

## **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

М	mark is for method			
m or dM	mark is dependent on one or more M marks and is for method			
А	mark is dependent on M or m marks and is for accuracy			
В	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	$\mathbf{F}\mathbf{W}$	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 <i>x</i> 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.

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Q	Solution	Marks	Total	Comments
1(a)(i)	Gradient $AB = \frac{1-7}{5-1}$	M1		Must be <i>y</i> 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 x = 6	M1 A1		Solving $x - 4y = 8$ ; $3x + 2y = 17$
	$y = -\frac{1}{2}$	A1	3	C is point $(6, -\frac{1}{2})$
(c)	Grad of perp = $-1 / their$ gradient <i>AB</i>	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	
<b>2(a)</b>	$(x+4)^2$	B1		p = 4
	+3	B1	2	<i>q</i> = 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)	$\begin{array}{c} v \\ 19 \end{array}$ Minimum (-4, 3)	B1√		ft their $-p$ and $q$ (or correct)
	graph	B1		Parabola (vertex roughly as shown)
	$\xrightarrow{-4}^{x}$	B1	3	Crossing at $y = 19$ marked or (0, 19) stated
(d)	Translation (and no additional transf'n)	E1		Not shift, move, transformation, etc
	three $\left[-4\right]$	M1		One component correct eg 3 units up
		A1	3	All correct – if not vector – must say 4
	Total		10	units in negative x- direction, to left etc
<b>3(a)</b>	dy 10-4	М1		$kr^4$ condone extra term
	$\frac{1}{\mathrm{d}x} = -10x^{-1}$	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 ( <b>not</b> 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 $x = -2$
	$\left(\frac{\mathrm{d}y}{\mathrm{d}x} < 0 \text{ hence}\right) y \text{ is decreasing}$	E1√	2	ft Increasing if their $\frac{dy}{dx} > 0$
	Total		7	

QSolutionMarksTotalComments4(a) $4(\sqrt{5})^2 + 12\sqrt{5} - \sqrt{5} - 3$ M1At least 3 terms with $\sqrt{5}$ term $4(\sqrt{5})^2 = 4 \times 5$ $(=20)$ B1At least 3 terms with $\sqrt{5}$ termAnswer $=17 + 11\sqrt{5}$ A13(b)Either $\sqrt{75} = \sqrt{25}\sqrt{3}$ or $\sqrt{27} = \sqrt{9}\sqrt{3}$ M1Or multiplying top and bottom by $\sqrt{3}$ $= 2$ A13CSO $= 2$ A13CSO $= 2$ A13Or callsing condition for stationary ptA1A1A1A1 $= 2$ A13 $= 2$ A1 $= 2$ $= 3$ A1 $= 3$ $= 3$ A1 $= 4$ $= 3$ $= 2$ A1 $= 4$ A1 $= 2$ $= 3$ A1 $= 4$ $= 4$ $= 1$ A1 $= 3$ $= 2$ $= 3$ A1 $= 4$ $= 4$ $= 1$ $= 1$ $= 3$ $= 2$ $= 1$ $= 3$ $= 2$ $= 1$	MPC1 (cont	)			
4(a) $4(\sqrt{5})^2 + 12\sqrt{5} - \sqrt{5} - 3$ M1Multiplied out At least 3 terms with $\sqrt{5}$ term $4(\sqrt{5})^2 = 4 \times 5  (= 20)$ B1A13Answer $= 17 + 11\sqrt{5}$ A13Or multiplying top and bottom by $\sqrt{3}$ Expression $= \frac{5\sqrt{3} - 3\sqrt{3}}{\sqrt{3}}$ A1or $\frac{\sqrt{2225} - \sqrt{81}}{3}$ or $\sqrt{25} - \sqrt{9}$ or $5-3$ $= 2$ A13CSOTotal6On term correct Another term correct Another term correct Another term correct Another term correct All correct (no + c etc)(ii)Their $\frac{dy}{dx} = 0$ for stationary point $(x-2)(3x-14) = 0$ M1 A1 $\Rightarrow x = 2$ A1A1 $\Rightarrow x = 2$ A1 $\Rightarrow x = 2$ A1<	Q	Solution	Marks	Total	Comments
