CAMBRIDGE
International Education

Cambridge O Level

MATHEMATICS SYLLABUS D **4024/23**

Paper 2 Calculator **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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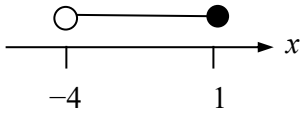
Abbreviations

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(a)	412 400 cao	**1**		
1(b)	3.13 cao	**1**		
2	7.3[0]	**3**	**B2** for 22.7[0] or **M2** for $30 - 5 \times 2.5[0] - 3 \times 3.4[0]$ oe or **M1** for $5 \times 2.5[0]$ or $3 \times 3.4[0]$ soi	e.g. 12.5 or 10.2
3	160	**4**	**B2** for sum of interior angles = 720 soi or **M1** for $180 \times (6 - 2)$ oe and **M1** for $\frac{\textit{their}\,720-(110+140+150)}{2+3+5} \times k$ oe where $k = 1, 2, 3$, or 5	Implied by 320 remaining For M1 condone division by 6 $\textit{their}\,720-(110+140+150)$
4(a)		**2**	**B1** for a line from –4 to 1 with circles at both ends or for correct circles but no line	
4(b)	$x < 2$ or $2 > x$ final answer	**1**		
5(a)	36	**1**		

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Question	Answer	Marks	Partial Marks	Guidance
5(b)	6.32 or 6.315 to 6.316	**3**	**B1** for 1 hour 54 min oe **M1** for 12 ÷ *their* time where *their* time comes from 1 hour 54 min or for 12 ÷ *their* time where their time comes from 1h 50 to 1h 58 and is correctly converted to hours	Mark at most accurate e.g. 1.9 [hours], 114 [min] e.g. 12 ÷ 1.9, 12 ÷ 114, 12 ÷ 1.54 1.833… to 1.966…
5(c)(i)	Ruled line from (10 30, 0) to (11 30, 12)	**2**	**B1** for single line with a positive gradient starting at (10 30, 0) or finishing at (11 30, 12)	For 2 marks or B1, accept freehand straight line
5(c)(ii)	Reading at point of intersection FT *their* line with positive gradient	**1**		Tolerance ± 0.2 km
6(a)	$2(2a - 1)$ final answer	**1**		condone omission of final bracket
6(b)	$3x(x + 2)$ final answer	**2**	**B1** for $x(3x + 6)$ or $3(x^2 + 2x)$ or for $3x(x + 2)$ seen and spoilt	condone omission of final bracket
7(a)	(–4, 3)	**1**		
7(b)	$-\frac{1}{2}$ oe final answer	**2**	**M1** for $\frac{(their\,3)--1}{(their-4)-4}$ oe seen	Accept e.g. $-\frac{4}{8}$ M1 - may use other coordinates on line AB
8(a)	$\frac{1}{3}$ oe final answer	**2**	**M1** for $12x = 7 - 3$ or better or for $x+\frac{3}{12}=\frac{7}{12}$ or better	Accept e.g. 0.333 or better Accept 0.33 after $\frac{4}{12}$ seen

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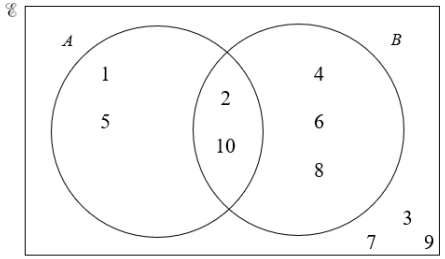
Question	Answer	Marks	Partial Marks	Guidance
8(b)	–7	**2**	**M1** for $8 - y = 5 \times 3$ or better or for $\frac{8}{3} = 5 + \frac{y}{3}$ or better	
9(a)	$\begin{pmatrix} -4 \\ 10 \end{pmatrix}$	**2**	**B1** for each	B1 maximum for fraction line
9(b)	(–3, 12)	**2**	**B1** for each	
10(a)	Correct tree diagram with 0.3 oe for red and 0.7 oe for yellow	**2**	**B1** for 0.7 oe for yellow seen	isw for attempts to convert or cancel
10(b)	0.49 oe	**1**	**FT** *their* 0.7 × *their* 0.7	isw for attempts to convert or cancel
11(a)		**2**	**B1** for at least two correct regions or up to 2 errors, omissions or repeats	
11(b)	3, 7, 9	**1**	**FT** *their* $(A \cup B)'$ provided not an empty set	Condone inclusion of {} brackets
11(c)	8	**1**	**FT** $\text{n}(\textit{their}(A' \cup B))$ provided elements in all regions	
12(a)	15.3 oe	**2**	**M1** for $\frac{3.4}{PR} = \frac{4}{18}$ oe or better	Accept $\frac{153}{10}$

