CAMBRIDGE
International Education

Cambridge O Level

MATHEMATICS (SYLLABUS D) **4024/22**

Paper 2 **May/June 2026**

MARK SCHEME

Maximum Mark: 100

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.

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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.

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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.

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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
	Accuracy mark awarded two
	Accuracy mark awarded three
	Independent mark awarded zero
	Independent mark awarded one
	Independent mark awarded two
	Independent mark awarded three
	Benefit of the doubt
	Communication mark

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Annotation	Meaning
	Incorrect
FT	Follow through
Highlighter	Highlight a key point in the working
ISW	Ignore subsequent work
M0	Method mark awarded zero
M1	Method mark awarded one
M2	Method mark awarded two
M3	Method mark awarded three
MR	Misread
O	Omission
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.
Pre	Premature rounding/approximation
SC	Special case
SEEN	Indicates that work/page has been seen
TE	Transcription error
	Correct

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Annotation	Meaning
XP	Correct answer from incorrect working

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks	Guidance
1	38%, $\frac{2}{5}$, 0.42	**1**		Accept equivalents
2(a)	Red	**1**		
2(b)	20	**1**		
3	36	**2**	**M1** for 4 × 5 or 8 × 2	Mark answer first M1 for 4 × 5 accept e.g. 5 + 5 + 5 + 5 with no other 5's added similarly for 8 × 2 Note: allow M1 for 4 × 5 and 5 × 2 For M1 either must not be part of a larger product
4	5.42 cao	**2**	**B1** for 5.417… If 0 scored **SC1** for *their* more accurate answer seen and rounded correctly to 2dp	
5(a)	(2, –3)	**1**		

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Question	Answer	Marks	Partial Marks	Guidance
5(b)	0.5 oe final answer	**2**	**M1** for $\frac{(their - 3) - -6}{(their\ 2) - -4}$ oe seen	For 2 marks accept e.g. answer $\frac{3}{6}$ For M1 e.g. allow for answer $\frac{3}{6}x$ or [$y =$] $\frac{3}{6}x + c$ where c is c or any number
5(c)	$(-1, -4.5)$ oe	**1**		
6(a)	72	**2**	**M1** for $\frac{60}{5}$ [$\times k$], $k = 1$, 6 or 11	M1 implied by 12 or 132
6(b)	8	**2**	**B1** for 8.5 or 8.6 or 8.57…	Do not allow answer 8.0 for 2 marks
7(a)	$\begin{pmatrix} 5 \\ -1 \end{pmatrix}$	**2**	**B1** for each component or **M1** for $\begin{pmatrix} 1 \\ 5 \end{pmatrix} - \begin{pmatrix} -4 \\ 6 \end{pmatrix}$ or $\begin{pmatrix} 1 \\ 5 \end{pmatrix} + \begin{pmatrix} 4 \\ -6 \end{pmatrix}$	If fraction line in vector answer then allow B1 maximum
7(b)	$(-3, 15)$	**2**	**B1** for correct x or correct y coordinate or $\begin{pmatrix} -3 \\ 15 \end{pmatrix}$ as answer	
8(a)	Correct tree diagram with $\frac{7}{12}$ oe for A and $\frac{5}{12}$ oe for B	**2**	**M1** for a correct pair of branches with $\frac{7}{12}$ oe and $\frac{5}{12}$ oe	isw for attempts to convert or cancel Condone dotty answer line used as fraction line
8(b)	$\frac{49}{144}$ oe	**1**	**FT** *their* $\frac{7}{12} \times$ *their* $\frac{7}{12}$ correctly evaluated	isw for attempts to convert or cancel FT dep on probabilities used $0 < P < 1$ Accept e.g. 0.34[0…]

