CAMBRIDGE
International Education

Cambridge International AS & A Level

MATHEMATICS **9709/12**

Paper 1 Pure Mathematics 1 **May/June 2026**

MARK SCHEME

Maximum Mark: 75

Published

This mark scheme contains the instructions and marking guidance that our examiners used to mark candidate responses for this component.

Before they start marking, examiners complete a standardisation process. They review a range of candidate responses and discuss the mark scheme in detail to agree which answers can and cannot be accepted. Examiners award marks where it is clear that candidate responses have met the requirements of the mark scheme. These requirements may vary between different components or different versions of the same component, depending on the exact requirements of the question and the candidate responses seen during the standardisation process.

Sometimes, our mark schemes may allow marks to be awarded to responses which contain elements that are factually incorrect or for content not covered by the syllabus. We do this in response to the demands of a specific question to support candidates and make sure that our assessments are fair. However, these allowances should not be used as a guide for teaching and learning.

We cannot discuss the mark scheme with schools, and we recommend that schools read the mark scheme together with the assessment material and the Principal Examiner Report for Teachers.

This document consists of **23** printed pages.

[Turn over

General marking principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: • the specific **content** defined in the mark scheme • the specific **skills** defined in the mark scheme or in the level descriptions • the **standard of response** required as exemplified by the standardisation scripts.
2	Examiners must award **whole marks** (not half marks, or other fractions).
3	Examiners must award marks **positively**. This means that: • marks are not deducted for errors or omissions • marks are awarded for correct/valid answers as defined in the mark scheme and also for **other valid answers** which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate • the quality of spelling, punctuation and grammar are judged **only** when the mark scheme indicates that these features are **specifically assessed** in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must **consistently** apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the **full range of marks** defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and **must not** award marks with grade thresholds or grade descriptions in mind.

Mathematics-Specific Marking Principles

1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.

2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.

3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.

4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).

5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	More information required
	Accuracy mark awarded zero
	Accuracy mark awarded one
	Independent accuracy mark awarded zero
	Independent accuracy mark awarded one
	Independent accuracy mark awarded two
	Benefit of the doubt
	Blank Page
	Incorrect
Dep	Used to indicate DM0 or DM1

Annotation	Meaning
DM1	Dependent on the previous M1 mark(s)
FT	Follow through
~~	Indicate working that is right or wrong
Highlighter	Highlight a key point in the working
ISW	Ignore subsequent work
J	Judgement
JU	Judgement
M0	Method mark awarded zero
M1	Method mark awarded one
M2	Method mark awarded two
MR	Misread
O	Omission or Other solution
Off-page comment	Allows comments to be entered at the bottom of the RM marking window and then displayed when the associated question item is navigated to.
On-page comment	Allows comments to be entered in speech bubbles on the candidate response.
PE	Judgment made by the PE
Pre	Premature approximation
SC	Special case
SEEN	Indicates that work/page has been seen

Annotation	Meaning
SF	Error in number of significant figures
✓	Correct
TE	Transcription error
XP	Correct answer from incorrect working

PUBLISHED

Mark Scheme Notes

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method mark, awarded for a valid method applied to the problem. Method marks are not lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, e.g. by substituting the relevant quantities into the formula. Correct application of a formula without the formula being quoted obviously earns the M mark and in some cases an M mark can be implied from a correct answer.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated method mark is earned (or implied).

B Mark for a correct result or statement independent of method marks.

DM or **DB** When a part of a question has two or more 'method' steps, the M marks are generally independent unless the scheme specifically says otherwise; and similarly, when there are several B marks allocated. The notation DM or DB is used to indicate that a particular M or B mark is dependent on an earlier M or B (asterisked) mark in the scheme. When two or more steps are run together by the candidate, the earlier marks are implied and full credit is given.

FT Implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A or B marks are given for correct work only.

- A or B marks are given for correct work only (not for results obtained from incorrect working) unless follow through is allowed (see abbreviation FT above).
- For a numerical answer, allow the A or B mark if the answer is correct to 3 significant figures or would be correct to 3 significant figures if rounded (1 decimal place for angles in degrees).
- The total number of marks available for each question is shown at the bottom of the Marks column.
- Wrong or missing units in an answer should not result in loss of marks unless the guidance indicates otherwise.
- Square brackets [ ] around text or numbers show extra information not needed for the mark to be awarded.

