{-2} = 1$	m1		
	SP is (5, 110)	A1A1	3	
(iii)	At SP $y'' = 0.4$	A1F		ft numerical error in y''
	So SP is a minimum	E1F	2	ft wrong value of y'' at SP
(b)	Min occurs at $x = 5$	B1F		ft wrong x value at SP
	Min cost is £11 000	B1F	2	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		
	Verification of $u_3 = 128$	B1	2	AG
(ii)	Ratio is 4	B1	1	Condone "ratio is 1 : 4"
(iii)	Formula for sum of GP stated	M1		or used
	$S_n = \dfrac{8(4^{20}-1)}{4-1}$	m1		Condone one wrong substitution here
	$\ldots = \dfrac{8}{3}(4^{20}-1)$	A1	3	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		
	Use of $\log_2 4 = 2$	m1		
	$v_n = 1 + 2n$	A1	3	convincingly shown (AG)
	Total		**10**	
5(a)	$\tan x = \dfrac{\sin x}{\cos x}$	M1		stated or used
	Multiplying both sides by $\cos x$	m1		in equation $\sin x = x \tan x$
	$\sin x(\cos x - x) = 0$	A1	3	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		OE; B1 for each value condone 0.06 or 0.07 and – 0.1
	Sign change, so root between	E1	3	OE
(ii)	Attempt to find f(0.75)	M1		This must be the first new calculation shown
	$f(0.75) \approx -0.018$ so root is closer to 0.7	A1	2	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)	$\int y\,\mathrm{d}x = \mathrm{e}^x - 3x(+c)$	B1B1	2	B1 for each term
(ii)	Substitution of $x = \ln 3$	M1		in c's integral $\left(\text{not } y \text{ or } y'\right)$
	Answer 2 – 3 ln 3	A1	2	Allow AWRT – 1.30
(iii)	$\ldots \approx -1.30$, so area is $+1.30$	E1	1	AG, condone vagueness provided –1.30 seen
(c)(i)	Range of f is $\mathrm{f}(x) > -3$	B1	1	Allow any symbol for f(x); condone $\geqslant$
(ii)	Domain of f^{-1} is $x > -3$	B1F		ft wrong answer to (ii); any symbol
	Range is all real numbers	B1	2	
(iii)	ln z appearing in solution	M1		Where z is any function of x or y; not $1\mathrm{n}^z$
	Complete correct method	m1		
	$\mathrm{f}^{-1}(x) = \ln(x+3)$	A1	3	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	M1		Only for $x < \ln 3$
	All clear and correct	A1	2	with sharp point and correct curvature; condone wrong shape as $x \to -\infty$
	Total		**16**	
	Total		**60**	