



General Certificate of Education

Mathematics 6300

Specification A

MAME Methods

Mark Scheme

2005 examination - June series

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.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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	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 book

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)	$k = \frac{1}{8}$	B1	1	
(b)(i)	Method for mean Mean = 3.5	M1 A1F	2	Award even if candidate then divides, eg by 5 ft wrong value for $k (<1)$
(ii)	$E(X^2) = 16.25$ $\text{Var}(X) = 16.25 - 3.5^2 = 4$	B1F M1A1F	3	PI by full correct calculation; ft as above ft wrong values
Total			6	
2(a)	$3x^2 + 7x - 6 = 0$	B1	1	convincingly shown (AG)
(b)	Valid method for quadratic $x = \frac{2}{3}$ or $x = -3$ $y = \frac{11}{3}$ or $y = 0$	M1 A1A1 m1A1F	5	leading to two roots ft wrong x values provided $y = x + 3$ used
Total			6	
3(a)	$x^2 - 10x + 29 = (x - 5)^2 + 4$	B1B1	2	
(b)	' $B > 0$ ', or 'min value is 4', etc	E2,1F	2	E1 for 'discriminant < 0 ' only (OE); ft wrong values provided candidate's $B > 0$ Allow E2 for complete sketch or E1 for incomplete sketch
Total			4	
4(a)	90, 200, 280 in table	B3, 2, 1	3	-1 for each error (consistent errors count as one)
(b)	Points plotted correctly Polygon or curve drawn All correct	B1F M1 A1F	3	ft candidate's (increasing) values ft candidate's points
(c)	Method for estimated median Correct value	M1 A1	2	P1 by correct value stated Consistent with candidate's graph to within 0.1g
(d)	30 th percentile is 454 (grams)	B1F	1	ft wrong CFs
Total			9	

MAME (cont)

Q	Solution	Marks	Total	Comments
5(a)	$\sqrt{3} = 3^{\frac{1}{2}}$	B1	1	
(b)	$3\sqrt{3} = 3^{\frac{3}{2}}$	B1F	1	ft wrong answer (fractional) to (a)
(c)	$(3\sqrt{3})^3 = 3^{\frac{9}{2}}$	M1A1F	2	M1 for use of $(a^b)^c = a^{bc}$; ft wrong answer to (b)
(d)	$\frac{1}{9} = 3^{-2}$	B1		
	$\frac{1}{9}\sqrt{3} = 3^{-\frac{3}{2}}$	B1F	2	ft wrong answer to (a)
Total			6	
6(a)(i)	$P(\text{top}) = \frac{5}{25} \left(= \frac{1}{5} \right)$	B1	1	
(ii)	$P(\text{from BT}) = \frac{10}{25} \left(= \frac{2}{5} \right)$	B1	1	
(iii)	$P(\text{top from BT}) = \frac{2}{25}$	B1	1	Condone assumption of independence here
(b)	$\frac{1}{5} \times \frac{2}{5} = \frac{2}{25}$, so independent	M1A1	2	
(c)	Cond prob = $\frac{8}{20} \left(= \frac{2}{5} \right)$	M1A1	2	M1 for $\frac{n}{20}$ or $\frac{x}{4/5}$ OE
Total			7	
7(a)	Mean = 40 (minutes)	B1		
	Method for variance or SD	M1		
	Variance = $\frac{48270}{30} - 40^2 (= 9)$	A1F		ft wrong value for mean
	SD = 3 (minutes)	A1F	4	ft one small error
(b)	Mean $y = 50$	B1F		ft wrong value for mean x
	SD = 3	B1F	2	ft wrong value for SD of x
Total			6	

MAME(cont)

Q	Solution	Marks	Total	Comments
8(a)	At P, $x^2 = 18$	M1		OE; B1 for verification with evidence shown
	$x_p = 3\sqrt{2}$ convincingly shown	A1	2	AG; A0 if decimal approximation used
(b)(i)	$y' = 4x^3 - 36x$	M1 A1A1	3	If at least one power correct
	(ii) Substituting $x = 3\sqrt{2}$ into y' $y'_p = 108\sqrt{2}$	m1 A1	2	NMS 2 / 2
(iii)	At S, $4x^3 = 36x$	m1		B1 for verification with evidence shown
	...so $x^2 = 9$ and $x = 3$	A2, 0	3	AG; condone no mention of $x > 0$
(c)(i)	$\int y \, dx = \frac{1}{5}x^5 - \frac{18}{3}x^3 (+c)$	M1 A1A1	3	If at least one power correct
	(ii) Calculation of $(\pm)(F(3) - F(0))$ $F(3) = -113.4$ So area = 113.4	m1 A1 A1F	3	$F(0) = 0$ may be implied or $ F(3) = 113.4$ fit wrong (negative) value for $F(3)$
	Total		16	
	TOTAL		60	