Abbreviations

AEF/OE	Any Equivalent Form (of answer is equally acceptable) / Or Equivalent
AG	Answer Given on the question paper (so extra checking is needed to ensure that the detailed working leading to the result is valid)
CAO	Correct Answer Only (emphasising that no 'follow through' from a previous error is allowed)
CWO	Correct Working Only
ISW	Ignore Subsequent Working
SOI	Seen Or Implied
SC	Special Case (detailing the mark to be given for a specific wrong solution, or a case where some standard marking practice is to be varied in the light of a particular circumstance)
WWW	Without Wrong Working
AWRT	Answer Which Rounds To

Question	Answer	Marks	Guidance
1	$3x^4 - 8x^2 - 16[=0]$ or $\left(3x + \frac{4}{x}\right)\left(x - \frac{4}{x}\right)[=0]$	**M1**	Forming a three-term quadratic in x^2 or with a substitution (which may be undefined) or factorising the original equation. Terms do not all need to be on the same side.
	$x^2 = 4$[or $-\frac{4}{3}$]	**A1**	If using a substitution, it must be defined but it can be implied by final answer of $2, -2$ or ± 2.
	$x = \pm 2$ only	**A1**	Ignore complex solutions.
		3	

Question	Answer	Marks	Guidance
2(a)	**Either:** {Translation} $\begin{pmatrix}\{1\}\\\{10\}\end{pmatrix}$ or {Translation} $\left\{\begin{pmatrix}1\\0\end{pmatrix}\right\}$ and $\left\{\begin{pmatrix}0\\10\end{pmatrix}\right\}$ or {Translation} {1 "parallel to the *x*-axis" or in "the *x*-direction" or "horizontally"} and {10 "parallel to the *y*-axis" or "in the *y*-direction" or "vertically"}	**(B2,1,0**	B2 for three correct components. B1 for two. May be seen as two separate translations. Do not condone 'factor', just 'right' or just 'up' for these marks. But, if a vector is seen, ignore any description.
	{Stretch} {factor 0.5} {"parallel to *y*-axis" or "in *y*-direction" or "vertically"}	**B2,1,0**	B2 for three correct components. B1 for two. Allow 'SF' in place of 'factor'. Allow any mention of the *y*-axis or 'the *x*-axis is invariant'.
	Correct order	**B1)**	The vertical part of the translation must be done before the stretch. Stretch and translation must be correct, except condone 'right' and 'up' for the direction and 'move' instead of 'translation' for this mark.
	Or: {Stretch} {factor 0.5} {parallel to *y*-axis}	**(B2,1,0**	B2 for three correct components. B1 for two. Allow 'SF' in place of factor. Allow any mention of the *y*-axis or 'the *x*-axis is invariant'.
	{Translation} $\begin{pmatrix}\{1\}\\\{5\}\end{pmatrix}$ or {Translation} $\left\{\begin{pmatrix}1\\0\end{pmatrix}\right\}$ and $\left\{\begin{pmatrix}0\\5\end{pmatrix}\right\}$ {Translation} {1 "parallel to the *x*-axis" or "in the *x*-direction" or "horizontally"} and {5 "parallel to the *y*-axis" or "in the *y*-direction" or "vertically"}	**B2,1,0**	B2 for three correct components. B1 for two. May be seen as two separate translations. Do not condone 'factor', just 'right' or just 'up' for these marks. But, if a vector is seen, ignore any description.
	Correct order	**B1)**	The vertical part of the translation must be done after the stretch. Stretch and translation must be correct, except condone 'right' and 'up' for the direction and 'move' instead of 'translation' for this mark.
	Available marks	**5**	

Question	Answer	Marks	Guidance
2(b)	$\left[\mathrm{g}(x)=\right]\{0.5\}\{\mathrm{f}(x-1)\}\{+5\}$ or $a=\frac{1}{2}, b=-1$ and $c=5$	**B2,1,0**	B2 for 3 correct components. B1 for 2. B1 for $\mathrm{g}(x)=\{0.5\}\{(\{\mathrm{f}(x-1)\}+k)$.
		2	