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Question	Answer	Marks	Partial Marks	Guidance
12(b)	2.8 oe	**2**	**B1** for $\left(\frac{18}{4}\right)^2$ or $\left(\frac{4}{18}\right)^2$ or **M1** for $\frac{1}{2}\times 4\times \frac{h}{18/4}$ where $h = \frac{56.7}{\frac{1}{2}\times 18}$ or $\frac{1}{2}\times 4\times 3.4\times \sin\theta$ where $\theta = \sin^{-1}\left(\frac{56.7\times 2}{18\times \textit{their}\,15.3}\right)$	Mark at most accurate Accept $\frac{14}{5}$ For reference: height of PQR is 6.3 and height of ABC is 1.4 $\theta = 24.315\ldots$
13(a)(i)	45	**1**		
13(a)(ii)	14	**2**	**B1** for [LQ =] 36 or [UQ =] 50 nfww seen	75 – 25 is wrong working
13(b)	21, 39 and 25	**2**	**B1** for 2 correct or **M1** for error made with first or second value and other value[s] correct with total of 3 values = 85	
14	370	**2**	**M1** for $x \times \left(1-\frac{18}{100}\right)$ = 303.40 oe or better	Do not accept 1 – 18% alone for M1
15(a)	2	**1**		
15(b)	$3x + 1$ oe final answer	**2**	**M1** for $x = \frac{y-1}{3}$ or for $3y = x - 1$ or for $y + \frac{1}{3} = \frac{x}{3}$	

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Question	Answer	Marks	Partial Marks	Guidance
15(c)	4	**3**	**M2** for $6\left(\frac{x-1}{3}\right)=14-8$ or better or $2(x-1)+8=14$ or better or **M1** for $6\left(\frac{x-1}{3}\right)+8$ or better	
16(a)	$30 < t \leqslant 50$	**1**		
16(b)	45.6	**4**	**M1** for correct midpoints soi **M1** for use of Σfx where x is in the correct interval including boundaries **M1** (dep on 2nd M1) for $\Sigma fx \div 50$	Mark at most accurate ISW $30 < t \leqslant 50$ as answer after correct answer seen 20, 40, 60, 80 condone one error or omission $20 \times 12 + 40 \times 18 + 60 \times 14 + 80 \times 6 = 2280$ Condone one further error or omission No more than one midpoint outside interval e.g. $(240 + 720 + 840 + 480) \div 50$ Condone $12 + 18 + 14 + 6$ for 50
16(c)	$\frac{12}{50}$ oe	**1**		ISW attempts to cancel or convert 0.24 or 24%
17	4.55 or 4.549…	**3**	**M2** for $\sqrt[6]{\frac{3918}{3000}}$ oe or **M1** for $3000 \times (\ldots)^6 = 3918$ or better	Mark at most accurate $\frac{3918}{3000} = 1.306$ M2 implied by 1.045 or 1.0454 to 1.0455 or 104.5 or 104.54 to 104.55
18(a)	$6.5 \leqslant w < 7.5$	**2**	**B1** for each If 0 scored, **SC1** for both correct but reversed	

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Question	Answer	Marks	Partial Marks	Guidance
18(b)	24.9 nfww	**2**	**M1** for $\frac{161.8\text{ to }161.85}{their\,6.5}$	Correct method 161.85 ÷ 6.5 Note 161.8 ÷ 6.5 = 24.892 *their* 6.5 must be < 7 M0 if further adjustment made
19(a)	9.58 or 9.576…	**3**	**M2** for $\frac{14\times\sin(180-110-30)}{\sin 110}$ or **M1** for $\frac{\sin(180-110-30)}{AD}=\frac{\sin 110}{14}$ oe	Mark at most accurate *ACD* may be marked on diagram
19(b)	$\frac{1}{2}\times 14\times AB\times\sin 67=50.9$ oe	**M1**		May be done in stages Accept any variable for *AB* e.g. *x*
	7.89 to 7.90…	**A1**		If 7.90, '0' is needed
19(c)	13.1 or 13.11 to 13.12	**3**	**M2** for $\sqrt{14^2+7.9^2-2\times 14\times 7.9\cos 67}$ oe OR **M1** for $14^2+7.9^2-2\times 14\times 7.9\cos 67$ **A1** for 171.9 to 172	Mark at most accurate 7.9 may be more accurate M2 for complete longer methods e.g. uses perpendicular from *B* to *AC*
20	$-\frac{1}{40}$ oe	**3**	**M2** for $-200\times 0.1^3=a\times 2^3$ oe OR **M1** for $a=\frac{k}{c^3}$ oe **M1** for $a=\frac{their\,k}{2^3}$ oe	−0.025 M1 implied by $k=-0.2$

