AQA

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme
January 2004

GCE

Mathematics A

Unit 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 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)	Method for mean	M1		Allow even if c then divides, eg by 5
	Mean = 0.6	A1	2	NMS 2/2
(b)	$E(X^2) = 2$	B1		PI; award even if this is c's variance
	Variance = $2 - 0.6^2 = 1.64$	M1A1F	3	ft one wrong value; NMS 3/3
	Total		**5**	
2 (a)	Median between 15th and 16th	M1		PI; allow 15th or 16th
	Median is 42	A1		
	LQ 23, UQ 54	B1B1	4	
(b)	LQ, M, UQ correct on box plot	B3F		B1 for each; ft reasonable values from (a)
	Whiskers to 12 and 75	B1	4	If no clear linear scale drawn (max 3) : LQ, M, UQ in roughly right ratio B1 Numerical values of LQ, M, UQ all clearly shown B1F Whiskers drawn and 12, 75 clearly shown in roughly right positions B1
	Total		**8**	
3 (a)	f(2) = 0	B1	1	Allow NMS
(b)	$x - 2$ is a factor	B1	1	or $x + 3$ if from Factor Theorem
(c)	$f(x) = (x-2)(x^2 + 6x + 9)$	M1A1		M1 if $6x$ or 9 correct
	$\ldots = (x-2)(x+3)^2$	m1A1	4	**NMS** 1/4 for 2nd factor, 4/4 all correct If c divides by $x + 2$, give M1 if $2x$ or -9 appears If c writes $x + 2$ and $x - 3$ as factors, give B1 If c's answer is $(x+2)(x-3)^2$, give B2
	Total		**6**	
4(a)(i)	Mean = $\frac{320}{20} = 16$ (miles)	B1	1	Allow NMS
(ii)	Variance = $\frac{5300}{20} - 16^2$ (= 9)	M1		B1 for verification
	SD = 3 (miles)	A1	2	Convincingly shown (AG)
(b)	Mean $y = 1.6 \times 16 = 25.6$	B1F		ft wrong value for mean x
	SD of $y = 1.6 \times 3 = 4.8$	B1	2	
	Total		**5**	

Q	Solution	Marks	Total	Comments
5 (a)	Grad of L is negative	B1		Allow NMS
	Grad of L is $(\pm)\ \frac{2}{3}$	B1	2	PI; condone $(\pm)\frac{2}{3}x$; allow NMS
(b)	Perp grad is $\frac{3}{2}$	B1F	1	Condone $\frac{3}{2}\ x;$ ft wrong answer to (a)
(c)	Req'd line is $y - 1 = \frac{3}{2}\ (x - 4)$	M1		OE; B1 for full verification
	ie $3x - 2y = 10$	A1	2	Convincingly shown (AG)
(d)	Elimination of x or y	M1		
	Pt of int is (6, 4)	A2, 1	3	2/3 for non-algebraic method
(e)	Shortest length is $\sqrt{13}$	m1A1F	2	ft one error in (d); allow AWRT 3.61
	Total		**10**	
6(a)(i)	P (both) = $0.1 \times\ 0.05 = 0.005$	M1A1	2	
(ii)	P (neither) = $0.9 \times 0.95 = 0.855$	M1A1	2	
(iii)	P (exactly one) = 0.14	M1A1F	2	ft wrong values if subtraction from 1 used
(b)	Formula for conditional prob	M1		Fraction with $0 < N < D < 1$ and D correct or equal to c's answer to (a)(iii)
	Numerator $= 0.1 \times 0.95$	m1		
	Denom = 0.14 so ans = $\frac{19}{28}$	A1F	3	ft wrong answer to (a)(iii); Accept AWRT 0.679 or 0.678
	Total		**9**	
7 (a)	$m = 3, n = -8$	B1B1	2	
(b)	Method for solving quadratic	M1		
	$x = -3 \pm \sqrt{8}$ or $\frac{-6 \pm \sqrt{32}}{2}$	A1		
	$\ldots = -3\ \pm 2\sqrt{2}$	B1	3	This mark is for $\sqrt{8} = 2\sqrt{2}$ or $\sqrt{32} = 4\sqrt{2}$
(c)	$-3 - 2\ \sqrt{2}\ < x < -3 + 2\sqrt{2}$	B1F	1	ft wrong answers or forms penalised in (b); allow $-5.83 < x < -0.17$; condone $\leq$ for $<$
	Total		**6**	

Q	Solution	Marks	Total	Comments
8(a)(i)	$y' = 3x^2 - 6x + 3$	M1A1	2	M1 if at least one term correct
(ii)	Solving quadratic $y' = 0$	m1		Allow verification here
	SP is (1,1)	A1A1	3	NMS $x = 1$ B1, $y = 1$ B1 provided y correct
(b)(i)	$\int y \, dx = \frac{1}{4}x^4 - x^3 + \frac{3}{2}x^2 \, (+c)$	B3,2,1	3	B1 for each term
(ii)	Substitution of $x = 3$	M1		In c's integral (not y or y'); M0 for attempting $\int_3^9 y \, dx$
	$\int_0^3 y \, dx = \frac{81}{4} - 27 + \frac{27}{2} = \frac{27}{4}$	A1		
	ie half of $\frac{1}{2}(3 \times 9)$			OE, eg integration
	hence result	A1	3	Convincing shown (AG)
	Total		**11**	
	Total		**60**	