Question	Answer	Marks	Guidance
3	**Either:** Midpoint $= \left(\frac{4-2}{2}, \frac{6+3}{2}\right)$	**(M1***	For attempt to find midpoint. Condone one sign error. Expect $\left(1, \frac{9}{2}\right)$.
	Gradient $= \frac{6-3}{-2-4}$	**M1***	For attempt to find gradient. Condone one sign error. Expect $-\frac{1}{2}$.
	$\frac{-1}{\textit{their}\text{ gradient}}$	**M1***	For finding the negative reciprocal of *their* gradient.
	$\frac{y-4.5}{x-1}=2$ or $y=2x+\frac{5}{2}$	**A1**	OE
	$y=2\left(4y+4\right)+\frac{5}{2}$ or $\frac{1}{4}x-1=2x+2.5$	**DM1**	OE For forming an equation in one variable. Condone sign errors in their rearrangements.
	$\left(-2,-\frac{3}{2}\right)$	**A1)**	Allow $x=-2, y=-\frac{3}{2}$ OE.
	Or: $(x-4)^2+(y-3)^2$ or $(x+2)^2+(y-6)^2$	**(M1***	Distance from $\left(x,\ y\right)$ to one of given points.
	$(x-4)^2+(y-3)^2=(x+2)^2+(y-6)^2$	**M1***	Distance from the other point and equating.
	Expanding and cancelling the squared terms	**M1***	
	$-12x-15+6y=0$	**A1**	OE
	$6y=12\left(4y+4\right)+15$ or $\frac{1}{4}x-1=2x+2.5$	**DM1**	For forming an equation in one variable. Condone sign errors in their rearrangements.
	$\left(-2,-\frac{3}{2}\right)$	**A1)**	Allow $x=-2, y=-\frac{3}{2}$ OE
	Available marks	**6**	

Question	Answer	Marks	Guidance
4(a)(i)	$81-54x+\frac{27}{2}x^2$	**B1B1**	B1 for the second or third terms correct and simplified. B1 for all correct and simplified. Allow $\frac{108}{8}x^2$ or other equivalent fractions or decimals. Terms may be listed. Ignore extra terms. Condone $81x^0-54x^1+\frac{27}{2}x^2$.
		2	
4(a)(ii)	$8+12ax+6a^2x^2$	**B1**	Terms may be listed. Ignore extra terms. Condone $8a^0x^0+12a^1x^1+6a^2x^2$.
		1	
4(b)	$81\times6a^2$, $-54\times12a$, $\frac{27}{2}\times8$	**M1***	Selecting the appropriate three products from *their* expansions. If explicit products are not shown, then must be correct for *their* values (but condoning one sign error). Allow x^2 to be included at this stage.
	$81\times6a^2-54\times12a+\frac{27}{2}\times8=-108$	**DM1**	For adding and equating *their* three terms to -108. Allow x^2 to be included, provided it is consistent or recovered later.
	$486a^2-648a+216=0$ or $9a^2-12a+4=0$	**A1**	OE Terms may not all be on the same side.
	$a=\frac{2}{3}$ only	**A1**	OE
		4	

Question	Answer	Marks	Guidance
5	$\frac{6}{3}x^3 + px\,[+q]$	**B1**	
	$2\times(2)^3 + 2p + q = 0$ and $2\times(-2)^3 - 2p + q = 0$	**M1***	For substituting $x = 2$ and -2 into an integrated expression comprising a term in x^3, the term px and a constant of integration and setting both equal to zero. This may be implied by equating them and setting at least one equal to zero (which may be seen later). All subsequent marks are dependent on this mark.
	$p = -8$ [and $q = 0$]	**A1**	OE
	$x = 0$	**A1**	Only available if previous B1M1A1 scored.
	$[y =](their\ '2')\frac{1}{4}x^4 + (their\ numerical\ 'p')\frac{1}{2}x^2 + (their\ numerical\ 'q')x\ [+r]$	**DM1**	Integrating *their* cubic expression to reach an expression of the given form. Do not allow if both p and q are 0.
	$3 = (their\ '2')\times\frac{1}{4}(2^4) + (their\ 'p')\times\frac{1}{2}(2^2) + (their\ 'q')\times 2 + r$	**DM1**	For substituting $(2,\ 3)$ or $(-2,\ 3)$ into *their* twice integrated expression of the given form. Allow one slip, but r must be present.
	(0, 11)	**A1**	Allow $x = 0, y = 11$.
		7	

