ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme January 2004

GCE

Mathematics A

Unit 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 mark 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		Perhaps implied
c		Candidate

Abbreviations used in marking

MC – *x*	deducted *x* marks for miscopy
MR – *x*	deducted *x* marks for misread
ISW	ignored subsequent working
BOD	gave benefit of doubt
WR	work replaced by candidate

Application of mark scheme

Correct answer without working	mark as in scheme
Incorrect answer without working	zero marks unless specified otherwise

Award method and accuracy marks as appropriate to an alternative solution using a correct method or partially correct method.

Q	Solution	Marks	Total	Comments
1 (a)	$\int x^{\frac{1}{2}}\,dx = \dfrac{x^{\frac{3}{2}}}{\frac{3}{2}}\ (+c)$	M1A1	2	M1 for the correct power of x
(b)	Substitution of $x = 2$	ml		
	$\int_0^2 x^{\frac{1}{2}}\,dx = \frac{2}{3}(2^{\frac{3}{2}})$	A1F		ft wrong coeff of $x^{\frac{3}{2}}$; decimals not allowed
	$\ldots = \frac{4}{3}\sqrt{2}$	A1F	3	ditto
	Total		**5**	
2 (a)	$u_1 = 6,\ u_2 = 18$	B1B1	2	Allow 1/2 for answers 2, 6
(b)	Common ratio is 3	B1	1	Condone 1:3
(c)	Formula for sum of GP stated	M1		or used
	$S_{10} = \dfrac{6(3^{10} - 1)}{3 - 1}$	m1		Allow with one numerical error
	$\ldots = 3(3^{10} - 1)$	A1	3	Convincingly shown (AG)
	Total		**6**	
3 (a)	Sector area formula stated Sector area = $12.5\ \theta\ (\text{cm}^2)$	M1 A1	 2	or used Condone omission of units throughout
(b)(i)	Equating sector area to 6.25 $\theta = 0.5$	M1 A1	 2	
(ii)	Arc length formula stated	M1		or used
	Perimeter = 22.5 (cm)	A1F	2	ft wrong value of θ
	Total		**6**	
4(a)(i)	Terms 102, 104	B1B1	2	
(ii)	Formula for nth term stated $100 + 2(n - 1) = 200$	M1 m1		or used OE; allow with one numerical error
	No of terms = 51	A1	3	Allow NMS; allow 2/3 for answer 50
(b)	Formula for sum of AP stated Total length = $\frac{51}{2}(100 + 200)$	M1 Ml		or used OE; allow with one numerical error
	$\ldots = 7650$ (mm)	A1	3	**SC** allow 3/3 for correct answer obtained by adding all 51 numbers but NMS 1/3
	Total		**8**	

Q	Solution	Marks	Total	Comments
5 (a)	$y' = 2e^{2x} \ldots$	M1A1		M1 for ke^{2x}
	$\ldots - 2x^{-2}$	B1	3	
(b)	At SP $2e^{2x} = 2x^{-2}$	m1		OE
	Multiplication by x^2	m1		Dep on m1
	$x^2 e^{2x} = 1$	A1	3	convincingly shown (AG)
(c)	Take square roots, $xe^x = 1$	B1		AG (square roots must be mentioned); condone no mention of ±
	Then take logs, $\ln x + x = 0$	M1A1	3	AG; M1 for use of a log law or $\ln e^x = x$ or $\ln 1 = 0$
(d)	$f(0.5) \approx -0.19, f(0.6) \approx 0.09$	B1B1		Where $f(x) = \ln x + x$
	Change of sign, so root between	E1	3	AG
(e)	$\int \left(e^{2x} + 2x^{-1}\right) dx = \frac{1}{2}e^{2x}$	M1A1		M1 for ke^{2x}
	$\ldots + 2\ln x\ (+c)$	B1	3	Modulus not needed here
		Total	**15**	
6(a)(i)	$fg(x) = \sqrt{x-1}$	B1		
	$gf(x) = \sqrt{x-1}$	B1	2	
(ii)	$fg(1) = gf(1) = 0$	B1	1	
(b)(i)	Translation	M1		Accept 'transformation' if clarified
	1 unit in (positive) x direction	A1	2	'Positive' may be implied
(ii)	Range of h is $0 \le h(x) \le 2$	B1	1	Allow any symbol for $h(x)$; condone < for ≤; allow '0 to 2'
(iii)	Domain of h^{-1} is $0 \le x \le 2$	B1F		ft wrong answer in (ii); any symbol for x
	Range of h^{-1} is $1 \le h^{-1}(x) \le 5$	B1	2	Allow any symbol for $h^{-1}(x)$; condone < for ≤; allow '1 to 5'
(iv)	$y = \sqrt{x-1} \Rightarrow y^2 = x - 1$	M1		OE
	$\ldots \Rightarrow x = y^2 + 1$	m1		Condone sign error here
	So $h^{-1}(x) = x^2 + 1$	A1	3	Allow NMS 3/3
	Total		**11**	

Q	Solution	Marks	Total	Comments
7 (a)	$\sin\frac{\pi}{6}=\frac{1}{2}$	B1		Allow 0.5
	$\cos\frac{\pi}{6}=\frac{\sqrt{3}}{2}$	B1		OE surd, eg $\sqrt{0.75}$
	$\tan\frac{\pi}{6}=\frac{1}{\sqrt{3}}$	B1	3	OE surd, eg $\sqrt{\frac{1}{3}}$ or $\frac{\sqrt{3}}{3}$
(b)	**Either** $\sin^2 x+\cos^2 x\equiv 1$ stated	M1		or used
	Elimination of $\sin x$ or of $\cos x$	ml		
	$4\cos^2 x=3$ or $4\sin^2 x=1$	A1		OE
	Or $\tan x\equiv \sin x/\cos x$ stated	M1		or used
	Equation in terms of $\tan x$ only	m1		
	$3\tan^2 x=1$	A1		OE
	Then one value is $\frac{\pi}{6}$	B1		Condone 0.52; condone degrees or decimals throughout
	At least one other value found	M1		NMS 2/2 if completely correct list given
	Values are $\frac{\pi}{6}$, $\frac{5\pi}{6}$, $\frac{7\pi}{6}$, $\frac{11\pi}{6}$ only	A1	6	Ignore values outside domain
	Total		**9**	
	Total		**60**	