ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme
January 2004

GCE

Mathematics & Statistics B

Unit MBP1

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 mark 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		Perhaps implied
c		Candidate

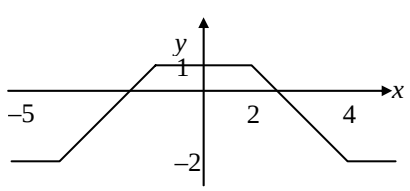
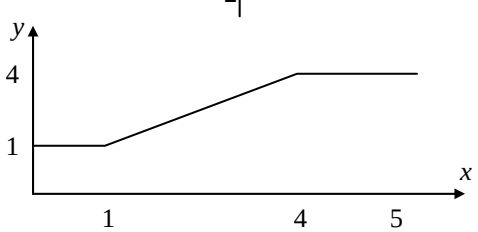
Abbreviations used in marking

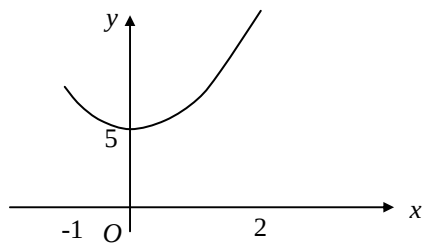
MC – *x*	deducted *x* marks for miscopy
MR – *x*	deducted *x* marks for misread
ISW	ignored subsequent working
BOD	gave benefit of doubt
WR	work replaced by candidate

Application of mark scheme

Correct answer without working	mark as in scheme
Incorrect answer without working	zero marks unless specified otherwise

Award method and accuracy marks as appropriate to an alternative solution using a correct method or partially correct method.

Question Number and part	Solution	Marks	Total	Comments
1(a)	$7+9d$	M1		Condone $7+10d$, or attempt to consider $\frac{43-7}{9}$ {or 10}
	$7+9d = 43$ $\quad d = 4$	A1	2	
(b)	$S_n = \frac{1}{2}n(2a+(n-1)d)$ formula attempted	M1		Condone one slip using n or 50
	$= 25\,(14+196)$	A1√		ft their $49\,d$ (eg $25\times190.4 = 4760$)
	$= 5250$	A1	3	
(c)(i)	$7+(k-1)d > 1000$	M1		Condone = instead of >
	$\Rightarrow 4k > 997$	A1	2	**ag** be convinced
(ii)	(Since k is integer) $\quad k = 250$	B1	1	
	Total		**8**	
2(a)(i)	Gradient $AB = -1$	B1	1	Accept $\frac{4}{-4}$ etc if $\frac{\Delta y}{\Delta x}$ used Withhold if incorrect formula used
(ii)	$y-2 = -(x+1)$	B1	1	or $y = -x+c$ **and** use of (–1,2) to find c
	$\Rightarrow$ equation of AB is $x+y=1$			**ag**
(b)(i)	$x+3y=7 \quad \Rightarrow \quad y = \ldots.$	M1		Making y the subject to get gradient or awareness that $m_1 \times m_2 = -1$
	Gradient of $x+3y=7$ is $-\frac{1}{3}$			
	gradient $BC = 3$	A1	2	
(ii)	Equation of BC is $y = 3(x-5)$	B1√	1	Correct or ft their BC gradient
(c)	Solving $x+y=1$ & candidate's BC	M1		
	$4x - 15 = 1$ etc	M1		Eliminating x or y
	$\Rightarrow B(4,-3)$	A1	3	
	Total		**8**	
3(a)		M1		Idea of reflection in y-axis
		A1	2	Accurate for $-5 \le x \le 5$
(b)		M1		General shape or 2 sections correct
		A1	2	Correct graph with $y = 4$ for $x > 4$
(c)	Reflection in $y = k$	M1		Accept reflection and translation in y-direction
	in $y = 1$	A1	2	Accept correct composite transformation e.g. reflect in x-axis followed by translation of 2 units in y-direction
	Total		**6**	

Question Number and part	Solution	Marks	Total	Comments
4(a)	$g(-1) = 6$	B1		
	$g(2) = 9$	B1	2	
(b)		M1 A1	2	Parabola (part or whole) ONLY drawn for $-1 \le x \le 2$
(c)	Range	M1		Either 5 or 9
	$5 \le g(x) \le 9$	A1 A1	3	One inequality correct All correct and g(x) or y (condone f(x) but not x)
(d)	g^{-1} does NOT exist Two values of x give same value of y	B1 E1	2	Many-one (not one-one ,etc)
(e)	$gg(x) = (x^2+5)^2+5$	M1		Must be correct expression
	$= x^4+10x^2+30$	A1	2	$p = 10$, $q = 30$
	Total		**11**	
5(a)(i)	$x^2+(3-7)x+5-49=0$			Be convinced - no missing brackets etc
	$\Rightarrow x^2-4x-44=0$	B1	1	**ag** Must have = 0
(ii)	Use of quadratic equation formula or attempt to complete square	M1		Condone one slip $\frac{4 \pm \sqrt{192}}{2}$
	$\Rightarrow (x=)\ 2 \pm 4\sqrt{3}$	A1	2	
(b)(i)	Discriminant b^2-4ac	M1		Used - must involve k
	$(3-k)^2-4(5-k^2)$	A1		$9-6k+k^2-20+4k^2$
	$\Rightarrow 5k^2-6k-11=0$	A1	3	**ag** must use " = 0 " condition
(ii)	$(5k-11)(k+1)=0$	M1		Attempt to solve or factorise
	$\Rightarrow k=-1,\ \frac{11}{5}$	A1	2	
	Total		**8**	

Question Number and part	Solution	Marks	Total	Comments
6(a)	Awareness that $\frac{\sin\theta}{\cos\theta} = \tan\theta$	M1		Generous
	$\tan 2x = 0.8$	A1	2	Correctly derived – not fudged
(b)	$\tan^{-1}$ (candidate's k)	M1		38.6598....° 0.6747 rads
	$2x = 38.7°$	A1		condone 38.6° or better
	$2x = 38.6598..° \Rightarrow x = 19.3°$	A1√		19.3299....° ft half their $\tan^{-1} k$ accept 0.337 rads
	$2x = 218.6598..° \Rightarrow x = 109.3°$	A1√	4	Their previous value + 90° Must be degrees for final mark Lose final A1 for extra solutions in interval
	Total		**6**	
7(a)(i)	$\frac{dy}{dx} = 2x$	B1		
	$-\frac{162}{x^3}$	M1		Power x^{-3}
		A1	3	
(ii)	$2x - \frac{162}{x^3} = 0$	M1		Putting candidate's $\frac{dy}{dx} = 0$
	$\Rightarrow x^4 = 81$ **ag**	A1	2	M1 only for verification $x = \pm 3$
(iii)	$x^2 = 9$ or $x = \sqrt[4]{81}$	M1		Or x = 3 as only value given
	$x = \pm 3$	A1	2	
(iv)	$y = 18$	B1	1	No need to show both equal 18 B0 if 2 different y values given
(b)(i)	$\frac{x^3}{3}$ $-\frac{81}{x}$ $(+C)$	B1		x^3 term
		M1		x^{-1} power
		A1	3	correct second term
(ii)	$\left[\frac{27}{3} - \frac{81}{3}\right] - \left[\frac{1}{3} - 81\right]$	M1		Correct use of limits 1 and 3 substituted into answer for part (b)(i)
	$62\frac{2}{3}$	A1	2	Accept 62.7 or better, condone 62.66 etc
	Total		**13**	
	TOTAL		**60**	