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Question	Answer	Marks	Partial Marks	Guidance
21	42[.0] or 42.01 to 42.02 nfww	**4**	**M3** for tan $[CEB] = \frac{20}{\sqrt{13^2 + 18^2}}$ oe or sin $[CEB] = \frac{20}{\sqrt{13^2 + 18^2 + 20^2}}$ oe or **M2** for $[BE^2] = 13^2 + 18^2$ oe or $[CE^2] = 13^2 + 18^2 + 20^2$ oe or **M1** for angle *CEB* identified	Mark at most accurate $\sqrt{13^2 + 18^2} = 22.2$ or 22.20… $\sqrt{13^2 + 18^2 + 20^2} = 29.9$ or 29.88… Lengths may be indicated in diagram 493 or 169 + 324 893 or 169 + 324 + 400 May be on diagram
22(a)	$3x - 15$ final answer	**1**		
22(b)	$2x^3 + 7x^2 - 7x - 12$ final answer	**3**	**B2** for correct unsimplified expression or simplified expression with 3 terms correct in a 4-term expression of required form or **B1** for correct expansion of two brackets with at least 3 terms correct	3 terms correct in a 4-term cubic For B2 e.g. $2x^3 + 8x^2 - x^2 - 4x - 3x - 12$ accept as part of a longer chain of terms provided 4 consecutive terms correct $2x^2 - 3x + 2x - 3$ $-[1]x$ counts as 2 terms correct $2x^2 - 3x + 8x - 12$ $+ 5x$ counts as 2 terms correct $x^2 + x + 4x + 4$ $+ 5x$ counts as 2 terms correct

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Question	Answer	Marks	Partial Marks	Guidance
23	$\frac{3x+1}{2(x+4)}$ or $\frac{3x+1}{2x+8}$ final answer	**5**	**B2** for $(3x+1)(x-4)$ seen or **M1** for $3x(x-4)+1(x-4)$ or for $x(3x+1)-4(3x+1)$ or for $(3x+a)(x+b)$ seen where $ab = -4$ or $a + 3b = -11$ **B2** for $2(x+4)(x-4)$ or $(2x+8)(x-4)$ seen or **M1** for $2x(x-4)+8(x-4)$ or for $x(2x+8)-4(2x+8)$ or for $2(x^2-16)$ or for $(2x+a)(x+b)$ seen where $ab = -32$ or $a + 2b = 0$	

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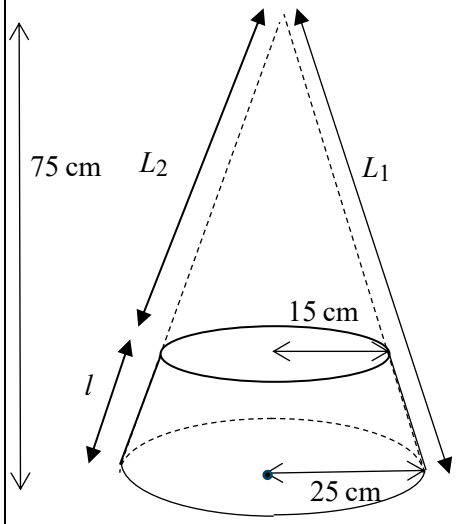
Question	Answer	Marks	Partial Marks	Guidance
24	6640 to 6650  	**6**	**M5** for $25\pi\sqrt{75^2+25^2} - 15\pi\sqrt{45^2+15^2}$ $+25^2\pi+15^2\pi$ oe or **M4** for $25\pi\sqrt{75^2+25^2} - 15\pi\sqrt{45^2+15^2}$ oe or $\left(1-\left(\frac{15}{25}\right)^2\right)\times 25\pi\sqrt{75^2+25^2}$ oe or **M3** for $15\pi\times\sqrt{45^2+15^2}$ oe or $\left(\frac{15}{25}\right)^2\times 25\pi\sqrt{75^2+25^2}$ oe or **M2** for $\sqrt{45^2+15^2}$ or $\frac{15}{25}\times\left(\sqrt{75^2+25^2}\right)$ oe or $25\pi\sqrt{75^2+25^2}$ oe or **M1** for $\frac{15}{25}\times 75$ oe or 75^2+25^2 or better If 0 scored **SC2** for $25\pi\times$*their* L_1 $-15\pi\times$*their* $L_2+25^2\pi+15^2\pi$ oe or **SC1** for $25\pi\times$*their* L_1 $-15\pi\times$*their* L_2	Accept $\left(850+400\sqrt{10}\right)\pi$ for 6 marks = 3973.835… CSA of frustum may be embedded in an attempt at total SA of frustum Other methods may be used for CSA = 2235.828… $L_2 = \sqrt{2250}$ or $15\sqrt{10}$ or 47.434 = 6209.117… = 45 $L_1 = \sqrt{6250}$ or $25\sqrt{10}$ or 79.056…. *Their* $L_1 > 75$

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