Question	Answer	Marks	Guidance
6	$\sin^2 x + \frac{3}{2}\sin x = \cos\frac{2}{3}\pi$	**B1**	Or better, e.g. $2\sin^2 x + 3\sin x + 1 = 0$. Condone poor notation.
	$\sin x = -\frac{1}{2}$ and $\sin x = -1$	**B1***	WWW Must not have come from the incorrect quadratic.
	$x = \frac{7}{6}\pi, \frac{3}{2}\pi, \frac{11}{6}\pi$	**DB1DB1**	OE WWW Must not have come from the incorrect quadratic. DB1 for any one, DB1 for all three and no others in the range $\{0, 2\pi\}$. Allow 3.67,4.71 and 5.76 or 1.17π, 1.5π and 1.83π AWRT. **SC** DB1 for $210°, 270°$ and $330°$ only. Correct final answers alone do not imply full marks.
		4	

Question	Answer	Marks	Guidance
7(a)	$d=-4$	**B1**	May be implied by later work.
	$their\ a+(n-1)\times(their\ d)=-28 \Rightarrow n=...$	**M1***	Finding n using the correct n^{th} term formula with *their a* (but not 60, 52 and –28) and *their* non-zero integer d (which may be positive). May be implied by $n=24$. If *their* equation would not lead to a positive integer value, then only this M1 is available.
	$their\ \frac{24}{2}(2\times 64+23\times(-4))$ or $their\ \frac{24}{2}(64-28)$	**DM1**	Use of a correct sum formula for *their* values with n a positive integer.
	432	**A1**	
		4	
7(b)(i)	**Either:** $\frac{k+4}{9}=\frac{k^2}{k+4}$ or $(k+4)^2=9k^2$ or $9\left(\frac{k+4}{9}\right)^2=k^2$ or $9\left(\frac{k^2}{k+4}\right)^2=k^2$	**(B1**	OE Forming an equation in k only. If B0 awarded, then 0/3.
	$8k^2-8k-16[=0]$ or $k+4=\pm 3k$	**B1)**	OE Terms do not all need to be on the same side. Or square rooting, but must include ±.
	Or: $9r^2=(9r-4)^2$ or $72r^2-72r+16=0$ or $2a^2-81a+729=0$	**(B1**	OE Forming an equation in r or a only.
	$r=\frac{1}{3}[$or $\frac{2}{3}]$ or $a=27[$or $\frac{27}{2}]$	**B1)**	Finding r or a.
	Then: $[k=]-1$	**B1**	Do not allow B1 if the solution $k=2$ also seen.
	Available marks	**3**	

Question	Answer	Marks	Guidance
7(b)(ii)	$r = \frac{1}{3}$ or $a = 27$	**B1**	OE Condone $r = \frac{2}{3}$ or $a = \frac{27}{2}$ OE from using $k = 2$.
	$a = 27$ or $\frac{9}{\textit{their } r}$ or $r = \frac{1}{3}$ **and** $S_\infty = \textit{their}\,\frac{27}{1-\frac{1}{3}}$	**M1**	For correctly finding a using *their* r (or vice versa) and using the sum to infinity formula for *their* values provided $\lvert r\rvert < 1$.
	$S_\infty = \frac{81}{2}$ or 40.5 only	**A1**	OE Condone 'correct' answer $\frac{81}{2}$ from using $k = 2$ instead of $k = -1$.
		3	

Question	Answer	Marks	Guidance
8(a)	$(3, 6)$	**B1**	Can be implied by correct final answer.
	$r = \sqrt{29}$ or $\frac{\sqrt{116}}{2}$ or $r^2 = 29$	**B1**	Can be implied by correct final answer.
	Either: $(x-3)^2 + (y-6)^2 = 29$	**(M1A1)**	M1 for using *their* centre (not $(-2,4)$ or $(8,8)$) and *their* labelled radius correctly. Do not allow $\left(\sqrt{29}\right)^2$ for A1.
	Or: $x^2 + y^2 + 2gx + 2fy + f^2 + g^2 + c = 0$ and $r^2 = g^2 + f^2 - c$ $\Rightarrow x^2 - 6x + y^2 - 12y + 16 = 0$	**(M1A1)**	M1 for using *their* centre $(-g, -f)$ (not $(-2,4)$ or $(8,8)$) and *their* labelled radius correctly.
		4	

