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CAMBRIDGE
International Education

Cambridge O Level

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

Paper 2 **October/November 2025**

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors 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
	Incorrect
	Follow through
Highlighter	Highlight a key point in the working
	Ignore subsequent work
	Method mark awarded zero
	Method mark awarded one
	Method mark awarded two
	Method mark awarded three
	Misread

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Annotation	Meaning
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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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
1	16.18 cao	**2**	**B1** for 16.17[8…] or 16.18 seen or for *their* more accurate value correctly rounded to 2 decimal places
2(a)	21.5 final answer	**2**	**M1** for correctly ordering first 7 or last 7 values isw or for 21, 22 identified
2(b)	25	**1**	
3	4100	**2**	**M1** for figs 5 – 12 × 75 or for 1 kg = 1000 g soi
4(a)	Correct triangle with intersecting arcs	**2**	**B1** for acceptable point C with no/incorrect arcs or for triangle with $AC = 7$ cm, $BC = 6$ cm and correct arcs
4(b)	Correct measurement of *their* BAC	**1**	
5(a)	33.6[0] cao	**2**	**M1** for $\frac{400 \times 2.8[\times 3]}{100}$ oe If 0 scored, **SC1** for answer 433.6[0]
5(b)	1.6[0] cao	**1**	
6	415	**2**	**B1** for answer figs 415 or **M1** for $\frac{5000 \times 8.3}{100}$ oe
7	$5x(4x - y)$ final answer	**2**	**B1** for answer $5(4x^2 - xy)$ or $x(20x - 5y)$ or $20x\left(x - \frac{1}{4}y\right)$ or for $5x(4x - y)$ seen

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Question	Answer	Marks	Partial Marks
8	$17x + 13$ final answer	**2**	**B1** for answer $17x + k$ (any k) or $jx + 13$ ($j \neq 0$) or **M1** for $12x + 8 + 5x + 5$ seen
9	132	**3**	**M2** for $[x =] \frac{360}{5} + \frac{360}{6}$ or better or for $[x =] 360 - \frac{(5-2)\times180}{5} - \frac{(6-2)\times180}{6}$ or better or **M1** for [exterior angle=] $\frac{360}{5}$ or $\frac{360}{6}$ oe or [interior angle =] $\frac{(5-2)\times180}{5}$ or $\frac{(6-2)\times180}{6}$ oe
10(a)	$\begin{pmatrix}-17\\14\end{pmatrix}$	**2**	**B1** for each component or **M1** for $\begin{pmatrix}-9\\12\end{pmatrix}$
10(b)	5.39 or 5.385…	**3**	**M2** for $(-3 + 8)^2 + (4 + -2)^2$ or **M1** for $(-3 + 8)$ and $(4 + -2)$ soi
11	1750	**2**	**M1** for $\frac{28}{2000}$ oe or $\frac{125\,000}{2000}$ oe
12(a)	3.72×10^8 cao	**1**	
12(b)	3.4×10^{-2} cao	**2**	**B1** for 0.034 oe or **B1FT** for *their* decimal < 1 correctly converted to standard form
13(a)(i)	28	**1**	
13(a)(ii)	$5n - 2$ oe final answer	**2**	**B1** for answer $5n + k$ oe or answer $jn - 2$ oe, $j \neq 0$ or for $5n - 2$ oe seen
13(b)	$\frac{123}{676}$ oe	**3**	**B2** for denominator = 676 or for correct answer seen OR **M1** for substitution of 25 into *their* $(5n - 2)$ **M1** for $(n+1)^2$ oe as denominator

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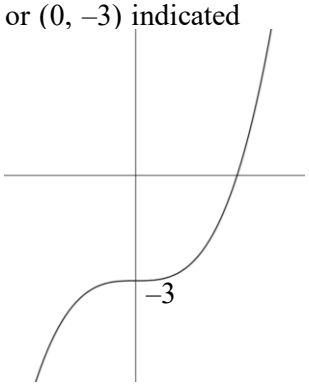
Question	Answer	Marks	Partial Marks
14(a)	[x =] 4 [y =] 2	**2**	**B1** for each or for answers 3^4 and 5^2 or **M1** for [16200 =] $2^3 \times 3^4 \times 5^2$ or for [360 =] $2^3 \times 3^2 \times 5$ or for [45 =] $3^2 \times 5$
14(b)	90	**1**	**FT** answer 30 if *their* x = 1
14(c)	180	**1**	
15(a)	[upper bound =] 2.55 [lower bound =] 2.45	**2**	**B1** for one correct or for both values correct but reversed
15(b)	38.65 cao	**2**	**B1** for 8.05 oe seen or for correct answer seen or **M1** for 12 × *their* 2.55 + *their* 8.05
16(a)	5	**3**	**M2** for $\sqrt[3]{\frac{102\,885}{120\,000}}$ oe or **M1** for $102\,885 = 120\,000 \times k^3$ oe
16(b)	2033 nfww	**3**	**B2** for 10 [years] nfww or 9.6 to 9.7 or **M2** for $102\,885 \times \left(1+\frac{1.6}{100}\right)^9$ oe or $102\,885 \times \left(1+\frac{1.6}{100}\right)^{10}$ oe or evaluates $\left(1+\frac{1.6}{100}\right)^9$ or $\left(1+\frac{1.6}{100}\right)^{10}$ and shows 1.166 or 1.1663 to 1.1664 or **M1** for $102\,885 \times \left(1+\frac{1.6}{100}\right)^k$ oe or for $\left(1-\frac{5}{100}\right)^3 \times \left(1+\frac{1.6}{100}\right)^k$
17(a)	Correct sketch with –3 or (0, –3) indicated  	**2**	**B1** for positive cubic curve