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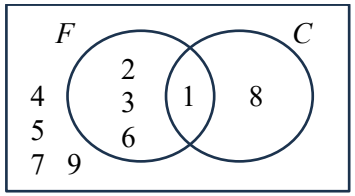
Question	Answer	Marks	Partial Marks	Guidance
9	11 11	**3**	**B2** for 1[hr] 36 [mins] or 96 [mins] or **M1** for 8 ÷ 5 oe	Accept 11 11 am, 11 11 hrs for 3 marks Not e.g. 11h 11 [mins], 11°11°, (time interval) but implies B2 Allow any other separators between hour/mins for 3 marks or B2, for B2 accept e.g. 9.35 + 1.36
10(a)		**2**	**B1** for Venn diagram with 2 or 3 correct regions or up to two values misplaced/omitted/repeated	
10(b)	4	**1**	Correct or **FT** number in *their* $(F \cup C)'$ provided not an empty set	Do not accept e.g. {4}, n(4)
11	38.08	**2**	**M1** for $56\times\left(1-\frac{32}{100}\right)$ oe or **B1** for answer 17.92	Mark at most accurate e.g. allow answer 38.1 after 38.08 in working 38.1 alone implies M1 For M1 do not allow 56 × (100 – 32)% alone Mark at most accurate for B1 e.g. award B1 for 17.92 in working leading to 17.9 on answer line
12(a)	$\frac{14}{5}$ oe final answer	**2**	**M1** for $5k = 12 + 2$ or $k-\frac{2}{5}=\frac{12}{5}$ or better	
12(b)	$-\frac{9}{2}$ oe final answer	**3**	**M1** for $10y - 5 = 12y + 4$ **M1** for isolating terms in y $10y - 12y = 4 + 5$ FT *their* first step	For 3 marks accept e.g. $\frac{9}{-2}$ M1 Dep on eqn of form $ay + b = cy + d$
13(a)	–5	**1**		

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Question	Answer	Marks	Partial Marks	Guidance
13(b)	$\frac{1}{3}$	**2**	**M1** for g(5) or $\frac{1}{(2x+3)-2}$ oe soi	Mark at most accurate Accept answer 0.333 or better e.g. $0.\dot{3}$, 0.3r, $0.\overline{3}$
14	65 nfww	**3**	**B2** for answer 1325 nfww or 1325.4 or 1325.35 to 1325.36 or shows increase for each year 21.42 and 21.78 and 22.15 or **M2** for $1260\times\left(\frac{100+1.7}{100}\right)^3-1260$ oe or **M1** for $1260\times\left(\frac{100+1.7}{100}\right)^3$ oe isw	Mark at most accurate for 3 marks or B2 For 3 marks accept 65.4 or 65.35 to 65.36 B2 for e.g. 1325.35 then 1330 on answer line (mark at most accurate) M2 or M1 could be done in stages but 'exponential' method must be clear Beware 64… or 1324… from 1260 × 0.017 × 3 [+ 1260] M1 implied by 1325 nfww or 1325.4 or 1325.35 to 1325.36 seen
15(a)	a^8 final answer	**1**		
15(b)	b^{-5} or $\frac{1}{b^5}$ final answer	**1**		
15(c)	$\frac{64x^3}{y^6}$ final answer	**2**	**B1** for answer $\frac{64x^a}{y^b}$ or $\frac{kx^3}{y^6}$ or kx^3y^{-6} oe or for correct answer seen and spoilt	For 2 marks, accept answer $64x^3y^{-6}$ (a, b, $k \neq 0$), Answer e.g. $64x^4y^2$ scores B1

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Question	Answer	Marks	Partial Marks	Guidance
16	42.5 or 42.46 to 42.47 nfww	**4**	**M1** for correct midpoints 22, 32, 49, 64 soi **M1** for use of $\sum fs$ where s is in the correct interval including boundaries **M1** (dep on 2nd M1) for $\sum fs \div 60$	Mark at most accurate After correct answer given condone $40 < s \leqslant 58$ Condone one error or omission Condone one further error or omission No more than one midpoint outside interval $22 \times 4 + 32 \times 22 + 49 \times 28 + 64 \times 6$ $88 + 704 + 1372 + 384 = 2548$ Condone 4 + 22 + 28 + 6 for 60
17(a)	– 0.12 oe	**3**	**M2** for $-\frac{3}{4}\left(2^2\right) = f(-5)^2$ OR **M1** for $f = \frac{k}{h^2}$ oe (k is algebraic) **M1** for $f = \frac{their\ k}{(-5)^2}$ oe ($k \neq 1$)	e.g. $-\frac{3}{4} = \frac{k}{2^2}$ If -5^2 allow recovery for 25 but not if $\frac{-3}{-5^2} = \frac{3}{25}$
17(b)	16	**1**		Allow final answer 4^2
18(a)	160 and angle at the centre is twice the angle at the circumference	**2**	**B1** for each	If answer space blank allow x = 160 indicated on diagram Must use the correct terms angle, centre and circumference in a correct statement and isw other comments that do not contradict Accept symbol $\angle$ or e.g. $B\hat{O}C$ for angle