Question	Answer	Marks	Guidance
8(b)	$(x-3)^2+(x+6-6)^2=29$ or $(y-6-3)^2+(y-6)^2=29$	**M1**	Forming a quadratic equation in one variable using *their* circle equation.
	Simplifying to a three-term quadratic	**M1**	Condone sign errors only. Terms do not all need to be on the same side.
	$2x^2-6x-20[=0]$ or $2y^2-30y+88[=0]$	**A1**	OE Terms do not all need to be on the same side.
	$x=-2,\ 5$	**A1**	Condone extra answers.
	$y=4,\ 11$	**A1**	Condone extra answers.
	$(PQ)^2=(11-4)^2+(5-(-2))^2$	**M1**	For use of Pythagoras with *their* coordinates, but do not award if either both x- or both y-coordinates are equal. Condone one sign error in the brackets.
	$[PQ=]7\sqrt{2}$ or $a=7$ and $b=2$ only	**A1**	
		7	

Question	Answer	Marks	Guidance
9(a)	**Either:** $3\times\frac{(2x+1)^{\frac{1}{2}+1}}{\frac{1}{2}+1}\times\frac{1}{2}$	**(B2**	Expect $(2x+1)^{\frac{3}{2}}$. B1 for $k(2x+1)^{\frac{3}{2}}$, $k\neq 3$.
	$(2\times 4+1)^{\frac{3}{2}}-(2\times 0+1)^{\frac{3}{2}}$	**M1**	Use of limits 0 and 4 on *their* integrated expression of the form $k(2x+1)^{\frac{3}{2}}$. Allow $k=3$. $27-1$ is the minimum acceptable working if correct, otherwise full substitution must be shown. 27 – 0 is M0.
	$=26$	**A1)**	Do not ISW if working out a different area. Answer without any working scores 0/4.
		4	
	Or: $4\times 9-\int_3^9 \frac{y^2}{18}-\frac{1}{2}\Rightarrow 36-\left[\frac{y^3}{54}-\frac{y}{2}\right]_3^9$	**(B2**	
	$36-\left(\left(\frac{9^3}{54}-\frac{9}{2}\right)-\left(\frac{3^3}{54}-\frac{3}{2}\right)\right)$	**M1**	Use of the limits 3 and 9 on *their* integrated expression of the form $\frac{y^3}{p}-\frac{y}{q}$ subtracted from 36. $36-(9-(-1))$ is the minimum acceptable working if correct, otherwise full substitution must be shown.
	$=26$	**A1)**	Do not ISW if working out a different area. Answer without any working scores 0/4.
		4	

Question	Answer	Marks	Guidance
9(b)	$3\times\frac{1}{2}(2x+1)^{\frac{1}{2}-1}\times 2$	**B2***	Expect $3(2x+1)^{-\frac{1}{2}}$. B1 for $k(2x+1)^{-\frac{1}{2}}$. Must be seen or used in **(b)**.
	[Gradient at $x=4$] = 1	**DB1**	
	Normal = $\frac{y-9}{(x-4)}=-1$ or y-intercept is $9-4(\text{gradient of } \textit{their} \text{ normal})$, or stating $c=13$	**M1**	OE WWW For equation using $(4, 9)$ and the negative reciprocal of *their* gradient from $k(2x+1)^{-\frac{1}{2}}$ or finding the y-intercept. Expect $y=-x+13$. May be implied by finding that the y-intercept is at 13.
	$\frac{1}{2}\times(13-a)(13-a)$ or $\int_a^{13}13-y=\left(13\times13-\frac{13^2}{2}\right)-\left(13\times a-\frac{a^2}{2}\right)$ or $\int_0^{13-a}13-x[\mathrm{d}x]-(13-a)a=\left(13\times(13-a)-\frac{(13-a)^2}{2}\right)-0-(13-a)a$	**B1**	OE Area of triangle in terms of a. Condone $\int_a^{13}13-x=\left(13\times13-\frac{13^2}{2}\right)-\left(13\times a-\frac{a^2}{2}\right)$.
	their $\frac{1}{2}(13-a)(13-a)=$ *their* 26	**M1**	For equating a quadratic expression in a to *their* 26. Not dependent on any previous marks. Expect $a^2-26a+117=0$.
	$a=13-\sqrt{52}$ or $13-2\sqrt{13}$	**A1**	A0 if also including $13+\sqrt{52}$.
		7	