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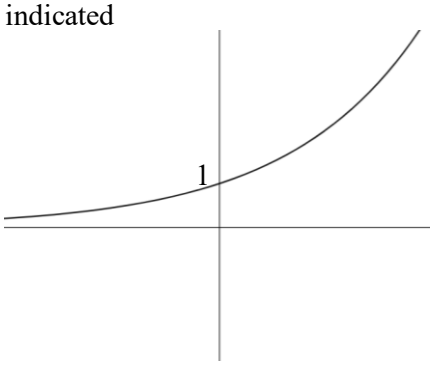
Question	Answer	Marks	Partial Marks
17(b)	Correct sketch with 1 or (0, 1) indicated 	**2**	**B1** for correct shape exponential curve crossing y-axis or for any sketch with single y-intercept = 1 or (0, 1) indicated
18(a)	$\frac{1}{5}$ oe	**1**	
18(b)(i)	Gradient of line M = *their* $\frac{1}{5}$ oe	**M1**	
	Substitutes (15, 0) into *their* equation $0 = \textit{their}$ gradient $\times 15 + c$ or $y - 0 = \textit{their}$ gradient $(x - 15)$	**M1**	
	Correct working leading to (0, –3)	**A1**	Dep on M1M1, A0 if any errors
18(b)(ii)	(7.2 oe, 0)	**5**	**B4** for $y = –5x + 36$ oe OR **B1** for midpoint = (7.5, –1.5) oe soi **M1** for gradient $N = \frac{-1}{\textit{their}\frac{1}{5}}$ **M1** for substituting *their* (7.5, –1.5) in $y = (\textit{their} –5)x + c$ oe **M1dep** for substituting $y = 0$ in *their* $y = –5x + 36$
19(a)	5	**1**	
19(b)	7	**1**	

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Question	Answer	Marks	Partial Marks
19(c)	$\frac{3}{55}$ oe	**3**	**M2** for $\frac{9}{22}\times\frac{8}{21}\times\frac{7}{20}$ oe or **M1** for $\frac{9}{22}$ oe decimal/% seen or for $\frac{9}{k}\times\frac{8}{k-1}\times\frac{7}{k-2}$ or for $\frac{p}{22}\times\frac{p-1}{21}\times\frac{p-2}{20}$
20	2.56 oe final answer	**3**	**M2** for $4(7-3)^2 = y(-2-3)^2$ oe OR **M1** for $y=\frac{k}{(x-3)^2}$ oe **M1** for $y=\frac{their\,k}{(-2-3)^2}$ oe
21	$x^2-3x-21[=0]$	**B3**	**M1** for correct removal of fractions $2x+1=(x-5)(x+4)$ oe or $2x+1+5(x+4)=x(x+4)$ **M1** for correct expansion of all brackets $x^2-5x+4x-20$ or $2x + 1 + 5x + 20 = x^2 + 4x$ or better
	$\frac{[--]3\pm\sqrt{([-]3)^2-4[\times1]\times-21}}{2[\times1]}$ oe OR $x-\frac{[--]3}{2}=\sqrt{\left(\frac{[-]3}{2}\right)^2+21}$ oe	**M2**	**M1** for $\sqrt{([-]3)^2-4[\times1]\times-21}$ or better or for $\frac{[--]3+\sqrt{p}}{2[\times1]}$ or $\frac{[--]3-\sqrt{p}}{2[\times1]}$ or for $\left(x-\frac{3}{2}\right)^2$
	6.32, –3.32	**B1**	
22(a)	368 or 367.8 to 367.9	**2**	**M1** for $\cos 42=\frac{AB}{495}$ oe
22(b)	$[\cos\ldots=]\frac{620^2+495^2-580^2}{2\times620\times495}$ oe	**M2**	**M1** for $580^2=620^2+495^2-2\times620\times495\cos[\ldots]$ oe
	61.48…	**A1**	

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Question	Answer	Marks	Partial Marks
22(c)	5.11 or 5.105 to 5.108…	**5**	**M2** for $\sin 61.5 = \frac{CX}{620}$ oe or $\frac{1}{2} \times 620 \times 495 \times \sin 61.5 = \frac{1}{2} \times 495 \times CX$ or **M1** for shortest distance identified **M2** for $\frac{\textit{their } CX}{6\frac{24}{60}} \times \frac{60}{1000}$ oe or **M1** for $\frac{\textit{their } CX}{\text{acceptable time}}$ oe
23	37.9 or 37.87 to 37.89…	**5**	**B4** for answer 62.1[%] or 62.10… [%]to 62.13[%] OR **M3** for a complete correct method to find the shaded area or unshaded area **M1** for $\frac{\textit{their} \text{ shaded or } \textit{their} \text{ unshaded area}}{\pi \times 10^2}[\times 100]$ oe OR **M1** for $\frac{130}{360} \times \pi \times 7^2$ oe **M2** for $[2\times]\frac{1}{2} \times 7 \times 10 \times \sin\left(\frac{360-130}{2}\right)$ oe or **B1** for $\angle COA$ or $\angle COB = 115$ **M1** for $\frac{\textit{their} \text{ shaded area}}{\pi \times 10^2}[\times 100]$ oe
24(a)	0.7 × (200 – 160) = 28	**1**	

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Question	Answer	Marks	Partial Marks
24(b)	226.8 nfww	**5**	**M1** for correct frequencies 3.9 × 20 and 4.5 × 20 and 0.9 × 60 soi **M1** for 180, 210, 230, 270 soi **M1** for Σ*their f* × *x* where *x* is in correct interval including boundaries **M1 dep** for $\frac{\Sigma fx}{250}$ dep on third M1

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