GCE 2005
January Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Mathematics A
(MAME)

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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

MAME

Q	Solution	Marks	Total	Comments
1(a)	$1(.1)+2(.4)+3(.4)+4(.1)=2.5$	E1	1	OE; AG
(b)	$\mathrm{E}\left(X^2\right)=6.9$	B1		PI by full correct calculation
	$\mathrm{V}(X)=6.9-2.5^2=0.65$	M1A1	3	NMS 3/3
	Total		**4**	
2(a)(i)	$\mathrm{f}(-1)=0$	B1	1	
(ii)	$x+1$ is a factor	B1	1	Allow if $x+1$ used as a factor in (b)
(b)	$\mathrm{f}(x)=(x+1)\left(x^2-16\right)$	M1A1		M1 for attempt at division
	$\ldots=(x+1)(x+4)(x-4)$	A2	4	**Alt** Repeated search (PI): $\mathrm{f}(4)=0$ B1 $\mathrm{f}(-4)=0,$ B1 complete factorisation B2
	Total		**6**	
3(a)	$\sqrt{2}\left(3\sqrt{2}+4\right)=6+4\sqrt{2}$	B1B1	2	
(b)	Multiplying N and D by $3\sqrt{2}+4$	M1		
	Numerator correct	A1F		ft wrong answer in (a); allow ft even if *p, q* not integers
	Denominator 2	A1	3	
	Total		**5**	
4(a)	Median between 10th & 11th	M1		Allow 10th or 11th
	Median 27 (km)	A1		
	LQ 14 or 15 (km)	B1		or any value between 14 and 15
	UQ 35 (km)	B1	4	Allow AWRT 35
(b)	Median correct on box plot	B1F		ft reasonable values found in (a)
	Quartiles correct on box plot	B1F		ditto
	Whiskers to 2.5 or 3 and to 48.5 or 48	B1	3	If no clear linear scale drawn (max 2): B1F All five points shown in roughly correct positions B1F All five numerical values shown
(c)	Est. mean = 260 (km)	B1		
	Est. variance = 15 600 $\left(\mathrm{km}^2\right)$	B1	2	
	Total		**9**	

MAME (cont)

Q	Solution	Marks	Total	Comments
5(a)	At *P, Q,* $\frac{1}{2}x+4=2x^2-3$	M1		
	So $4x^2-x-14=0$	A1	2	convincingly shown (AG)
(b)	Method for solving quadratic	M1		not verification
	$x=2$ or $x=-\frac{7}{4}$	A1		
	P is (2, 5)	A1	3	NMS Allow 1/3 for (2, 5); ft wrong *x* coordinates provided one positive and one negative
(c)	Gradient of given line is $\frac{1}{2}$	B1		PI
	Perpendicular gradient is – 2	B1F		ft wrong value for grad *PQ*
	Correct form for eqn of line	M1		with c's grad (not $\frac{1}{2}$)
	Equation is $y-5=-2(x-2)$	A1F	4	OE; ft wrong grad (not $\frac{1}{2}$) and/or coordinates
	Total		**9**	
6(a)(i)	P(SI) = 0.3	B1	1	
(ii)	P(S1 & A) $=0.3\times0.2=0.06$	B1F	1	ft wrong answer to (i)
(iii)	P(SI′ & A) $=0.7\times0.4$	M1		M1 for reasonable attempt
	P (A) $=0.06+0.28=0.34$	A1	2	convincingly shown (AG)
(b)	Cond prob with N or D correct	M1		where 0 < N < D < 1
	Numerator 0.06	A1F		ft wrong answer to (a)(ii)
	Denominator 0.34	A1	3	
	Total		**7**	

MAME (cont)

Q	Solution	Marks	Total	Comments
7(a)(i)	$n=5 \Rightarrow$ total score 600	M1		M1 for reasonable attempt
	$(5\times 98)+110=6\times 100$	A1	2	with conclusion drawn (AG)
(ii)	Variance $=\left(\dfrac{\sum x^2}{n}\right)-\text{mean}^2$	M1		formula stated or used
	$8^2=\dfrac{\sum x^2}{5}-98^2$	m1		correct substitution or verification (m1A0)
	$\sum x^2=5(8^2+98^2)=48340$	A1	3	convincingly shown (AG)
(b)(i)	New $\sum x^2=48\ 340+110^2$	M1		
	$\ldots=60\,440$	A1	2	
(ii)	Var $=\dfrac{60440}{6}-100^2\ \ (\approx 73.3)$	m1		
	SD ≈ 8.56	A1	2	Allow AWRT 8.56
	Total		**9**	
8(a)(i)	$y'=1-9x^2$	M1A1	2	M1 if at least one term correct
(ii)	At P, $1=9x^2$	m1		OE; m1A0 for verification
	So $x=\dfrac{1}{3}$ convincingly shown	A1	2	AG but condone no mention of $\pm$
(b)(i)	$\int y\,\mathrm{d}x=\dfrac{1}{2}x^2-\dfrac{3}{4}x^4(+c)$	M1A1	2	M1 if at least one term correct
(ii)	Area $=\dfrac{1}{2}\left(\dfrac{1}{3}\right)^2-\dfrac{3}{4}\left(\dfrac{1}{3}\right)^4$	m1		at least one term correct
	$\ldots=\dfrac{5}{108}$	A1	2	Allow NMS: AWRT 0.0463
(iii)	Integral = 0	B1F		ft numerical errors in (i) and (ii)
	Two regions have equal area	E1		
	Below axis $\Rightarrow$ negative	E1	3	
	Total		**11**	
	Total		**60**	