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Question	Answer	Marks	Partial Marks	Guidance
18(b)	35	**2**	**B1** for $\angle ABC = 45$ soi or $\angle ACB = 55$ soi or $\angle BAO = 35$ soi	If answer space blank allow $y = 35$ indicated on diagram For B1 allow angle marked correctly on diagram
19(a)	52 to 52.5	**1**		
19(b)	47 to 48	**2**	**M1** for 60% = 24 soi	16 written may imply M1 Reading from 24 on cumulative frequency or answer 54.5 to 55 implies M1
20	18.6 nfww	**3**	**M2** for $\frac{69.5 \text{ to } 70.0}{3.75}$ or $\frac{69.75}{3.7 \text{ to } 3.8}$ or **M1** for 69.75 or 69.25 or 3.85 or 3.75 oe seen	Correct method is $\frac{69.75}{3.75}$ For M2 accept 3.8 – 0.05 for 3.75 and 69.5 + 0.25 for 69.75 For M1 accept 69.5 + 0.25 or 69.5 – 0.25 or 3.8 + 0.05 or 3.8 – 0.05 seen
21(a)	$\frac{1}{4x}$ final answer	**1**		For 1 mark accept e.g. $0.25x^{-1}$ Answer $1/4x$ only allow the mark if written correctly previously
21(b)	$\frac{2f}{f+4}$ final answer	**3**	**B1** for $2f(f-4)$ seen **B1** for $(f+4)(f-4)$ seen	Answer $2f/f+4$ allow 3 marks if written correctly previously

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Question	Answer	Marks	Partial Marks	Guidance
22(a)	18.6 to 18.7	**6**	Method 1 using AC to find AB or BC **B1** for angle $ACD = 146$ **or** angle $CAD = 16$ **M2** for $[AC =]\ \frac{8\times\sin 18}{\sin 16}$ oe or **M1** for $\frac{AC}{\sin 18}=\frac{8}{\sin 16}$ oe **M1dep** for $\frac{AB}{\sin 34}=theirAC$ oe or better or for $\frac{BC}{\cos 34}=theirAC$ oe or better **M1dep** for $\frac{1}{2}\times their\ AB\times their\ AC\times\sin 56$ oe	Mark at most accurate Check diagram for angle or may be implied in method If lengths not identified allow if implied from diagram or used in next stage correctly $AC = 8.95$ to 8.97 (implies M2) Dep on at least M1 earned $AB = 5$ to 5.02 Longer methods for AB, BC must be correct using *their AC* Accept use of Pythagoras to calculate side AB or BC $BC = 7.4$ to 7.44 If AB and BC attempted, then mark the better method M1 implied by AB or BC in range Dep on at least M1M1 If sides other than AB or AC used then must see correct implicit method for the 2 sides used oe e.g. $\frac{1}{2}\times their\ AC\times their\ BC\times\sin 34$ oe

