CAMBRIDGE
International Education

Cambridge O Level

MATHEMATICS (SYLLABUS D) **4024/12**

Paper 1 **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

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Annotation	Meaning
C	Communication mark
✗	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

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Annotation	Meaning
	Correct
	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)	125	**1**		
1(b)	11	**1**		Accept ±11 or –11 Do not accept 11^2
2(a)	11 30	**1**		In both parts, allow any clear notation for time with colon, dot or space as separator e.g. 1130, 11:30, 11.30, 11.30 am etc. Do not allow 11.3, 11 30 pm, 11 30h, 11h 30 min etc.
2(b)	14 45 or 2.45 pm	**1**		Do not allow 2.45, 14 45 pm, 14h 45min
3(a)	8.5 oe	**2**	**B1** for 7 and 10 identified or for correctly ordered list of first 6 or last 6 numbers	Answer $\frac{17}{2}$ scores 2 5 5 7 7 7 10 … or …7 10 10 11 13 15 Allow B1 if ordered list seen below given list or in working space for **3(a)**

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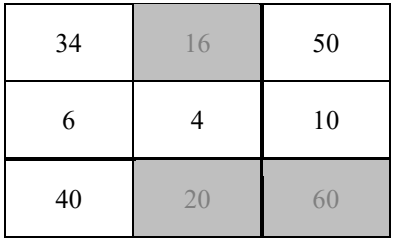
Question	Answer	Marks	Partial Marks	Guidance
3(b)	9	**2**	**M1** for $\frac{7+10+10+15+7+5+11+7+13+5}{10}$ oe or **B1** for 90 seen	Condone one error or omission in addition for M1 Must see attempt to add if total ≠ 90
4(a)	$60 \div (2 + 1) = 20$ OR $60 \times \frac{2}{2+1} = 40$ and $60 - 40 = 20$	**1**		Allow 3 in place of 2 + 1 Do not allow working back from 20, e.g. $60 \div 20 = 3$
4(b)		**2**	**M1** for 50 and 10 correct	50 and 10 in table or seen linked with square and triangle Condone 50 : 10 seen or 50, 10 in red column for M1 Do not allow 10 square, 50 triangle
5(a)	*C* positioned correctly south of *B* with intersecting arcs seen *AC* = 8 cm, *BC* = 5 cm	**3**	**B2** for *C* positioned correctly with incorrect or no arcs or for position of *C* constructed with arcs and sides 8 cm and 5 cm or **B1** for 8 cm or 5 cm soi	Tolerance ±2 mm, measure with onscreen rulers If *C* not labelled, take intersection to be *C* Lines *AC* and *BC* are not required For B2, correct arcs but *C* north of *B* or *AC* = 5 and *BC* = 8 Seen written or a length of 8 cm or 5 cm on diagram
5(b)	*their* bearing of *C* from *A*	**1**		Tolerance ±2°, use onscreen protractor Accept e.g. 95 Do not accept e.g. N95E

Question	Answer	Marks	Partial Marks	Guidance
6	2280	**3**	**B2** for [interest =] 280 or **M2** for $2000+\frac{2000\times3.5\times4}{100}$ oe or **M1** for $\frac{2000\times3.5[\times4]}{100}$ oe	Condone answer 280 for B2 M1 implied by 70 [× 4] but M0 for 70 × *k* where $k \neq 4$ Compound interest scores M0
7	18	**3**	**M2** for $x+7=\frac{100\times2}{8}$ or better or $x-7=\frac{2(100-8\times7)}{8}$ or better or **M1** for $\frac{1}{2}\times8\times(x+7)$ or $8\times7+\frac{1}{2}(x-7)\times8$ or $8x-\frac{1}{2}(x-7)\times8$ If 0 scored, **SC1** for base of triangle = 11	M2 for rearranging to one step from answer e.g. $4x=100-7\times8+7\times4$
8(a)	Frequencies all close to 100 oe	**1**		Reason must include reference to 100 or approximately equal
8(b)	$\frac{100}{500}$ oe	**1**		ISW incorrect cancelling or conversion Accept 0.2 or 20% but not 20 Do not accept 1 out of 5, 1 : 5 etc.
8(c)	20	**1**	**FT** 100 × *their* $\frac{100}{500}$ correctly evaluated	FT provided *their* $\frac{100}{500}<1$