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	4(a)				Multiplied out
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		$4(\sqrt{5})^{2} + 12\sqrt{5} - \sqrt{5} - 3$	M1		At least 3 terms with $\sqrt{5}$ term
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		$4\left(\sqrt{5}\right)^2 = 4 \times 5  (=20)$	B1		
(b) Either $\sqrt{75} = \sqrt{25}\sqrt{3}$ or $\sqrt{27} = \sqrt{9}\sqrt{3}$ M1 Expression = $\frac{5\sqrt{3}-3\sqrt{3}}{\sqrt{3}}$ A1 = 2 A2 = 2 A1 = 2 A1		Answer = $17 + 11\sqrt{5}$	A1	3	
Expression = $\frac{5\sqrt{3}-3\sqrt{3}}{\sqrt{3}}$ A1or $\frac{\sqrt{225}-\sqrt{81}}{3}$ or $\sqrt{25}-\sqrt{9}$ or5-3= 2A13CSOTotal65(a)(i) $\frac{dy}{dx} = 3x^2 - 20x + 28$ M1A1A1A1A1A13All correct (no + c etc)(ii)Their $\frac{dy}{dx} = 0$ for stationary pointM1Or realising condition for stationary pt $x = 2$ A13All correct (no + c etc)(iii)Their $\frac{dy}{dx} = 0$ for stationary pointM1Or realising condition for stationary pt $x = 2$ A1A1A1 $x = 2$ A1A1 $x = 2$ A1A1 $x = \frac{14}{3}$ A14 $x = 2 \Rightarrow \frac{dy}{dx} = 0$ then may earn m1 later(b)(i) $\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2$ (+c)M1One term correct unsimplified A1 correct unsimplified A1 correct unsimplified A1 correct unsimplified A1 correct unsimplified A1 correct unsimplified (condone missing + c)(ii) $\left[\frac{81}{4} - 90 + 126\right]$ $= 56\frac{1}{4}$ M1A12AGIntegration, limit sub'n all correct(iii)Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}B1Correct unsimplified\frac{1}{2} \times 21 \times 3Shaded Area = 54\frac{1}{4} - triangle area= 24\frac{3}{4}A13Or equivalent such as \frac{99}{4}$	(b)	Either $\sqrt{75} = \sqrt{25}\sqrt{3}$ or $\sqrt{27} = \sqrt{9}\sqrt{3}$	M1		Or multiplying top and bottom by $\sqrt{3}$
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		Expression = $\frac{5\sqrt{3} - 3\sqrt{3}}{\sqrt{3}}$	A1		or $\frac{\sqrt{225} - \sqrt{81}}{3}$ or $\sqrt{25} - \sqrt{9}$ or 5-3
Total65(a)(i) $\frac{dy}{dx} = 3x^2 - 20x + 28$ M1 A1 A1One term correct Another term correct All correct (no + c etc)(ii)Their $\frac{dy}{dx} = 0$ for stationary point $(x-2)(3x-14) = 0$ $\Rightarrow x = 2$ or $x = \frac{14}{3}$ M1 m1 A1Or realising condition for stationary pt Attempt to solve using formula/ factorise Award M1, A1 for verification that $x = 2 \Rightarrow \frac{dy}{dx} = 0$ then may earn m1 later(b)(i) $\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2$ (+c)M1 A1 A1One term correct unsimplified Another term correct unsimplified Another term correct unsimplified All correct unsimplified (condone missing + c)(iii) $\left[\frac{81}{4} - 90 + 126\right]$ $= 56\frac{1}{4}$ M1 A1A12(iii)Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}$ B1 A13Or equivalent such as $\frac{99}{4}$		= 2	A1	3	CSO
