



# Cambridge O Level

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**MATHEMATICS (SYLLABUS D)**

**4024/01**

Paper 1 Non-calculator

**For examination from 2025**

MARK SCHEME

Maximum Mark: 100

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**Specimen**

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This document has **10** pages. Any blank pages are indicated.

**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.

<p><b>GENERIC MARKING PRINCIPLE 1:</b></p> <p>Marks must be awarded in line with:</p> <ul style="list-style-type: none"> <li>• the specific content of the mark scheme or the generic level descriptions for the question</li> <li>• the specific skills defined in the mark scheme or in the generic level descriptions for the question</li> <li>• the standard of response required by a candidate as exemplified by the standardisation scripts.</li> </ul>
<p><b>GENERIC MARKING PRINCIPLE 2:</b></p> <p>Marks awarded are always <b>whole marks</b> (not half marks, or other fractions).</p>
<p><b>GENERIC MARKING PRINCIPLE 3:</b></p> <p>Marks must be awarded <b>positively</b>:</p> <ul style="list-style-type: none"> <li>• 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</li> <li>• marks are awarded when candidates clearly demonstrate what they know and can do</li> <li>• marks are not deducted for errors</li> <li>• marks are not deducted for omissions</li> <li>• 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.</li> </ul>
<p><b>GENERIC MARKING PRINCIPLE 4:</b></p> <p>Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptions.</p>
<p><b>GENERIC MARKING PRINCIPLE 5:</b></p> <p>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).</p>

**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 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 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.

**MARK SCHEME NOTES**

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

Anything in the mark scheme which is in square brackets [...] is not required for the mark to be earned, but if present it must be correct.

When a part of a question has two or more ‘method’ steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation ‘dep’ is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

**Types of mark**

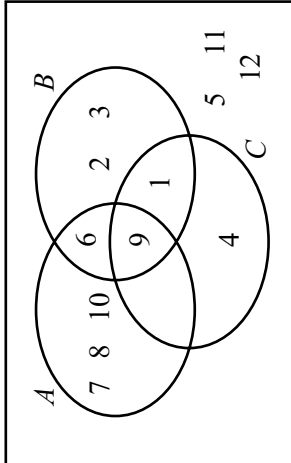
- M** Method mark, awarded for a valid method applied to the problem.
- A** Accuracy mark, given for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.
- B** Mark for a correct result or statement independent of Method marks.

**Abbreviations**

awrt	answers which round to
cao	correct answer only
dep	dependent on the previous mark(s)
FT	follow through after error
isw	ignore subsequent working (after correct answer obtained)
nfww	not from wrong working
oe	or equivalent
SC	special case
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	2.705 cao	1	
2	13y final answer	1	
3(a)	9	1	
3(b)	25	1	
3(c)	8	1	
4(a)	C positioned correctly with intersecting arcs seen $AC = 5 \text{ cm}$ , $BC = 8 \text{ cm}$	3	<b>allow</b> $\pm 2 \text{ mm}$ tolerance <b>B2</b> for C positioned correctly with no/incorrect arcs or <b>B1</b> for $AC = 5 \text{ cm}$ or $BC = 8 \text{ cm}$ soi
4(b)	$123[^\circ]$ – $127[^\circ]$	1	<b>FT</b> their angle $BAC \pm 2^\circ$
5	$\frac{1}{9}$ or 0.i	1	
6(a)	$0.08$ or $\frac{2}{25}$ oe	1	
6(b)	$\frac{19}{21}$ oe	3	<b>M1</b> for $\frac{2}{3} \times \frac{6}{7}$ oe <b>M1</b> for correct use of common denominator in addition $\frac{1}{3} + \text{their } \frac{12}{21}$ e.g. $\frac{12}{21} + \frac{7}{21}$
7	$3a(4b - a)$ final answer	2	<b>B1</b> for answer $3(4ab - a^2)$ or $a(12b - 3a)$ or for correct answer seen
8(a)(i)	$\frac{70}{200}$ oe	1	
8(a)(ii)	Large number of spins used oe	1	
8(b)	175	1	<b>FT</b> $500 \times \text{their } \frac{70}{200}$ evaluated correctly
9(a)	$-\frac{5}{2}$ oe	2	<b>M1</b> for $y = \frac{13 - 5x}{2}$ or better
9(b)	$(\frac{7}{2} \text{ oe}, 0)$	2	<b>B1</b> for one correct or <b>M1</b> for $0 = 2x - 7$ oe