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Question	Answer	Marks	Partial Marks	Guidance
9	$3\frac{7}{10}$ cao	**4**	**B3** for $\frac{37}{10}$ oe OR **B2** for $\frac{45}{30}$ oe or **M1** for $\frac{5}{3}\times\frac{9}{10}$ **M1** for correct use of common denominator in $\left(\textit{their}\ \frac{45}{30}\right)+2\frac{1}{5}$ e.g. $\frac{45+6\times11}{30}$	B3 for $\frac{111}{30}$ or $3\frac{21}{30}$ or 3.7 *Their* 45/30 must be a fraction with a denominator that is not 5
10	Correct triangle (1, –1), (1, –3), (2, –3)	**2**	**B1** for two correct vertices If 0 scored, **SC1** for reflection in $y = -x$	Clear intention, accept unruled Use overlay 2 marks for green triangle, SC1 for red triangle If more than one triangle, treat as choice
11(a)	$2^4 \times 5^2$ or $2 \times 2 \times 2 \times 2 \times 5 \times 5$	**2**	**B1** for 2, 2, 2, 2, 5, 5 or **M1** for correct factor tree or ladder	For 2 marks, factors may be in any order in product, allow e.g. $2^2 \times 5^2 \times 2^2$ Condone $2^4 \times 5^2 = 400$ on answer line for 2 marks, but not 400 alone Allow B1 if 1 included in product or list Allow 2 stages correct in factor tree or ladder for M1
11(b)	20	**2**	**B1** for answer 2 or 4 or 5 or 10 or [HCF =] $2 \times 2 \times 5$ or **M1** for [180 =] $2 \times 2 \times 3 \times 3 \times 5$	Allow 2 marks for $2^2 \times 5 = 20$ on answer line but B1 only for $2^2 \times 5$, 20 Must be written as a product for M1

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Question	Answer	Marks	Partial Marks	Guidance
12	$\frac{k}{4}+p$ or $\frac{k+4p}{4}$ final answer	**2**	**M1** for $\frac{k}{4}=m-p$ or $k+4p=4m$ or better	If answer e.g. $k + 4p / 4$, then check working and award 2 marks if seen written correctly, otherwise M1 maximum For 2 marks allow e.g. $\frac{-k-4p}{-4}$ For M1 allow e.g. $-4m = -k - 4p$
13(a)	9, 10, 11	**1**		
13(b)(i)	add 6 oe	**1**		Mark answer line Do not accept $6n$ or $n + 6$ or 6 alone
13(b)(ii)	$6n – 2$ oe final answer	**2**	**B1** for answer $6n + j$ or $kn – 2$, $k \neq 0$ or for $6n – 2$ oe seen	Allow correct unsimplified as final answer e.g. $4 + (n – 1)6$ Accept $n6 – 2$, $n = 6n – 2$, x or t for n etc for 2 or 1 marks Do not allow $6T – 2$
13(c)	42	**3**	**M1** for $\frac{their(6k-2)}{k+8}=5$ **M1dep** for eliminating fraction and expanding bracket	Allow any letter including n in place of k *Their* $(6k – 2)$ must be algebraic Dep on numerator of form $ak + b$ e.g. $6k – 2 = 5k + 40$
14(a)	3.5×10^5 cao	**1**		Allow trailing zeros, e.g. 3.500×10^5
14(b)	0.00027 cao	**1**		Allow .00027
14(c)	4.63×10^{13} cao	**2**	**B1** for answer figs 463 or answer $A \times 10^{13}$ with $1 \leqslant A < 10$ or **M1** for 45×10^{12} or 0.13×10^{13} seen	$A \neq 1.3$, 4.5 or 5.8 M1 implied by e.g. $10^{12}(1.3 + 4.5 \times 10)$ or $10^{13}(1.3 \div 10 + 4.5)$ seen

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Question	Answer	Marks	Partial Marks	Guidance
15(a)(i)	$-\frac{1}{2}$ oe	**2**	**M1** for $2y = 19 - x$ or $y + \frac{x}{2} = \frac{19}{2}$ or $y = -\frac{1}{2}x + c$	Condone $\frac{1}{-2}$ for 2 marks Allow decimals in place of fractions and algebraic or any numerical value for c M1 implied by answer $-\frac{x}{2}$
15(a)(ii)	$\frac{19}{2}$ oe	**1**		Accept (0, $\frac{19}{2}$) or $y = \frac{19}{2}$
15(b)	Correct justification for gradient = 2 e.g. $m \times \left(-\frac{1}{2}\right) = -1$	**B1**		Allow $m = -\frac{1}{-1\frac{}{}/2}$ Allow statement e.g. gradient is negative reciprocal of $-\frac{1}{2}$
	$-5 = 2 \times -1 + c$ oe or $(y - -5) = 2(x - -1)$ leading to $y = 2x - 3$	**B1**	If B0B0 scored, **SC1** for $m \times \textit{their}\left(-\frac{1}{2}\right) = -1$	Allow $y + 5 = 2(x + 1)$ Allow SC1 for correct justification for their perpendicular gradient but *their m* must be numerical
15(c)	(5, 7) cao	**3**	**M1** for correct method to eliminate one variable **A1** for $x = 5$ or $y = 7$ If A0 scored, **SC1** for a pair of coordinates satisfying one of the equations	When equating coefficients allow one arithmetic error for M1 When substituting, must substitute a correct rearrangement for M1 Award SC for values on answer line, if blank allow if x and y values clearly identified as answers in working