5(a)(i) $\frac{dy}{dx} = 3x^2 - 20x + 28$ M1 A1 A1One term correct Another term correct All correct (no + c etc)(ii)Their $\frac{dy}{dx} = 0$ for stationary point $(x - 2)(3x - 14) = 0$ $\Rightarrow x = 2$ or $x = \frac{14}{3}$ M1 m1 A1One term correct Another term correct All correct (no + c etc)(b)(i) $\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2$ (+c)M1 A1 A1One term correct All correct using formula/ factorise Award M1, A1 for verification that $x = 2 \Rightarrow \frac{dy}{dx} = 0$ then may earn m1 later(ii) $\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2$ (+c)M1 A1 A1One term correct unsimplified Another term correct unsimplified All correct unsimplified (condone missing + c)(iii) $\left[\frac{81}{4} - 90 + 126\right]$ $= 56\frac{1}{4}$ M1 A1A1 A12(iii)Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}$ B1 A13Or equivalent such as $\frac{99}{4}$		Total		6	
(ii) $\frac{dx}{dx} = 3x^{2} - 20x + 28$ (ii) $\frac{dx}{dx} = 0 \text{ for stationary point} \\ (x-2)(3x-14) = 0 \\ \Rightarrow x = 2 \\ \text{or } x = \frac{14}{3}$ (b)(i) $\frac{x^{4}}{4} - \frac{10x^{3}}{3} + 14x^{2}  (+c)$ (ii) $\left[\frac{81}{4} - 90 + 126\right]  (-0) \\ = 56\frac{1}{4}$ (iii) $\frac{81}{4} - 90 + 126 = 31\frac{1}{2}$ (iii) $\frac{81}{4} - 90 + 126 = 31\frac{1}{2}$ (iii) $\frac{81}{4} - 90 + 126 = 31\frac{1}{2}$ (iv) $$	5(a)(i)	dy $dy$ $dy$ $dy$ $dy$	M1		One term correct
(ii)A1A1A1A1Correct (no + c etc)(iii)Their $\frac{dy}{dx} = 0$ for stationary point $(x-2)(3x-14) = 0$ $\Rightarrow x = 2$ M1 M1 A1Or realising condition for stationary pt Attempt to solve using formula/ factorise Award M1, A1 for verification that $x = 2 \Rightarrow \frac{dy}{dx} = 0$ then may earn m1 later(b)(i) $\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2$ (+c)M1 A1 A1A1One term correct unsimplified Another term correct unsimplified (condone missing + c)(iii) $\left[\frac{81}{4} - 90 + 126\right]$ $= 56\frac{1}{4}$ (-0) $= 56\frac{1}{4}$ M1 A1A12(iii)Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}B1A1Correct unsimplifiedA1Correct unsimplified\frac{1}{2} \times 21 \times 3$		$\frac{dy}{dx} = 3x^2 - 20x + 28$	A1		Another term correct
(ii) Their $\frac{dy}{dx} = 0$ for stationary point (x-2)(3x-14) = 0 $\Rightarrow x = 2$ or $x = \frac{14}{3}$ (b)(i) $\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2$ (+c) (ii) $\left[\frac{81}{4} - 90 + 126\right]$ (-0) $= 56\frac{1}{4}$ (iii) Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}$ (iii) M1 A1 M1 M1 A1 M1 M1 A1 M1 M1 A1 M1 M1 M1 M1 M1 M1 M1 M1 M1 M		dλ	A1	3	All correct (no $+ c$ etc)
(ii) Their $\frac{dy}{dx} = 0$ for stationary point (x-2)(3x-14) = 0 $\Rightarrow x = 2$ or $x = \frac{14}{3}$ (b)(i) $\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2$ (+c) (ii) $\left[\frac{81}{4} - 90 + 126\right]$ (-0) $= 56\frac{1}{4}$ (iii) Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}$ (iv) Their $\frac{dy}{dx} = 0$ for stationary pt M1 A1 A1 A1 A1 A1 A1 A1 A1 A1 A					
Their $\frac{y}{dx} = 0$ for stationary point (x - 2)(3x - 14) = 0 $\Rightarrow x = 2$ or $x = \frac{14}{3}$ (b)(i) $\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2$ (+c) (ii) $\left[\frac{81}{4} - 90 + 126\right]$ (-0) $= 56\frac{1}{4}$ (iii) $Area of triangle = 31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}$ (iv) Their $\frac{y}{dx} = 0$ for stationary point M1 M1 M1 M1 M1 M1 M1 M1 M1 M1	(ii)	dy			
$(\mathbf{i}, \mathbf{i}, \mathbf{j}, j$	(11)	Their $\frac{dy}{dx} = 0$ for stationary point	M1		Or realising condition for stationary pt
