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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Mathematics 6360

MPC1 Pure Core 1

Mark Scheme

2006 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	or equivalent	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)

No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded. However, there are situations in some units where part marks would be appropriate, particularly when similar techniques are involved. Your Principal Examiner will alert you to these and details will be provided on the mark scheme.

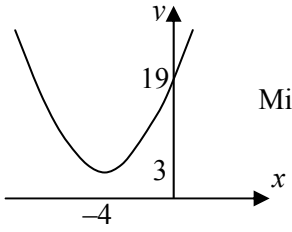
Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to candidates showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the candidate to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

Otherwise we require evidence of a correct method for any marks to be awarded.

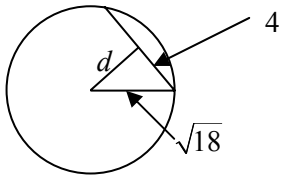
MPC1

Q	Solution	Marks	Total	Comments
1(a)(i)	Gradient $AB = \frac{1-7}{5-1}$	M1		Must be y on top and subtr'n of cords
	$= -\frac{6}{4} = -\frac{3}{2} = -1.5$	A1	2	Any correct equivalent
(ii)	$y-7 = m(x-1)$ or $y-1 = m(x-5)$	M1		Verifying 2 points or $y = -\frac{3}{2}x + c$
	leading to $3x + 2y = 17$	A1	2	AG (or grad & 1 point verified)
(b)	Attempt to eliminate x or y : $7x = 42$ etc	M1		Solving $x - 4y = 8$; $3x + 2y = 17$
	$x = 6$	A1		
	$y = -\frac{1}{2}$	A1	3	C is point $(6, -\frac{1}{2})$
(c)	Grad of perp = – 1 / *their* gradient AB	M1		Or $m_1 m_2 = -1$ used or stated
	$= \frac{2}{3}$	A1√		ft their gradient AB
	$y - 7 = \frac{2}{3}(x-1)$ or $3y - 2x = 19$	A1	3	CSO Any correct form of equation
	Total		**10**	
2(a)	$(x+4)^2$	B1		$p = 4$
	$+3$	B1	2	$q = 3$
(b)	$(x+4)^2 = -3$ or "their" $(x+p)^2 = -q$	M1		Or discriminant = 64 –76
	No real square root of –3	A1	2	Disc < 0 so no real roots (all correct figs)
(c)	 Minimum (– 4, 3)	B1√		ft their $-p$ and q (or correct)
	graph	B1		Parabola (vertex roughly as shown)
		B1	3	Crossing at $y = 19$ marked or (0, 19) stated
(d)	Translation (and no additional transf'n)	E1		Not shift, move, transformation, etc
	through $\begin{bmatrix} -4 \\ 3 \end{bmatrix}$	M1		One component correct eg 3 units up
		A1	3	All correct – if not vector – must say 4 units in negative x- direction, to left etc
	Total		**10**	
3(a)	$\frac{dy}{dx} = -10x^4$	M1		kx^4 condone extra term
		A1	2	Correct derivative unsimplified
(b)	When $x = 1$, gradient = –10	B1√		FT their gradient when $x = 1$
	Tangent is	M1		Attempt at y & tangent (**not** normal)
	$y - 5 = -10(x-1)$ *or* $y + 10x = 15$ etc	A1	3	CSO Any correct form
(c)	When $x = -2$ $\frac{dy}{dx} = -160$ (or < 0)	B1√		Value of their $\frac{dy}{dx}$ when $x = -2$
	($\frac{dy}{dx} < 0$ hence) y is **decreasing**	E1√	2	ft Increasing if their $\frac{dy}{dx} > 0$
	Total		**7**	

MPC1 (cont)