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Question	Answer	Marks	Partial Marks	Guidance
16(a)	$\angle AXB = \angle DXM$ [vertically] opposite angles $\angle BAX = \angle DMX$ alternate angles $\angle ABX = \angle XDM$ alternate angles All angles equal, so triangles similar	**3**	**B2** for two correct pairs of angles with correct reasons or **B1** for one correct pair of angles with correct reason or for two correct pairs of angles with incorrect/no reasons	For 3 marks, no incorrect work seen Condone missing conclusion if three correct pairs of angles with correct reasons stated Allow 3 marks for two pairs of angles with reasons and concluding statement, e.g. all angles equal hence similar or AA and similar or AAA and similar Do not allow alt, alternating, alternative Do not allow Z angles but accept as embellishment
16(b)(i)	5	**2**	**M1** for scale factor = $\frac{8}{4}$ or $\frac{4}{8}$ soi or for $15 \div 3$ seen	Condone incorrect use of scale factor e.g. $\frac{8}{15} = \frac{4}{DX}$ oe
16(b)(ii)	4 [: 1] cao	**1**		Not $\frac{4}{1}$ or 2^2

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Question	Answer	Marks	Partial Marks	Guidance
17(a)	$x^2+(x-7)^2=(x+2)^2$ or $x^2=(x+2)^2-(x-7)^2$ or $(x-7)^2=(x+2)^2-x^2$	**M2**	**M1** for $x-7$ seen **or** $x+2$ seen	Do not allow $(7-x)$ Condone inclusion of units Allow M2 if $x-7$ and $x+2$ seen and correct equivalent equation seen For M1 condone $x-7$ or $x+2$ seen as part of an incorrect expression
	$x^2-7x-7x+49$ and $x^2+2x+2x+4$	**M1**	Correct expansion of *their* two pairs of brackets	Allow $-14x$ for $-7x-7x$ and $4x$ for $2x+2x$ *Their* brackets must be of form $(ax+b)^2$ allow positive or negative values for a and b
	Correct simplification to $x^2-18x+45=0$	**A1**	A0 if any errors or omissions	
17(b)	$(x-3)(x-15)$	**M2**	**M1** for $(x+a)(x+b)$ where $ab=45$ or $a+b=-18$ or for correct partial factors $x(x-15)-3(x-15)$ or $x(x-3)-15(x-3)$	If factorisation seen, ignore other methods
	3 15	**B1**		Allow M2B1 for correct solutions after correct partial factors seen
17(c)	60	**2**	**M1** for substitution of *their* $x>7$ into $\frac{1}{2}x(x-7)$ oe	If both solutions > 7, allow M1 for use of either
18(a)	60	**2**	**M1** for $\frac{80+40}{200}[\times 100]$ oe	M1 implied by answer 0.6 or $\frac{3}{5}$ oe

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Question	Answer	Marks	Partial Marks	Guidance
18(b)	Correct histogram	**3**	**B2** for 3 correct blocks or **B1** for 2 correct blocks If 0 scored, **SC1** for three correct frequency densities from 1.5, 5, 8, 2 soi	Condone good freehand Blocks must touch correct horizontal line for majority of interval for 5, 8, 2 and for 1.5 must be within correct square for majority of interval Condone omission of vertical line at 140 only Ignore inclusion of frequency polygon
19	$26\pi x^2$	**6**	**B3** for $k = \frac{9}{2}$ oe or $kx = \frac{9}{2}x$ oe or $h = \frac{9}{2}x$ or **M2** for $\frac{1}{2}\times\frac{4}{3}\pi(3x)^3 = \pi(2x)^2 \times kx$ oe or **M1** for $\frac{1}{2}\times\frac{4}{3}\pi(3x)^3$ oe or $\pi(2x)^2 \times kx$ oe **M2** for $2\times\pi(2x)^2 + 2\pi\times 2x\times \textit{their}\,\frac{9}{2}x$ oe or **M1** for $2\pi\times 2x\times \textit{their}\,\frac{9}{2}x$ oe	Condone answer 26 if $26\pi x^2$ final expression in working Allow recovery from missing brackets for all method marks Use of radius = 2 is not a misread ISW incorrect cancelling after $\frac{18}{4}$ or equivalent numerical fraction without π seen For all method marks condone use of *h* for *kx* and use of 3.14[2...] or $\frac{22}{7}$ for π Allow *k* or *their* expression identified as *k* in place of *their* $\frac{9}{2}$ for M2 or M1 Do not allow extra terms for M2, condone inclusion of incorrect terms for M1
20(a)	2**b** – 3**a** final answer	**1**		
20(b)	4**b** final answer	**1**		

