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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Mathematics 6360

MPC1 Pure Core 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

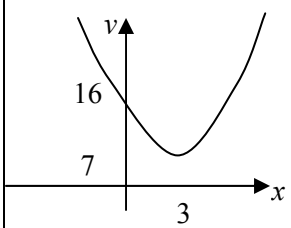
M	mark is for method
m or dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation

√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

MPC1

Q	Solution	Marks	Total	Comments
1(a)	Midpoint $\left(\frac{6+2}{2}, \frac{5-1}{2}\right) = (4, 2)$	M1 A1	2	One coordinate correct unsimplified Both correct and simplified
(b)	$AB^2 = (6-2)^2 + (5+1)^2$ $= (16 + 36) = 52$ $\Rightarrow AB = 2\sqrt{13}$	M1 A1 A1	3	Pythagoras used (condone one slip) 52 or $\sqrt{52}$ seen
(c)(i)	Gradient $AB = (5 - -1) / (6 - 2)$ $= \frac{6}{4} = \frac{3}{2} = 1.5$	M1 A1	2	Must be y on top and subtraction $(6 - 2)$ Any correct equivalent
(ii)	$y - 5 = m(x - 6)$ or $y + 1 = m(x - 2)$ $2y - 10 = 3x - 18$ etc leading to $3x - 2y = 8$	M1 A1	2	or $y = mx + c$ and attempt to find c. **AG** (be convinced)
(d)	Attempt to eliminate x or y $x = 4$ $y = 2$	M1 A1 A1	3	$7x = 28$ etc C is point (4,2)
	Total		**12**	
2(a)	$(x - 3)^2$ $+ 7$	B1 B1	2	$p = 3$ $q = 7$
(b)(i)	Vertex (3, 7)	B1√ B1√	2	ft their p ft their q
(ii)	 graph	M1 A1	2	parabola (ft on vertex approx position) correct with $y = 16$ marked or stated
(iii)	Line of symmetry $x = 3$	B1	1	Must have correct equation
(c)	Translation (and no additional transf'n) through $\begin{bmatrix} 3 \\ 7 \end{bmatrix}$	E1 M1 A1	3	Not shift, move, transformation, etc one part correct eg 7 units up all correct – if not vector – must say 3 units in positive x- direction etc
	Total		**10**	
3(a)	$(x - 2)^2 + (y + 1)^2$ $= 5^2$ or 25	M1 B1 A1	3	$(x \pm a)^2 + (y \pm b)^2$ Correct equation for circle
(b)	Sub $x = 6$, $y = 2$ into *their* circle equation $(6-2)^2 + (2+1)^2 = 16 + 9 = 25$	M1 A1	2	Or distance $PC^2 = 4^2 + 3^2$ Shown to equal radius^2
(c)	Gradient $CP = (2 - -1) / (6 - 2)$ $= \frac{3}{4} = 0.75$	M1 A1	2	Must be y on top and subtraction $(6 - 2)$ Any correct equivalent
(d)(i)	Grad of perp $= -1$ / *their* gradient CP $= -4/3$	M1 A1	2	Or $m_1 m_2 = -1$ used or stated
(ii)	$y - 2 =$ their $(d)(i)$gradient$(x - 6)$	B1√	1	**OE** such as $3y + 4x = 30$
	Total		**10**	

MPC1 (cont)

