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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Mathematics and Statistics 6320
Specification B

MBP1 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

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
cso		correct solution only
awfw		anything which falls within
awrt		anything which rounds to
acf		any correct form
ag		answer given
sc		special case
oe		or equivalent
sf		significant figure(s)
dp		decimal place(s)
A2,1		2 or 1 (or 0) accuracy marks
–x ee		deduct x marks for each error
pi		possibly implied
sca		substantially correct approach

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

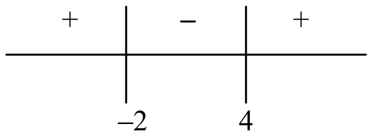
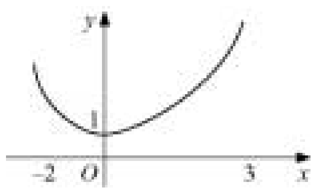
Application of Mark Scheme

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

Mathematics and Statistics B Pure 1 MBP1 June 2005

Q	Solution	Marks	Total	Comments
1(a)	$y=-\frac{3}{4}x+\frac{1}{2}$	M1		attempt at $y=....$
	Gradient of $AB=-\frac{3}{4}$	A1	2	
(b)(i)	$m_1m_2=-1$ used or stated	M1		
	Gradient of $BC=\frac{4}{3}$	A1 √	2	ft their gradient of AB
(ii)	$y-3=their\frac{4}{3}(x-5)$	M1		ft 'their gradient' $y=\frac{4}{3}x-\frac{11}{3}$ or $y=$ 'their m'$x+c$ AND attempt to find c
	$4x-3y=11$	A1	2	**ag** Algebra must be correct
(iii)	Solving $3x+4y=2$ and $4x-3y=11$	M1		eliminating x or y
	$x=2$	A1		
	$y=-1$	A1	3	$B(2,-1)$
	Total		**9**	
2(a)	$\left(3+\sqrt{2}\right)^2=9+6\sqrt{2}+\left(\sqrt{2}\right)^2$	M1		at least 3 terms
	$=11+6\sqrt{2}$	A1	2	
(b)	$\frac{98}{11+6\sqrt{2}}\times\frac{11-6\sqrt{2}}{11-6\sqrt{2}}$	M1		multiply top and bottom by their conjugate
	Denominator $=121-72=49$	B1√		ft 'their' denominator (must be real)
	Answer $=22-12\sqrt{2}$	A1	3	$m=22$; $n=-12$
	Total		**5**	
3(a)	$u_1=8$	B1		
	$u_2=11$	B1	2	
(b)	$\Rightarrow d=3$	B1 √	1	ft their values from (a)
(c)	$S=\frac{n}{2}\left[2a+(n-1)d\right]$ or $\sum n=\frac{1}{2}n(n+1)$	M1		condone one slip in formula
	$=15[16+29\times3]$ or $3\times15\times31+5\times30$	m1		$n=30$, and 'their a and d' substituted
	$=1545$	A1	3	
	Total		**6**	

MBP1 (cont)

Q	Solution	Marks	Total	Comments
4(a)	Discriminant $= 4k^2 - 8(k+4)$	M1		$b^2 - 4ac$ attempted - in terms of *k* for real distinct roots
	$4k^2 - 8(k+4) > 0$			
	$k^2 - 2(k+4) > 0 \Rightarrow k^2 - 2k - 8 > 0$	A1	2	**ag** watch correct algebra
(b)	Attempt at critical values	M1		or attempt to factorise $(k \pm 4)(k \pm 2)$
	4 and -2	A1		correct (perhaps seen in solution)
	Use of critical points AND sketch or sign diagram	M1		ft their critical values M0 for $k > -2,\ k > 4$ etc
				
	$k < -2,\ k > 4$	A1	4	correct answer without working scores full marks
	Total		**6**	
5(a)(i)	$f(-2) = 5;\ f(3) = 10$	B1	1	both correct
(ii)		M1		$\cup$ shaped parabola above *x*-axis – not touching
		B1		(0,1) stated or *y*-intercept shown as 1
		A1	3	Only drawn for $-2 \le x \le 3$ *as on left*
(iii)	Range is $1 \le f(x) \le 10$	M1		either end value correct and used correctly
		A1		one correct inequality or both end values only
		A1	3	all correct using $f(x)$, for *y* [NOT *x*]
(iv)	Inverse does NOT exist	B1		
	Not one-one; f is many-one etc	E1	2	
(b)	$gf(x) = (x^2 + 1 - 1)^4$	M1		
	$= x^8$	A1	2	
	Total		**11**	

MBP1 (cont)

Q	Solution	Marks	Total	Comments
6(a)	$\sin^2\theta = 1-\cos^2\theta$	M1		used correctly
	$3+\sin^2\theta = 4-\cos^2\theta$ etc			
	$\dfrac{3+\sin^2\theta}{2+\cos\theta} = 2-\cos\theta$ established	A1	2	**ag** be convinced
(b)	$\dfrac{3+\sin^2 2x}{2+\cos 2x} = 2-\cos 2x = \dfrac{5}{4}$			
	$\Rightarrow \cos 2x = 2-\dfrac{5}{4} = \dfrac{3}{4}$	B1	1	**ag** be convinced
(c)	$\cos^{-1}\left(\dfrac{3}{4}\right) = 41.4^\circ$	B1		
	$2x = 41.4^\circ$	M1		
	$\Rightarrow x = 20.7^\circ$	A1		condone more SF or 21°
	Also $x = 159.3^\circ$	A1	4	condone more SF (withhold if extra solutions in the given interval)
	Total		**7**	
7(a)(i)	$\dfrac{dy}{dx} = 2-\dfrac{16}{x^3}$	B1		2
		M1		kx^{-3}
		A1	3	$-16x^{-3}$
(ii)	Putting 'their' $\dfrac{dy}{dx} = 0\left(\Rightarrow 2 = \dfrac{16}{x^3}\right)$	M1		
	$x^3 = 8$	m1		Forming equation $x^n = \ldots(\text{or } x = \ldots)$
	$\Rightarrow x = 2,\ y = 6$	A1	3	cso and both coordinates correct (2,6) and no other values of x
(b)(i)	$x^2 - \dfrac{8}{x}(+c)$	B1		x^2
		M1		kx^{-1}
		A1	3	$-8x^{-1}$ (condone no $+c$)
(ii)	$[16-2]-[1-8]$	M1		$F(4)-F(1)$ from their answer to (b)(i)
	$= 21$	A1	2	
(c)(i)	$d = 21$	B1		$x = 1,\ y = 10$ in $x+2y = d$ therefore $d = 21$
	$p = 8\frac{1}{2}$	B1	2	Since $4+2p = 21$
(ii)	Area of trapezium $= \dfrac{1}{2}(10+p)\times 3$	B1√		Allow if no value of p found
	$= 27\frac{3}{4}$			$\int_1^4\left(\dfrac{d}{2}-\dfrac{x}{2}\right)dx = \left[\dfrac{dx}{2}-\dfrac{x^2}{4}\right]_1^4$
	Shaded region = trapezium – (b)(ii) value	M1		
	$= 6\frac{3}{4}$	A1	3	cso
	Total		**16**	
	TOTAL		**60**	