Q	Solution	Marks	Total	Comments
4(a)				Multiplied out
	$4\left(\sqrt{5}\right)^2 + 12\sqrt{5} - \sqrt{5} - 3$	M1		At least 3 terms with $\sqrt{5}$ term
	$4\left(\sqrt{5}\right)^2 = 4 \times 5 \quad (= 20)$	B1		
	Answer $= 17 + 11\sqrt{5}$	A1	3	
(b)	Either $\sqrt{75} = \sqrt{25}\sqrt{3}$ or $\sqrt{27} = \sqrt{9}\sqrt{3}$	M1		Or multiplying top and bottom by $\sqrt{3}$
	Expression $= \dfrac{5\sqrt{3} - 3\sqrt{3}}{\sqrt{3}}$	A1		or $\dfrac{\sqrt{225} - \sqrt{81}}{3}$ or $\sqrt{25} - \sqrt{9}$ or 5–3
	$= 2$	A1	3	CSO
	Total		**6**	
5(a)(i)	$\dfrac{dy}{dx} = 3x^2 - 20x + 28$	M1 A1 A1	3	One term correct Another term correct All correct (no + *c* etc)
(ii)	Their $\dfrac{dy}{dx} = 0$ for stationary point	M1		Or realising condition for stationary pt
	$(x-2)(3x-14) = 0$	m1		Attempt to solve using formula/ factorise
	$\Rightarrow x = 2$	A1		Award M1, A1 for verification that
	or $x = \dfrac{14}{3}$	A1	4	$x = 2 \Rightarrow \dfrac{dy}{dx} = 0$ then may earn m1 later
(b)(i)	$\dfrac{x^4}{4} - \dfrac{10x^3}{3} + 14x^2 \quad (+c)$	M1 A1 A1	3	One term correct unsimplified Another term correct unsimplified All correct unsimplified (condone missing + *c*)
(ii)	$\left[\dfrac{81}{4} - 90 + 126\right] \qquad (-0)$	M1		Attempt to sub limit 3 into their (b)(i)
	$= 56\dfrac{1}{4}$	A1	2	AG Integration, limit sub'n all correct
(iii)	Area of triangle $= 31\dfrac{1}{2}$	B1		Correct unsimplified $\dfrac{1}{2} \times 21 \times 3$
	Shaded Area $= 56\dfrac{1}{4} -$ *triangle area*	M1		
	$= 24\dfrac{3}{4}$	A1	3	Or equivalent such as $\dfrac{99}{4}$
	Total		**15**	

MPC1 (cont)

Q	Solution	Marks	Total	Comments
6(a)	p(3) = 27 – 36 + 9	M1		Finding p(3) and **not** long division
	p(3) = 0 $\Rightarrow$ $x-3$ is a factor	A1	2	Shown = 0 **plus a statement**
(b)	$x(x^2-4x+3)$ or $(x-3)(x^2-x)$ attempt	M1		Or p(1) = 0 $\Rightarrow$ $x-1$ is a factor attempt
	$p(x)=x(x-1)(x-3)$	A1	2	Condone $x+0$ or $x-0$ as factor
(c)(i)	$p(2)=8-16+6$	M1		Must use p(2) and **not** long division
	(Remainder is) -2	A1	2	
(ii)	Attempt to multiply out and compare	M1		Or long division (2 terms of quotient)
	coefficients $a=-2$	A1		$x^2-2x...$
	$b=-1$	A1		-1
	$r=-2$	A1	4	Withhold final A1 for long division unless written as $(x-2)(x^2-2x-1)-2$
	SC B1 for r = –2 if M0 scored			
	Total		**10**	
7(a)(i)	$(x-2)^2$	M1		Attempt to complete square for x
	centre has x-coordinate = 2	A1		M1 implied if value correct or –2
	and y-coordinate = 0	B1	3	Centre (2,0)
(ii)	RHS = 18	B1		Withhold if circle equation RHS incorrect
	Radius = $\sqrt{18}$	M1		Square root of RHS of equation (if > 0)
	Radius = $3\sqrt{2}$	A1	3	
(b)	Perpendicular bisects chord so need to use			
	Length of 4	B1		
	d^2 = (radius)$^2 - 4^2$	M1		
	$d^2 = 18 - 16$			
	so perpendicular distance = $\sqrt{2}$	A1	3	
(c)(i)	$x^2+(2k-x)^2-4x-14=0$	M1		
	$(2k-x)^2=4k^2-4kx+x^2$	B1		
	$\Rightarrow 2x^2+4k^2-4kx-4x-14=0$			
	$(\Rightarrow x^2+2k^2-2kx-2x-7=0)$			
	$\Rightarrow x^2-2(k+1)x+2k^2-7=0$	A1	3	AG (be convinced about algebra and = 0)
(ii)	$4(k+1)^2-4(2k^2-7)$	M1		"b^2-4ac" in terms of k (either term correct)
	$4k^2-8k-32=0$ or $k^2-2k-8=0$	A1		$b^2-4ac=0$ correct quadratic equation in k
	$(k-4)(k+2)=0$	m1		Attempt to factorise, solve equation
	$k=-2$, $k=4$	A1	4	SC B1, B1 for –2 , 4 (if M0 scored)
(iii)	Line is a tangent to the circle	E1	1	Line touches circle at one point etc
	Total		**17**	
	TOTAL		**75**	