$(b)(i) \Rightarrow x = 2$ $(b)(i) \Rightarrow x = 2$ $(c) = x = \frac{14}{3}$ $(b)(i) = \frac{x^4}{4} - \frac{10x^3}{3} + 14x^2  (+c)$ $(i) = \frac{x^4}{4} - \frac{10x^3}{4} + \frac{10x^3}{4} +$		(x-2)(3x-14) = 0	m1		Attempt to solve using formula/ factorise
(b)(i) $\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2$ (+c) (ii) $\left[\frac{81}{4} - 90 + 126\right]$ (-0) $= 56\frac{1}{4}$ (iii) $Area of triangle = 31\frac{1}{2}$ $Shaded Area = 56\frac{1}{4} - triangle area}$ $= 24\frac{3}{4}$ (iv) $\frac{14}{3}$ $\frac{14}{3}$ A1 A2 A1 A1 A2 A2 A1 A3 A1 A		$\Rightarrow r = 2$	A1		Award M1 A1 for verification that
(b)(i) $rac{x^{4}}{4} - \frac{10x^{3}}{3} + 14x^{2}$ (+c) (ii) $\left[\frac{81}{4} - 90 + 126\right]$ (-0) $rac{(iii)}{(iii)}$ $Area of triangle = 31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $rac{2}{3}\frac{9y}{dx} = 0$ then may earn m1 later M1 A1 A1 A1 A1 A1 A1 A1 A1 A1 A		$\rightarrow x^{2}$			dv
(b)(i) $\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2$ (+c) (ii) $\left[\frac{81}{4} - 90 + 126\right]$ (-0) $= 56\frac{1}{4}$ (iii) Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}$ M1 A1 A1 A1 A1 A1 A1 A1 A1 A1 A		or $x = \frac{1}{3}$	Al	4	$x = 2 \Rightarrow \frac{dy}{dx} = 0$ then may earn m1 later
(i) $\begin{bmatrix} \frac{x^4}{4} - \frac{10x^3}{3} + 14x^2 + c \end{bmatrix}$ (i) $\begin{bmatrix} \frac{81}{4} - 90 + 126 \end{bmatrix}$ (-0) $= 56\frac{1}{4}$ (ii) Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}$ M1 A1 A1 A1 A1 A1 A1 A1 A1 A1 A			N ( 1		
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	(b)(1)	$\frac{x^4}{10x^3} - \frac{10x^3}{14x^2} + 14x^2$ (+c)			One term correct unsimplified
(ii) $\begin{bmatrix} \frac{81}{4} - 90 + 126 \end{bmatrix}$ (-0) $= 56\frac{1}{4}$ (iii) Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}$ (All Correct unsimplified (condone missing + c)) M1 A1 2 AG Integration, limit sub'n all correct Correct unsimplified $\frac{1}{2} \times 21 \times 3$ Or equivalent such as $\frac{99}{4}$		4 3		2	Another term correct unsimplified
(ii) $\begin{bmatrix} \frac{81}{4} - 90 + 126 \end{bmatrix}$ (-0) $= 56\frac{1}{4}$ (iii) Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}$ (iii) (iii) Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}$ (iii) (iii) Area of triangle area $= 24\frac{3}{4}$ (iv) (iv) And (iv) (iv) (iv) (iv) (iv) (iv) (iv) (iv)			AI	3	(appdong missing   a)
(ii) $\begin{bmatrix} \frac{81}{4} - 90 + 126 \end{bmatrix}$ (-0) M1 Attempt to sub limit 3 into their (b)(i) $= 56\frac{1}{4}$ A1 2 AG Integration, limit sub'n all correct (iii) Area of triangle = $31\frac{1}{2}$ B1 Correct unsimplified $\frac{1}{2} \times 21 \times 3$ Shaded Area = $56\frac{1}{4} - triangle area$ M1 a Or equivalent such as $\frac{99}{4}$					(condone missing $+ c$ )
(iii) $\begin{vmatrix} \frac{31}{4} - 90 + 126 \end{vmatrix}$ (-0) $= 56\frac{1}{4}$ (iii) Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ $= 24\frac{3}{4}$ (iii) M1 A1 B1 M1 A1 B1 M1 A1 B1 M1 A1 B1 M1 A1 B1 M1 A1 B1 M1 A1 B1 M1 A1 B1 M1 A1 B1 M1 A1 B1 M1 A1 B1 M1 A1 B1 B1 A1 B1 B1 A1 B1 B1 A1 B1 B1 A1 B1 B1 A1 B1 B1 B1 B1 B1 B1 B1 B1 B1 B	(ii)	Г <u>о</u> 1 Л			
