

GCE 2004

November Series



Mark Scheme

Mathematics A

(Subject Codes 5301, 5306, 5311, 6301 & 6311)

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)(i)	L is $y = \frac{3}{4}x - 3$	B1	1	
(ii)	Gradient of L is $\frac{3}{4}$	B1F	1	Condone " $\frac{3}{4}x$ "; ft wrong coefficient of x
(b)	Perpendicular gradient is $-\frac{4}{3}$	B1F		ft wrong gradient for L
	Equation is $y = -\frac{4}{3}x$	B1F	2	ft wrong perpendicular gradient
	Total		4	
2	Mean is 4.6 $E(X^2) = 25.2$ Variance = $25.2 - 4.6^2$ = 4.04	B1 B1 M1 A1F	4	Allow NMS PI Allow M1 even if c then takes the square root NMS 3/3; ft wrong value for mean or $E(X^2)$
	Total		4	
3(a)	$64 = 4^3$	B1	1	
(b)	$\frac{1}{64} = 4^{-3}$	B1F	1	ft wrong answer to (a)
(c)	$128 = 4^{\frac{7}{2}}$	B1	1	
(d)	$\sqrt{2} = 4^{\frac{1}{4}}$	B1	1	
	Total		4	
4(a)	Widths in ratio 2:1:1:1:5 Calculation of FDs Heights in ratio 4:18:24:20:6	B1 M1 A1F	3	Using unequal widths ft wrong widths
(b)	Use of midpoints Method for mean Est mean $x = 6.52$ Method for variance Est variance = 4.6396	M1 M1 A1 M1 A1F	5	Condone one error but must be clear using values from given intervals Condone absence of units in answers NMS 3/3; allow AWRT 6.52 After M0 allow B1 for 47.15 NMS 2/2; Allow AWRT 4.64; ft wrong value for mean provided all 3 M marks earned; No ft if using $\frac{\sum(x - \bar{x})^2}{n}$
	Total		8	

MAME (cont)

Q	Solution	Marks	Total	Comments
5(a)(i)	$P(\text{work \& TMR}) = \frac{2}{3} \times \frac{2}{5} = \frac{4}{15}$	M1A1	2	'TMR' means 'ten mile run'
(ii)	$P(\text{no work, TMR}) = \frac{1}{3} \times \frac{4}{5} = \frac{4}{15}$	M1A1	2	
(iii)	$P(\text{TMR}) = \frac{4}{15} + \frac{4}{15} = \frac{8}{15}$	A1F	1	ft errors in (i) and /or (ii)
(b)	Reasonable attempt	M1		Allow $\frac{x}{y}$ where $0 < x < y = (a)$ (iii)
	$P(\text{work} \text{TMR}) = \frac{1}{2}$	A1F	2	Allow NMS; ft errors in (a)
Total			7	
6(a)	$A = -6, B = 4$	B1B1	2	
(b)	$A = -6, C = 9$	B1B1F	2	ft wrong answers to (a) ($C = 2B + 1$)
(c)	Good explanation	E2,1F	2	E1 for incomplete explanation eg $\Delta < 0$; ft wrong answer to (b) provided $C > 0$
Total			6	
7(a)(i)	Mean SP = $\pounds \frac{2220}{200} = \pounds 11.10$	M1A1	2	Condone absence of units
(ii)	Mean $x^2 = \frac{24660}{200} = 123.3$	B1		PI
	Var(x) = $123.3 - 11.1^2 (= 0.09)$	M1		
	SD of SP = $\pounds 0.30$	A1	3	Convincingly found (AG)
(b)	Mean profit = $\pounds 1.10$	B1F		ft wrong answer for mean SP
	SD of profit = $\pounds 0.30$	B1	2	
(c)	New Var(x) = $\frac{24660}{210} - \left(\frac{2220}{210}\right)^2$	B1B1		B1 for each term
	So new SD $\approx \pounds 2.38(19)$	B1	3	convincingly shown (AG $\pounds 2.38$)
Total			10	

MAME (cont)

Q	Solution	Marks	Total	Comments
8(a)(i)	$f(-1) = -1 - 4 - 1 + 6 = 0$	B1	1	Convincingly shown (AG)
(ii)	$x + 1$ is a factor	B1	1	PI by correct answer in (iii)
(iii)	$f(x) = (x+1)(x^2 - 5x + 6)$ $\dots = (x+1)(x-2)(x-3)$	M1A1 A2,0	4	M1 if $-5x$ or $+6$ correct <u>Alternative</u> Repeated search (PI): B1 for $f(2) = 0$, B1 for $f(3) = 0$ B2 for complete factorisation SC: $(x-1)(x+2)(x+3)$ 2/4
(b)(i)	$\int \dots = \frac{1}{4}x^4 - \frac{4}{3}x^3 + \frac{1}{2}x^2 + 6x$	M1A2	3	(+ c); M1 one term, A1 two terms correct
(ii)	Substitution of correct limits $\text{Area} = 0 - \left(\frac{1}{4} + \frac{4}{3} + \frac{1}{2} - 6 \right) = 3\frac{11}{12}$	M1 A2,1,0	3	in c's integral (not y or y') -1EE; allow AWRT 3.92
(c)(i)	$y' = 3x^2 - 8x + 1$	M1A1	2	M1 if at least one term correct
(ii)	At SPs $x = \frac{8 \pm \sqrt{52}}{6}$ $x = \frac{4}{3} \pm \frac{1}{3}\sqrt{13}$	M1A1 B1	3	OE Allow B1 if $\sqrt{52} = 2\sqrt{13}$ used
	Total		17	
	Total		60	