Question	Answer	Marks	Guidance
10(a)	$2^2-4p(p+4)$ or $p\left(x-\frac{1}{p}\right)^2-\frac{1}{p}+p+4$	**B1***	For b^2-4ac or by completing the square. Ignore $>, <, \geq$ or $\leq$.
	$(p+2)^2=5$ or $(2p+4)^2=20$ or $\frac{-16\pm\sqrt{16^2-4\times4\times(-4)}}{8}$ or $\frac{-4\pm\sqrt{4^2-4\times1\times(-1)}}{2}$	**M1**	For completing the square or use of the quadratic formula (or factorising) on *their* three-term quadratic in p.
	$-2\pm\sqrt{5}$ or $\frac{-16\pm\sqrt{320}}{8}$ or $\frac{-4\pm\sqrt{20}}{2}$	**DB1**	OE WWW ISW if decimals given afterwards but not an inequality. The discriminant must be a single value. This mark is available if no method is shown but if working shown there must be no errors.
		3	
10(b)(i)	$\left[g'(x)\text{ or }\frac{dy}{dx}=\right]\ 2px-2$ or $\left[g(x)\text{or }y\text{or }g=\right]p\left(x-\frac{1}{p}\right)^2+\ldots$ or $x=\frac{2}{2p}$	**B1***	Allow a or x for both marks.
	$2px-2=0\Rightarrow x=\frac{1}{p}$ or $\left(x-\frac{1}{p}\right)=0\Rightarrow x=\frac{1}{p}$ or $x=\frac{2}{2p}=\frac{1}{p}$	**DB1**	**AG** WWW Allow vertex or minimum is $\left(\frac{1}{p},\ldots\right)$ or a sketch with minimum point labelled.
		2	

Question	Answer	Marks	Guidance
10(b)(ii)	**Either:** $y = 2\left(x - \frac{1}{2}\right)^2 + \text{constant terms}$ or $2x^2 - 2x + 6 - y = 0$	**(M1***	Completing the square or intention to use quadratic formula. x and y may be interchanged at this stage. Candidates may work in terms of p.
	$\frac{y + \frac{1}{2} - 2 - 4}{2} = \left(x - \frac{1}{2}\right)^2$ or $x = \frac{2 \pm \sqrt{(-2)^2 - 4(2)(6 - y)}}{4}$	**DM1***	Solving as far as $\left(x - \frac{1}{2}\right)^2 = ...$ condoning subsequent sign errors in the rearrangement of *their* constant or using the quadratic formula (see guidance). Candidates may work in terms of p.
	$x = \frac{1}{2} \pm \sqrt{\frac{y + \frac{1}{2} - 2 - 4}{2}}$ or $x = \frac{2 \pm \sqrt{8y - 44}}{4}$	**DM1**	For an expression for $x = ...$, condoning sign errors only. Allow ± at this stage. Candidates may work in terms of p.
	$\frac{1}{2} + \sqrt{\frac{x - \frac{11}{2}}{2}}$ or $\frac{1}{2} + \sqrt{\frac{2x - 11}{2^2}}$ or $\frac{1 + \sqrt{2x - 11}}{2}$ or $\frac{2 + \sqrt{8x - 44}}{4}$	**A1)**	OE Do not allow $x = \ldots$ or $g(x) = \ldots$
	Or:		
	$y = px^2 - 2x + p + 4$ $y = p\left(x - \frac{1}{p}\right)^2 + \text{constant terms}$	**(M1***	
	$\frac{y + \frac{1}{p} - p - 4}{p} = \left(x - \frac{1}{p}\right)^2$	**DM1***	
10(b)(ii)	$x = \frac{1}{p} \pm \sqrt{\frac{y + \frac{1}{p} - p - 4}{p}}$	**DM1**	
	$\frac{1}{2} + \sqrt{\frac{x - \frac{11}{2}}{2}}$ or $\frac{1}{2} + \sqrt{\frac{2x - 11}{2^2}}$ or $\frac{1 + \sqrt{2x - 11}}{2}$ or $\frac{2 + \sqrt{8x - 44}}{4}$	**A1)**	OE Do not allow $x = \ldots$ or $g(x) = \ldots$
	Available marks	**4**	