Q	Solution	Marks	Total	Comments
4(a)(i)	$p(3) = 27 - 45 + 21 - 3$ $p(3) = 0 \Rightarrow$ $x-3$ is a factor	M1 A1	2	Finding p(3) Shown = 0 plus a statement Or $(x-3)(x^2-2x+1)$
(ii)	B is point (3,0)	B1	1	Must have coordinates
(b)(i)	$\frac{dy}{dx} = 3x^2 - 10x + 7$	M1 A1	2	One term correct All correct with NO $+c$ etc
(ii)	$3x^2 - 10x + 7 = 0$ $\Rightarrow (x-1)(3x-7) = 0$ $\Rightarrow$ at M, $x = \frac{7}{3}$	M1 m1 A1	3	Putting their $\frac{dy}{dx} = 0$ Attempt to use quad formula or factorise **CSO** factors correct etc
(c)	$\frac{d^2y}{dx^2} = 6x - 10$ sub $x = 1$, $\Rightarrow \frac{d^2y}{dx^2} = -4$	B1√ B1√	2	ft their $\frac{dy}{dx}$ ft their $\frac{d^2y}{dx^2}$
(d)(i)	$\frac{x^4}{4} - \frac{5x^3}{3} + \frac{7x^2}{2} - 3x \quad (+c)$	M1 A1 A1 A1	4	Increase one power by 1 One term correct Two other terms correct All correct (condone missing + c)
(ii)	Realisation that limits are 0 and 1 $\left[\frac{1}{4} - \frac{5}{3} + \frac{7}{2} - 3\right] - 0$ $= -\frac{11}{12}$ Area $= \frac{11}{12}$	B1 M1 A1 E1	4	Condone wrong way round Attempt to sub their limits into their (d)(i) **CSO**. Must use F(1) – F(0) correctly **CSO**. Convincing argument
	Total		**18**	
5(a)	$3 + 1 + 2\sqrt{3}$ $= 4 + 2\sqrt{3}$	M1 A1	2	Multiplied out At least 3 terms with $\sqrt{3}$ term $m = 4$, $n = 2$
(b)	Multiplying top and bottom by $\sqrt{3} + 1$ Denominator $= 3 - 1 = 2$ Expression $= \frac{4 + 2\sqrt{3}}{2}$ $= 2 + \sqrt{3}$	M1 B1 A1	3	**CSO** $m = 2$, $n = 1$
	Total		**5**	

MPC1 (cont)

Q	Solution	Marks	Total	Comments
6(a)	$p(x) = x^3 + x^2 + 3x - 2x^2 - 2x - 6$	M1		Condone one slip
	$= x^3 - x^2 + x - 6$	A1	2	$a = -1$, $b = 1$
(b)	$p(-1) = -3 \times 3$ *or* $-1-1-1-6$	M1		Must use p(–1) and not long division
	(Remainder is) -9	A1	2	
(c)	Considering $x^2 + x + 3 = 0$ and attempting to solve or use discriminant	M1		$b^2 - 4ac = 1 - 12 = -11$
	$b^2 - 4ac < 0$ $\Rightarrow$ no real roots	A1	3	**CSO**
	Only real root is 2	B1		$x = 2$
	Total		**7**	
7(a)	$3x - 3 > 3 - 5x - 30$	M1		Multiplying out (condone one slip)
	$\Rightarrow 8x > -24$	A1		Or correct equivalent eg $-8x < 24$
	$\Rightarrow x > -3$	A1	3	(Penalise $\leqslant$, $\geqslant$ once only in (a) and (b))
(b)	$x^2 - x - 6 = (x-3)(x+2)$	M1		Attempt to use quad formula or factorise
	(critical points are) 3 and –2	A1		May be seen in diagram or solution
	Sketch or sign diagram	M1		+ (–2) – (3) +
	$2 < x < 3$	A1	4	
	Total		**7**	
8(a)	$mx - 1 = x^2 - 5x + 3$			Strict mark here – no trailing equals signs
	$\Rightarrow x^2 - 5x - mx + 4 = 0$			
	$\Rightarrow x^2 - (5+m)x + 4 = 0$	B1	1	**AG**
				(be convinced about algebra and = 0)
(b)	$(5+m)^2 - 16 = 0$	M1		Equal roots when "$b^2 - 4ac$" = 0 used
	$5 + m = (\pm)4$ or $(m+1)(m+9) = 0$	m1		Square root or factor/formula attempt
	$m = -1$	A1		
	$m = -9$	A1	4	**SC** B1, B1 only for –1 , –9 (no working)
(c)	Line is a tangent to the curve	E1	1	Line touches curve, cuts at one point etc
	Total		**6**	
	Total		**75**	