Question	Answer	Marks	Partial Marks
9(c)	(3, -1)	3	<b>M1</b> for correct method to eliminate one variable <b>A1</b> for $x = 3$ or $y = -1$ or if <b>A0</b> scored, <b>SC1</b> for a pair of values that satisfy either equation
10(a)	160	2	<b>M1</b> for $\frac{1}{2} \times (14 + 26) \times 8$ oe
10(b)	4.8	2	<b>FT</b> 0.03 $\times$ <i>their</i> 160 correctly evaluated <b>B1FT</b> for answer figs 48 or <b>M1</b> for $\frac{30 \times \textit{their} 160}{1000}$
10(c)	1340	6	<b>B3</b> for $BC = 10$ or <b>M2</b> for $\left[ BC^2 = \left( \frac{26 - 14}{2} \right)^2 + 8^2 \right]$ or <b>M1</b> for $\frac{26 - 14}{2} = 6$ <b>AND</b> <b>M2</b> for $2 \times \textit{their} 160 + 2 \times \textit{their} BC \times 30 + 30 \times 14$ or <b>M1</b> for $[2 \times] \textit{their} BC \times 30$ or $30 \times 14$
10(d)	5360	2	<b>FT</b> 4 $\times$ <i>their</i> 1340 correctly evaluated <b>B1</b> for $\left( \frac{16}{8} \right)^2$ soi
11(a)	Pattern 4 correct	1	
11(b)	13 32 50	2	<b>B1</b> for two values correct
11(c)(i)	$3n + 1$ oe final answer	2	<b>B1</b> for $3n + k$ oe seen
11(c)(ii)	$2n^2$ oe final answer	2	<b>B1</b> for quadratic expression in $n$ or for second difference of 4 seen
11(d)	45	3	<b>M1</b> for substitution of 10 into <i>their</i> $2n^2$ and $3n + 1$ <b>M1</b> for substitution of 11 into <i>their</i> $2n^2$ and $3n + 1$ <b>OR B2</b> for 31, 200 and 34, 242 or <b>B1</b> for two of these values

Question	Answer	Marks	Partial Marks
11(e)	800	4	<b>B2</b> for $k = 20$ or <b>M1</b> for <i>their</i> $(3n + 1) = 61$ <b>M1</b> for substitution of <i>their</i> $k$ into <i>their</i> $2n^2$
12	$\begin{pmatrix} 8 \\ 1 \end{pmatrix}$	2	<b>B1</b> for one component correct or <b>M1</b> for $\begin{pmatrix} -2 \\ 3 \end{pmatrix} + 2 \begin{pmatrix} 5 \\ -1 \end{pmatrix}$ oe
13	$\frac{7}{30}$ cao	3	<b>B2</b> for $\frac{21}{90}$ oe seen or <b>M1</b> for 23.33... – 2.33... oe or for $90x = 21$ oe or for $\frac{2}{10} + \frac{1}{30}$ oe
14	angle $CBD = 18^\circ$	<b>B3</b>	<b>B1</b> for $\angle BCD = 112^\circ$ <b>B1</b> for $\angle BDC = 50^\circ$ or $\angle DCF = 18^\circ$
	3 correct reasons associated with correct angles: opposite angles of a cyclic quadrilateral are supplementary associated with $\angle BCD$ alternate segment theorem associated with $\angle BDC$ or $\angle DCF$ angle sum of a triangle = $180^\circ$ or sum of angles at a point on a straight line = $180^\circ$	<b>B2</b>	<b>B1</b> for opposite angles of cyclic quadrilateral are supplementary associated with $\angle BCD$ or for alternate segment theorem associated with $\angle BDC$
15	$\frac{1}{125}$	2	<b>B1</b> for $5^{-3}$ or better If 0 scored, <b>SC1</b> for answer 125
16(a)		3	<b>B2</b> for Venn diagram with 1 or 2 errors, omissions or repeats or for correct Venn diagram with $(A \cup B \cup C)$ blank or <b>B1</b> for Venn diagram with 3 or 4 errors, omissions or repeats or for correct Venn diagram with $(A \cup B \cup C)$ blank and one further error
16(b)	0	1	<b>FT</b> <i>their</i> Venn diagram

