

GCE 2004

June Series



Mark Scheme

Mathematics A

Unit 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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Dr Michael Cresswell Director General

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)	$x^2 + 2x - 3 = 0$	B1	1	convincingly shown (AG)
	(b) Solution of quadratic	M1		Two solutions needed
	Solutions are (1, 1), (-3, -7)	A2,1	3	(M1A0 for $x = -1$ or 3) A1 for both x values or one pair; NMS 1/3
Total			4	
2	Mean = 3	B1		Allow NMS
	$E(X^2) = \frac{31}{3}$	B1		PI; allow AWRT 10.3 even if this is c's variance
	Variance = $\frac{31}{3} - 3^2 = \frac{4}{3}$	M1A1F	4	Allow AWRT 1.33; NMS 3/3; ft wrong value for mean or $E(X^2)$
Total			4	
3(a)	Median 15%	B1	1	Allow AWRT 15.0% or 15.1%
	(b) Method for quartiles	M1		PI by at least one correct quartile
	Quartiles 9%, 17.8% IQR = 8.8%	A1A1 A1F	4	Allow AWRT 9%, 18% Allow use of c's reasonable values for quartiles NMS 4/4 for 8.5% to 9.0% Condone omission of % sign in this question
Total			5	
4(a)(i)	$P(\text{British}) = \frac{13}{30}$	B1	1	Allow decimal answers throughout question
	(ii) $P(\text{goalkeeper}) = \frac{4}{30} \left(= \frac{2}{15} \right)$	B1	1	
	(iii) $P(\text{British \& goalkeeper}) = \frac{2}{30} \left(= \frac{1}{15} \right)$	B1	1	
	(iv) $P(\text{defender or midfielder}) = \frac{21}{30} \left(= \frac{7}{10} \right)$	B1	1	
	(v) $P(\text{Br or attacker, not both}) = \frac{14}{30} \left(= \frac{7}{15} \right)$	M1A1	2	
	(b)(i) $P(\text{goalkeeper} \mid \text{British}) = \frac{2}{13}$	M1A1	2	
	(ii) <i>Not independent (reason)</i>	E2,1	2	
Total			10	

MAME (Cont)

Q	Solution	Marks	Total	Comments
5(a)	$(\sqrt{3} - \sqrt{2})(\sqrt{3} + \sqrt{2}) = 1$	B1	1	Condone answer 3 – 2
(b)(i)	Rationalising denominator	M1	3	Method must be shown To give $m + n\sqrt{6}$, not necessarily simplified
	Expanding numerator	m1		
	$k = 5 - 2\sqrt{6}$	A1		
(ii)	Rationalising denominator	M1	2	using original k or answer to (i)
	$1/k = 5 + 2\sqrt{6}$	A1		
Total			6	
6(a)(i)	$\int y \, dx = \frac{1}{4}x^4 - x^3 + 3x^2 (+c)$	M1A1	2	M1 if one term or all powers correct. Accept unsimplified
(ii)	Substitution and subtraction Definite integral = 18	m1 A2, 1F	3	Subtraction must be the right way ft one wrong coefficient in (i); A1 if only one (perhaps repeated) error
(b)(i)	$y' = 3x^2 - 6x + 6$	M1A1	2	M1 if at least one term correct
(ii)	y increasing if $y' > 0$	M1	3	or using discriminant
	Completing square	m1		
	$y' > 0$ for all x	A1		
Total			10	
7(a)	At B , $2x + 3y = 15$	M1	2	OE elimination
	B is (3, 3)	A1		
(b)	Good attempt at equation of CD	M1	3	Linear equation, with same grad as AB (attempted) NMS $2x + 3y = 30$; 3/3 $2x + 3y = k$; 2/3 $2x + 3y = (\text{other})$; 0/3 ft wrong grad: eqn satisfied by (6,6)
	Gradient of CD correct	A1		
	Constant correct	A1F		
(c)	D is (0, 10)	A1F	1	ft wrong equation for CD
(d)	Complete method for area	M2	4	A1 if at least relevant area correct
	Area = 22.5	A2,1		
Total			10	

MAME (Cont)

Q	Solution	Marks	Total	Comments
8(a)(i)	$\sum x = 50 \times 300 = 15000$	M1A1	2	M1 for use of $\bar{x} = \frac{\sum x}{n}$; NMS 2/2
(ii)	Use of $\frac{\sum x^2}{n} - \mu^2 = \sigma^2$	M1		or $\sum x^2 = n(\mu^2 + \sigma^2)$; numbers substituted with at most one error
	Numbers substituted correctly	A1		Max M1A1 for verification
	so $\sum x^2 = 4\,680\,000$	A1	3	convincingly shown (AG)
(b)	All have same number of pages	E1	1	
(c)(i)	$50(300) + n(240) = (50 + n)(280)$	M1		Max M1A1 for verification
	$15\,000 - 14\,000 = 40n$	m1		OE
	$n = 25$	A1	3	convincingly found (AG)
(ii)	$\sum y^2 = 25 \times 240^2$	M1		Correct numbers needed here
	$\dots = 1\,440\,000$	A1	2	
	Total		11	
	Total		60	