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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Mathematics 6360

MFP1 Further Pure 1

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 and abbreviations used in marking

M	mark is for method
m or dM	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	MC	mis-copy
CAO	correct answer only	MR	mis-read
CSO	correct solution only	RA	required accuracy
AWFW	anything which falls within	FW	further work
AWRT	anything which rounds to	ISW	ignore subsequent work
ACF	any correct form	FIW	from incorrect work
AG	answer given	BOD	given benefit of doubt
SC	special case	WR	work replaced by candidate
OE	OE	FB	formulae book
A2,1	2 or 1 (or 0) accuracy marks	NOS	not on scheme
–*x* EE	deduct *x* marks for each error	G	graph
NMS	no method shown	c	candidate
PI	possibly implied	sf	significant figure(s)
SCA	substantially correct approach	dp	decimal place(s)

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

MFP1

Q	Solution	Marks	Total	Comments
1(a)(i)	$\mathbf{A}+\mathbf{B}=\begin{bmatrix}3 & 6\\ 6 & 3\end{bmatrix}$	M1A1	2	M1A0 if 3 entries correct
(ii)	$\mathbf{AB}=\begin{bmatrix}8 & 6\\ 6 & 8\end{bmatrix}$	M1A1	2	Ditto
(b)	$\mathbf{A}+\mathbf{B}-\mathbf{AB}=\begin{bmatrix}-5 & 0\\ 0 & -5\end{bmatrix}$	B1F		ft wrong answers in (a)
	$\ldots=-5\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$	B1	2	
	Total		**6**	
2	$x=0.5\Rightarrow y'=\sin 1$	M1		Max 4/6 if degrees used
	First increment is 0.1 sin 1	m1A1		
	$x=0.6\Rightarrow y\approx 1.084$	A1		PI by correct answer at end
	Second increment is 0.1 sin 1.2	m1		
	$x=0.7\Rightarrow y\approx 1.177\approx 1.18$	A1F	6	Ft error in $y(0.6)$
	Total		**6**	
3(a)	$\Sigma r^2(r-1)=\Sigma r^3-\Sigma r^2$	M1		With attempt to use the given formulae
	Good progress with expansion	m1		or use of common factors
	Factors n and $n+1$ found	A1		Allow verification here
	$\ldots=\frac{1}{12}n(n^2-1)(3n+2)$	A1	4	Convincingly shown (AG)
(b)	Use of f(11) – f(3) in above	M1		M1 for f(11) – f(4)
	f(11) = 3850	A1		PI by correct answer
	f(3) = 22 (so answer is 3828)	A1	3	ditto
	Total		**7**	
4(a)	$(2+h)^3=8+ah+bh^2+h^3$	M1		
	$(2+h)^3=8+12h+6h^2+h^3$	A1A1		A1 for each of a, b ; PI
	$f(2+h)-f(2)=13h+6h^2+h^3$	m1A1F	5	Ft one coeff. wrong
(b)	Divide by h and let $h\to 0$	M1		NMS B1F
	$f'(2)=p=13$	A1F	2	ft wrong value of p
	Total		**7**	

MFP1 (cont)

Q	Solution	Mark	Total	Comments
5(a)	Use of $\tan\frac{\pi}{3}=\sqrt{3}$	M1		Degrees used - 1-mark penalty
	GS is $\frac{1}{3}(\frac{\pi}{3}+n\pi)$	m1A1	3	m1A0 for $\frac{\pi}{9}+n\pi$ or for correct answer plus extra solutions
(b)	One solution is 0	M1A1		OE
	GS is $\frac{1}{3}n\pi$	m1A1F	4	m1A0 for $n\pi$ or for correct answer plus extra solns; ft wrong first solution
	Total		**7**	
6(a)(i)	$\alpha+\beta=4,\ \alpha\beta=13$	B1B1	2	
(ii)	$\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta$	M1		
	$...=4^2-26=-10$	A1	2	convincingly shown (AG)
(iii)	The square of a real number is positive (or zero)	E1		
	The sum of two such squares is positive (or zero)	E1	2	
(b)(i)	$(\alpha+\text{i})+(\beta+\text{i})=4+2\text{i}$	B1F	1	ft wrong value in (a)(i)
(ii)	$(\alpha+\text{i})(\beta+\text{i})=12+4\text{i}$	M1A1F	2	ditto
(c)	Correct coeff of x or constant term	M1		Using c's answers in (b)
	$x^2-(4+2\text{i})x+(12+4\text{i})=0$	A1F	2	ft wrong answers in (b)
	Total		**11**	
7(a)(i)	$D(4, 0)$	M1A1		M1 if at least one point
	$E(8, -4)$, $F(10, -2)$	A1A1	4	correct
(ii)	Correct sketch	m1A1F	2	Ft one error
(b)(i)	Scale factor is $2\sqrt{2}$	M1A1	2	NMS 2/2; 1/2 for AWRT 2.8
(ii)	Angle 45°	M1A1	2	NMS 2/2; condone 315°;1/2 for AWRT 44-46° OE
	Total		**10**	
8(a)	P is (2, 0)	B1	1	
(b)	PQ is $y=2(x-2)$	M1A1F		ft wrong value for x_P
	Elimination of y (or of x)	m1A1F		ft numerical error
	$(x-2)(5x-22)=0$	A1		
	Q is (4.4, 4.8)	A1A1	7	
	Total		**8**	
9(a)(i)	Asymptote is $y=1$	B1	1	
(ii)	Denominator never zero	E2,1	2	E1 if incomplete
(b)	$f(x)=k\Rightarrow(1-k)x^2+4x-9k=0$	M1A1		
	Equal roots if $16+36k(1-k)=0$	m1		
	ie if $9k^2-9k-4=0$	A1	4	convincingly shown (AG)
(c)	Solving quadratic for k	M1		
	$k=-\frac{1}{3}$ or $k=\frac{4}{3}$	A1		NMS 2/2
	$4x^2+12x+9=0$ or $x^2-12x+36=0$	m1		
	SPs when $x=-\frac{3}{2}$…. ;and when $x=$	A1		
	6…….	A1		
	SPs are $\left(-\frac{3}{2},-\frac{1}{3}\right)$ and $\left(6,\frac{4}{3}\right)$	A1	6	
	Total		**13**	
	Total		**75**	