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Question	Answer	Marks	Partial Marks	Guidance
20(c)	$\frac{3}{2}\mathbf{a}+3\mathbf{b}$ or $\frac{3\mathbf{a}+6\mathbf{b}}{2}$ or $\frac{3}{2}(\mathbf{a}+2\mathbf{b})$ final answer	**3**	**M2** for a correct unsimplified answer or $\overrightarrow{PX}$ or $\overrightarrow{XQ}=3\mathbf{b}-\frac{3}{2}\mathbf{a}$ oe seen or $\overrightarrow{QX}$ or $\overrightarrow{XP}=\frac{3}{2}\mathbf{a}-3\mathbf{b}$ oe seen or **M1** for a correct route for $\overrightarrow{OX}$ along the lines of the diagram or $\overrightarrow{PQ}=6\mathbf{b}-3\mathbf{a}$ seen or $\overrightarrow{QP}=3\mathbf{a}-6\mathbf{b}$ seen If 0 scored, **SC1** for answer $\frac{3}{2}\mathbf{a}+k\mathbf{b}$, $k\neq 0$	Allow any equivalent two-term expression as final answer for 3 marks Accept mixed notation for route e.g. $3\mathbf{a}+\overrightarrow{PX}$, $OQ+QX$, *their OQ* + *their QX* if OQ and QX have been identified in working not just labelled on diagram Do not allow e.g. XP for PX
21	$\frac{-7x^2+10x+12}{(x-1)(4-x)}$ or $\frac{-7x^2+10x+12}{-x^2+5x-4}$ final answer	**4**	**B1** for common denominator $(x-1)(4-x)$ oe isw **B1** for $(2x+3)(4-x)-5x(x-1)$ or better seen **B1** for $8x+12-2x^2-3x$ or $-5x^2+5x$ seen	For 4 marks, allow any simplified equivalent e.g. $\frac{7x^2-10x-12}{x^2-5x+4}$ Ignore any subsequent cancelling for B marks For all B marks accept in two separate fractions with common denominator
22(a)	$[a=]$ 3 $[b=]$ 4	**3**	**B1** for $b=4$ **B2** for $a=3$ or **M1** for $13=a^2+$ *their b* or for $13-5=a^2-1$	Do not accept ±3 for a but this implies M1
22(b)	$y=4$ or $y=$ *their b*	**1**		*Their b* must be numeric

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Question	Answer	Marks	Partial Marks	Guidance
23	–2	**3**	**M2** for $\left(3^3\right)^{-\frac{4}{3}} = 3^{2x}$ oe or better or **B2** for 9^{-2} or $\frac{1}{9^2}$ or **B1** for 3^{-4} or 81^{-1}	Do not treat $27^{\frac{4}{3}} = 9^x$ as a misread as it alters the difficulty Allow $\frac{1}{3^4}$ or $\left(\frac{1}{3}\right)^4$ or $\frac{1}{81}$ for B1 B0 for $\frac{1^4}{3}$ or $\left(3^3\right)^{-\frac{4}{3}}$ or 3^{2x}
24	$37+7\sqrt{2}$ cao	**3**	**M1** for three terms correct in expansion $6\sqrt{8}+10\sqrt{2}\times\sqrt{8}-3-5\sqrt{2}$ or better **M1** for $\sqrt{8}=2\sqrt{2}$ soi or $\sqrt{2}\times\sqrt{8}=4$ soi	Method marks may be awarded in either order No more than 4 terms in expansion $\sqrt{2}\times\sqrt{8}=\sqrt{16}$ does not imply M1 Answer $37+k\sqrt{2}$ may imply $\sqrt{2}\times\sqrt{8}=4$ Answer $k+7\sqrt{2}$ may imply $\sqrt{8}=2\sqrt{2}$

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