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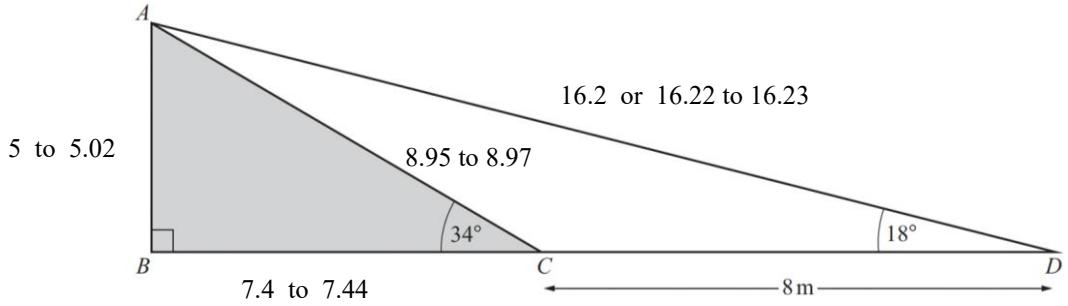
Question	Answer	Marks	Partial Marks	Guidance
22				
	Alternative method			
22(a)	18.6 to 18.7	**6**	Method 2 using *AD* to find two of *AC, BC* or *AB* **B1** for angle *ACD* = 146 **or** angle *CAD* = 16 **M1** for $\frac{AD}{\sin 146} = \frac{8}{\sin 16}$ or better	Mark at most accurate Check diagram for angles or may be implied in method If lengths not identified allow if implied from diagram or used in next stage correctly *AD* = 16.2 or 16.22 to 16.23 (implies M1)

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Question	Answer	Marks	Partial Marks	Guidance
22(a)			**M2 dep** for any **two of** *AC* explicit method, and *AB* or *BC* implicit method $AC = \frac{their\ AD \times \sin 18}{\sin 146}$ or for $AC = \sqrt{8^2 + (their\ AD)^2 - 2 \times 8 \times their\ AD \cos 18}$ or $\frac{AB}{\sin 18} = their AD$ oe or better or $\frac{BC + 8}{\cos 18} = their\ AD$ oe or better Accept *BD* for *BC* + 8 provided *BD* – 8 seen later **or M1dep** for explicit method for *AC,* or implicit method for *AB* or *BC* **M1dep** for $\frac{1}{2} \times their\ AB \times their\ BC$ oe	Dep on at least M1 If all 3 sides attempted, mark the method for the best 2 *AC* = 8.95 to 8.97 Longer methods, e.g. finding *AC* first using *their AD* must be correct at the explicit stage for *AC* before using *their AC* to find *AB*, *BC* *AB* = 5 to 5.02 *BC* = 7.4 to 7.44 Two correct values in range for *AC, AB* or *BC* implies M2 Dep on at least M1 Implied by one correct value in range for *AC*, *AB* or *BC* dependent on at least M1M1 If *AC* used with *AB* or *BC* then must see correct explicit method for *AC* and the correct implicit method for *AB* or *BC*
22(b)	**FT** *their* **22(a)** ÷ 5 rounded up then ×6 correctly evaluated dep on *their* **22(a)** not a multiple of 5	**2**	**M1** for *their* **22(a)** ÷ 5 and × 6 oe	If **22(a)** is correct, answer = 24 M1 *their* **22(a)** does not have to be rounded up and can be rounded down M1 can be implied by answer

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Question	Answer	Marks	Partial Marks	Guidance
23(a)	276.99 to 277.2	**3**	**M2** for $[x =] \frac{44\times360}{2\times9.1\times\pi}$ oe or **M1** for $[44 =] \frac{x}{360}\times\pi\times2\times9.1$ isw or **B1** for answer 82.7 to 83.1	Mark at most accurate For 3 marks accept answer 4.84 rads or 4.835… rads (must have units) Allow any letter or symbol for x for M2 and M1 For M2 or M1 condone use of 3.14 or $\frac{22}{7}$ for π M2 implied by 276.9 to 277.3…
23(b)(i)	$2\times\pi\times r = 44$ or $\frac{\textit{their}\ \textbf{23(a)}}{360}\times\pi\times9.1^2 = \pi\times9.1\times r$	**M1**		For M1 condone use of 3.14 or $\frac{22}{7}$ for π Do not allow e.g. 200.1 to 200.2 without seeing correct substitution first
	7.00 or 7.001 to 7.003 seen	**A1**		
23(b)(ii)	298 or 298.2 to 298.5	**4**	**M2** for $[h =] \sqrt{9.1^2 - 7^2}$ oe or **M1** for $h^2 + 7^2 = 9.1^2$ **M1** for $\frac{1}{3}\times\pi\times7^2\times\textit{their}\ h$	Mark at most accurate 5.81 or 5.811 to 5.815 May use a more accurate value for 7 Alt trig methods M2 for explicit method for h M1 for implicit method for h *Their h* is dependent on the use of Pythagoras or trig in right-angled triangle with lengths 7 and 9.1

