GCE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Mathematics and Statistics B
MBP1

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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	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 2004

Question Number and Part	Solution	Marks	Total marks	Comments
1(a)	$4x^3 - 32$	M1 A1	 2	Reducing power by 1 Correct
(b)	$\frac{dy}{dx} = 0 \quad \Rightarrow x^3 = 8$ $\Rightarrow x = 2$	M1 A1	 2	Putting their $\frac{dy}{dx} = 0$. Used, not stated
(c)	Testing gradient for $x = 2 \pm \varepsilon$ minimum point	M1 B1	 2	Or second derivative, or $y(2 \pm \varepsilon)$ Stated
	Total		**6**	
2(a) (i)	$2^{\frac{1}{2}}$	B1	1	
(ii)	2^{3x}	B1	1	Not $(2^3)^x$
(b)	$2^{3x} \times 2^{x+1} = 2^{\frac{1}{2}}$	M1		Substituting their values from part (a)
	$4x + 1 = \frac{1}{2}$	m1		Equating powers of 2 after ADDING indices
	$\Rightarrow x = -\frac{1}{8}$	A1	3	
	Total		**5**	
3 (a)	$fg(x) = \frac{5}{x^2 + 1}$	B1	1	
(b)	$5 = x(x^2 + 1)$ $\Rightarrow x^3 + x - 5 = 0$	M1 A1	 2	$fg(x) = x$ & clearing denominator **ag** be convinced (Watch f(*x*)=g(*x*))
(c)	$f(x) = x^3 + x - 5$ f(1.5) = −0.125 and f(1.6)=0.696 change of sign $\Rightarrow$ root between 1.5 and 1.6	M1 A1	 2	Both f(1.5) and f(1.6) attempted Must have statement and NO wrong values
	Total		**5**	

MBP1 (cont)

Question Number and Part	Solution	Marks	Total marks	Comments
4(a) (i)	Gradient $AB = \frac{3}{2}$	B1	1	Accept any unsimplified equivalent fraction, eg $\frac{-6}{-4}$.
(ii)	Gradient $AC = \frac{2}{3}$	B1		Or equivalent or grad $AC \neq -\frac{2}{3}$
	Grad $AB \times$ Grad $AC = (1)$	M1		Or perp lines occur when $m_1 \times m_2 = -1$
	Lines are NOT perpendicular	A1	3	cso both gradients correct
(b) (i)	Eliminating y $\Rightarrow 2x^2 + 2x = 12$	M1		attempt
	$\Rightarrow x^2 + x - 6 = 0$	A1	2	**ag**
(ii)	$(x+3)(x-2) = 0$	M1		Factors or attempt to solve
	$\Rightarrow x = -3, \quad x = 2$	A1		
	(2, 1) and $\left(-3, -\frac{7}{3}\right)$	M1		Attempt at **one** y - value
		A1	4	Both points correct
	Total		**10**	

MBP1 (cont)

Question Number and Part	Solution	Marks	Total marks	Comments
5(a) (i)	$(x-3)^2$	B1		$p = 3$
	$+1$	B1	2	$q = 1$
(ii)	Translation (& no other transformation)	M1		or first component of vector correct
	through 3 in x-direction	A1√		ft their p
	and 1 in y-direction	A1√	3	ft their q
(b)	Use of discriminant $b^2 - 4ac$	M1		or $\frac{1}{2}(6+\sqrt{\ })$ or $(x-p)^2 = -q$
	$= 36 - 40 = -4$	A1		or $\frac{1}{2}(6+\sqrt{-4})$ or $(x-3)^2 = -1$
	$< 0 \Rightarrow$ no real solutions	A1	3	cannot find sq rt of –4, etc
(c) (i)	$\frac{x^3}{3} - 3x^2 + 10x \quad (+c)$	M1		Raising one power by 1
		A1	2	Correct
(ii)	$\left[\frac{125}{3} - 75 + 50\right] - 0$	M1		5 (and 0) substituted into (c)(i)
	$= 16\frac{2}{3}$	A1	2	
(iii)	Area of trapezium $= \frac{1}{2}(10+5)\times 5$	M1		Or difference of 2 integrals
	$= 37\frac{1}{2}$	A1		
	Shaded area $= 20\frac{5}{6}$	A1√	3	"their" Trapezium – "their" (c)(ii)
(d) (i)	$y(1+h) = 1 + 2h + h^2 - 6 - 6h + 10$	M1		Subs $1 + h$ and attempt to multiply out
	Gradient $= \frac{y(1+h) - y(1)}{h}$	m1		$y(1) = 5$
	$= \frac{h^2 - 4h}{h} = h - 4$	A1	3	**ag**
(ii)	As $h \to 0$, gradient at $P = -4$	B1	1	Must use limit and not calculus rule
	Total		**19**	

MBP1 (cont)

Question Number and Part	Solution	Marks	Total marks	Comments
6 (a)	Use of $\frac{n}{6}(n+1)(2n+1)$	M1		$\frac{29}{6}\times 30\times 59$
	$= 8\,555$	A1	2	
(b) (i)	common difference, $d = 4$	B1		
	Use of $a+(r-1)d$	M1		Condone $a+(n-1)d$
	$u_r = 4r-1$	A1	3	Condone $4n-1$
(ii)	Upper limit 200 and lower limit 1 on $\sum$	B1		Or equivalent
	$\sum_{r=1}^{200} 4r-1$	B1√	2	ft their u_r (ignore limits) Two B marks are independent
	Total		**7**	
7(a)	$(2y+1)(y-2)=0$	M1		Attempt at factors or formula
	$\Rightarrow (y=)2,\quad -\frac{1}{2}$	A1	2	
(b)(i)	$\frac{3\sin x}{\cos x}+2\cos x=0$			*Must see this line*
	$\Rightarrow 3\sin x+2\cos^2 x=0$	B1	1	**ag**
(ii)	$\cos^2 x = 1-\sin^2 x$	M1		Any equivalent stated correctly
	$3\sin x+2(1-\sin^2 x)=0$			
	$\Rightarrow 2\sin^2 x-3\sin x-2=0$	A1	2	**ag** Be convinced of NO sign errors and $=0$ Watch (–1) factor
(c)	$\sin x = -\frac{1}{2}$			
	$x=\sin^{-1}\left(-\frac{1}{2}\right)$	M1		Attempt at inverse sine of one of "their" y values
	$210°$	A1		
	$330°$	A1	3	
	Total		**8**	
	TOTAL		**60**	