Question	Answer	Marks	Partial Marks
17(a)	Correct histogram	3	<b>B2</b> for 3 correct bars drawn or <b>B1</b> for 2 correct bars drawn If 0 scored, <b>SC1</b> for 3 or 4 correct frequency densities soi, 1.6, 5.8, 4, 0.5
17(b)	The frequency densities are the same but the group widths are different so the frequencies are different. oe or The areas are different so the frequencies are different. oe or There are only 8 students in the 5 to 10 group [but 16 in the 10 to 20 group]. oe	1	Accept equivalent explanations
18(a)	(0, 8)	2	<b>M1</b> for $3 \times 2^0 + 5$ oe
18(b)	$y = 5$	1	
19(a)	17	1	
19(b)	$25x^2 + 20x - 1$ final answer	3	<b>M1</b> for $(5x + 2)^2 - 5$ <b>B1</b> for $[(5x + 2)^2] = 25x^2 + 10x + 4$ or $[(5x + 2)^2] = 25x^2 + 20x + 4$
19(c)	$\frac{8}{5}$ oe	3	<b>M1</b> for $\frac{3}{7 - (5x + 2)} = -1$ <b>M1</b> for eliminating fraction and isolating term in $x$ e.g. $5x = 3 + 5$
20(a)	$2\mathbf{g} - 2\mathbf{f}$ or $2(\mathbf{g} - \mathbf{f})$ final answer	1	
20(b)	$\frac{3}{2}\mathbf{f} + \frac{1}{2}\mathbf{g}$ or $\frac{1}{2}(3\mathbf{f} + \mathbf{g})$ final answer	3	<b>M1</b> for $\overrightarrow{XB} = \frac{1}{4} \text{ their } (2\mathbf{g} - 2\mathbf{f})$ or $\overrightarrow{XA} = -\frac{3}{4} \text{ their } (2\mathbf{g} - 2\mathbf{f})$ <b>M1</b> for a correct vector route for $\overrightarrow{XC}$ soi e.g. $\overrightarrow{XB} + \overrightarrow{BC}$

Question	Answer	Marks	Partial Marks
21	$\frac{13 - 11x}{(3x - 1)(x + 2)}$ or $\frac{13 - 11x}{3x^2 + 5x - 2}$ final answer	3	<b>B1</b> for $4(x + 2) - 5(3x - 1)$ oe isw <b>B1</b> for denominator $(3x - 1)(x + 2)$ oe isw
22	$\frac{13\pi}{2}$ or $6\frac{1}{2}\pi$ or $6.5\pi$	3	<b>M2</b> for $\frac{360 - 100}{360} \times \pi \times 3^2$ oe or <b>B1</b> for major sector angle $260^\circ$ soi
23(a)	$(x - 3)^2 - 28$	2	<b>B1</b> for $\left(x + \frac{-6}{2}\right)^2$
23(b)	$(3, -28)$	1	<b>FT</b> <i>their</i> completed square expression
24(a)	$8\sqrt{3}$ final answer	2	<b>B1</b> for $5\sqrt{3}$ or $3\sqrt{3}$
24(b)	$3\sqrt{5} - 6$ or $3(\sqrt{5} - 2)$ final answer	3	<b>M1</b> for $\times \frac{2 - \sqrt{5}}{2 - \sqrt{5}}$ <b>B1</b> for $4 + 2\sqrt{5} - 2\sqrt{5} - \sqrt{5} \times \sqrt{5}$ or better

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