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Question	Answer	Marks	Partial Marks	Guidance
23(b)(iii)	13.99 to 14.01 nfww	**3**	**M2** for $\sqrt[3]{\frac{2387}{their(\mathbf{b})(\mathbf{ii})}} \times 7$ oe or $7 \div \sqrt[3]{\frac{their(\mathbf{b})(\mathbf{ii})}{2387}}$ oe or **M1** for $\sqrt[3]{\frac{2387}{their(\mathbf{b})(\mathbf{ii})}}$ oe or $\sqrt[3]{\frac{their(\mathbf{b})(\mathbf{ii})}{2387}}$ oe or $\frac{7^3}{r^3} = \frac{their(\mathbf{b})(\mathbf{ii})}{2387}$ oe or better	Mark at most accurate *their* **23(b)(ii)** must be a value *their* 7 may be more accurate

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Question	Answer	Marks	Partial Marks	Guidance
24(a)	$6(x + 2)(3x – 10) = 720$ oe	**M1**	oe accept e.g. $(6x + 12)(3x – 10) = 720$ $(x + 2)(3x – 10) = 120$	May be seen in stages Allow recovery of omission of brackets if expansion correct for M1 but A0
	$18x^2 – 60x + 36x – 120$ seen or $3x^2 – 10x + 6x – 20$ seen	**B1**	Accept or better	M0B1A0 is possible e.g. may be four consecutive terms in surface area calculation
	Correct simplification to $3x^2 – 4x – 140 = 0$	**A1**	All brackets expanded and no errors or omissions throughout	If brackets expanded separately from equation then do not treat as an omission isw solving equation
24(b)	$\frac{[--]4 \pm \sqrt{(-4)^2 - 4\times3\times(-140)}}{2\times3}$ oe or better	**B2**	**B1** for $\sqrt{(-4)^2 - 4\times3\times(-140)}$ or better or for $\frac{[--]4 + \sqrt{k}}{2\times3}$ or $\frac{[--]4 - \sqrt{k}}{2\times3}$ oe	Working may be shown in part **24(a)** – allow credit only if used in part **24(b)** As minimum accept $\frac{4\pm\sqrt{1696}}{6}$ with no errors for B2 If $–4^2$ allow recovery for 16 or $\sqrt{1696}$ Sq root to cover – sign, division to cover ± sign, but can recover with working seen
	7.53 and − 6.20	**B1**		Mark at most accurate Condone 7.530... or –6.2 or –6.197…
24(c)	75.5 or 75.54 to 75.55	**2**	**M1** for substituting *their x* value into $6(3x – 10)$, where $x > \frac{10}{3}$	Mark at most accurate M1 may be implied by correct evaluation

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Question	Answer	Marks	Partial Marks	Guidance
25(a)	$2(x-2)^2 - 1$ final answer	**3**	**B2** for $2(x-2)^2$ soi OR **M1** for $ax^2 - 2abx + ab^2$ [+ c] or $2(x^2 - 4x) + 7$ or $2(x^2 - 4x + 3.5)$ oe or better **B1** for $b = 2$ soi or FT $c = 7 - 2(\textit{their } b)^2$	For 3 marks accept $2(x-2)^2 + -1$ If not shown , accept e.g. $a = 2$ and $b = 2$ Ignore extra brackets that are not incorrect for B2 or M1 oe e.g. M1 for $2(x^2 - 4x + 4) - 1$ e.g. $(x-2)^2$ FT may be implied e.g. $2(x-4)^2 - 25$ implies B1FT
25(b)	$(2, -1)$	**1**	Correct or **FT** *their* **25(a)** provided in correct form	
25(c)	-1	**1**	Correct or **FT** *their* **25(b)**	

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