

GCE 2005

January Series



Mark Scheme

Mathematics A

(MAME)

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

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)	$E(X^2) = 6.9$ $V(X) = 6.9 - 2.5^2 = 0.65$	B1 M1A1	3	PI by full correct calculation NMS 3/3
Total			4	
2(a)(i)	$f(-1) = 0$	B1	1	
(ii)	$x + 1$ is a factor	B1	1	Allow if $x + 1$ used as a factor in (b)
(b)	$f(x) = (x + 1)(x^2 - 16)$ $\dots = (x + 1)(x + 4)(x - 4)$	M1A1 A2	4	M1 for attempt at division Alt Repeated search (PI): $f(4) = 0$ B1 $f(-4) = 0$, B1 complete factorisation B2
Total			6	
3(a)	$\sqrt{2}(3\sqrt{2} + 4) = 6 + 4\sqrt{2}$	B1B1	2	
(b)	Multiplying N and D by $3\sqrt{2} + 4$ Numerator correct Denominator 2	M1 A1F A1	3	ft wrong answer in (a); allow ft even if p, q not integers
Total			5	
4(a)	Median between 10th & 11th Median 27 (km) LQ 14 or 15 (km) UQ 35 (km)	M1 A1 B1 B1	4	Allow 10th or 11th or any value between 14 and 15 Allow AWRT 35
(b)	Median correct on box plot Quartiles correct on box plot Whiskers to 2.5 or 3 and to 48.5 or 48	B1F B1F B1	3	ft reasonable values found in (a) ditto 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) Est. variance = 15 600 (km ²)	B1 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	2	convincingly shown (AG)
	So $4x^2 - x - 14 = 0$	A1		
	(b)	Method for solving quadratic $x = 2$ or $x = -\frac{7}{4}$ P is (2, 5)	M1 A1 A1	3
(c)	Gradient of given line is $\frac{1}{2}$	B1	4	PI ft wrong value for grad PQ with c's grad (not $\frac{1}{2}$) OE; ft wrong grad (not $\frac{1}{2}$) and/or coordinates
	Perpendicular gradient is -2	B1F		
	Correct form for eqn of line	M1		
	Equation is $y - 5 = -2(x - 2)$	A1F		
Total			9	
6(a)(i)	P(SI) = 0.3	B1	1	
(ii)	P(S1 & A) = $0.3 \times 0.2 = 0.06$	B1F	1	ft wrong answer to (i)
(iii)	P(SI' & A) = 0.7×0.4	M1	2	M1 for reasonable attempt convincingly shown (AG)
	P(A) = $0.06 + 0.28 = 0.34$	A1		
(b)	Cond prob with N or D correct	M1	3	where $0 < N < D < 1$ ft wrong answer to (a)(ii)
	Numerator 0.06	A1F		
	Denominator 0.34	A1		
Total			7	

MAME (cont)

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