(iii) $\begin{bmatrix} 4 \\ & = 56\frac{1}{4} \end{bmatrix}$ Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4} - triangle area$ = $24\frac{3}{4}$ And Area = $124\frac{3}{4}$ And Area = $124\frac{3}{4}$ Area = $124\frac{3}{4}$	(11)	$\left  \frac{61}{4} - 90 + 126 \right $ (-0)	M1		Attempt to sub limit 3 into their (b)(i)
(iii) $ \begin{array}{ c c c c c } = 56\frac{1}{4} & A1 & 2 & AG & Integration, limit sub'n all correct \\ \hline (iii) & Area of triangle = 31\frac{1}{2} & B1 & Correct unsimplified \frac{1}{2} \times 21 \times 3 \\ \hline Shaded & Area = 56\frac{1}{4} - triangle area & M1 & \\ & = 24\frac{3}{4} & A1 & 3 & Or equivalent such as \frac{99}{4} \\ \hline \end{array} $					
(iii) Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4}$ - triangle area = $24\frac{3}{4}$ A1 3 Or equivalent such as $\frac{99}{4}$		$= 56\frac{1}{4}$	A1	2	AG Integration, limit sub'n all correct
(iii) Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4}$ - triangle area = $24\frac{3}{4}$ B1 M1 A1 3 Or equivalent such as $\frac{99}{4}$		<b>T</b>			
Area of triangle = $31\frac{1}{2}$ Shaded Area = $56\frac{1}{4}$ - triangle area = $24\frac{3}{4}$ B1 A1 B1 M1 A1 B1 Or equivalent such as $\frac{99}{4}$	(iii)				1
Shaded Area = $56\frac{1}{4}$ - triangle area = $24\frac{3}{4}$ A1 3 Or equivalent such as $\frac{99}{4}$	()	Area of triangle = $31\frac{1}{2}$	B1		Correct unsimplified $\frac{1}{2} \times 21 \times 3$
$= 24\frac{3}{4}$ A1 3 Or equivalent such as $\frac{99}{4}$		Shaded Area = $56\frac{1}{4}$ - triangle area	M1		
$= 24\frac{-}{4}$ Al 3 Or equivalent such as $-\frac{-}{4}$		- 243		-	99
		$= 24 - \frac{1}{4}$	Al	3	Or equivalent such as $\frac{-}{4}$
l lotal 15		Total		15	

MPC1 (cont				
Q	Solution	Marks	Total	Comments
6(a)	p(3) = 27 - 36 + 9	M1		Finding p(3) and <b>not</b> long division
	$p(3) = 0 \implies x - 3$ 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 $p(1) = 0 \implies x - 1$ 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 <b>not</b> long division
	(Remainder is) $-2$	A1	2	
(ii)	Attempt to multiply out and compare	M1		Or long division (2 terms of quotient)
		A 1		
	coefficients $a = -2$	AI		$x^2 - 2x$
	b = -1	AI	4	
	r = -2	AI	4	withhold final A1 for long division unless written as $(r - 2)(r^2 - 2r - 1) - 2$
	SC B1 for $1 = -2$ if who scored		10	withen as $(x-2)(x-2x-1)-2$
7(a)(i)	1  otal	M1	10	Attempt to complete square for a
/(a)(l)	(x-2)			Attempt to complete square for x
	and v-coordinate = $0$	AI B1	3	Centre $(2,0)$
		DI	5	
(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			4
	Length of 4	BI		d
	$d^2 = (radius)^2 - 4^2$	M1		
	$a^{-} = 18 - 16$	A 1	2	√√18
	so perpendicular distance – $\sqrt{2}$	AI	3	
	2 (2) 2 4 14 0	N (1		
(c)(1)	$x^{2} + (2k - x)^{2} - 4x - 14 = 0$	MI D1		
	(2k-x) = 4k - 4kx + x $\Rightarrow 2x^2 + 4k^2 - 4kx + x = 14 - 0$	BI		
	$\Rightarrow 2x + 4k - 4kx - 4x - 14 = 0$ (\Rightarrow r^2 + 2k^2 - 2kx - 2r - 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)
	$4k^2 - 8k - 32 = 0 \text{ or } k^2 - 2k - 8 = 0$	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	