Cambridge Assessment International Education

Cambridge O Level

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

Paper 1 **October/November 2022**

MARK SCHEME

Maximum Mark: 80

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.

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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 descriptors 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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Maths-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, 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 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.

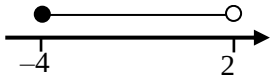
Abbreviations

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

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Question	Answer	Marks	Partial Marks
1(a)	4000	**1**	
1(b)	10	**1**	
2(a)	$4 + 4 \times (4 - 4) = 4$	**1**	
2(b)	–24	**1**	
3	0.000 754 cao	**1**	
4(a)	C and D	**1**	
4(b)	A and E	**1**	
5	12 nfww	**2**	**M1** for 8×9
6(a)	$\frac{1}{15}$ oe final answer	**1**	
6(b)	$\frac{1}{20}$ cao	**2**	**M1** for $\frac{3}{10} \times \frac{1}{6}$ seen or $\frac{3}{60}$ oe seen
7(a)	108	**2**	**M1** for $180 - \frac{360}{5}$ oe or $\frac{180(5-2)}{5}$ oe
7(b)	72	**1**	**FT** 180 – *their* 108, where *their* 108 < 180 and *their* 108 ≠ 90
8	30 nfww	**2**	**M1** for $\frac{180}{2+5+5}[\times k]$ where $k = 2$ or 5 oe or for $5x + 5x + 2x = 180$ oe or for $x + 5x = 90$ oe
9	50 and 40 and 60 and 20 seen as rounded values **and** final answer 30	**2**	**B1** for three of 50, 40, 60 or 20 seen as rounded values
10(a)	$2^2 \times 3 \times 5 \times 7$ or $2 \times 2 \times 3 \times 5 \times 7$	**2**	**B1** for list 2, 2, 3, 5, 7 or **M1** for any two stages correct in factor tree or ladder method
10(b)	84	**1**	

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Question	Answer	Marks	Partial Marks
11(a)	0.35 oe	**2**	**M1** for 1 – (0.15 + 0.3 + 0.2) oe or **B1** for 0.65 oe seen
11(b)	45	**1**	
12(a)		**1**	
12(b)	$n > 5$ or $5 < n$ final answer	**2**	**M1** for correct isolation of terms in n e.g. $10 + 5$ […] $2n + n$ oe or better
13	13	**3**	**M2** for $\frac{2600}{1000} \times \frac{60}{12}$ oe or **M1** for (figs 26) ÷ 12 [× 60] soi or for correct conversion to km seen e.g. 2600 ÷ 1000 oe or for correct conversion to hours seen e.g. 12 ÷ 60 oe
14(a)	Acceptable bisector of angle *PSR* with correct arcs meeting line *PQ*	**2**	**B1** for acceptable bisector of angle *PSR* with no/incorrect arcs
14(b)(i)	Line drawn on bearing 104° from *P*	**1**	
14(b)(ii)	152 to 160 dep on correct angle bisector and correct bearing drawn	**2**	**B1FT** for correct measurement of *their* line from *P* to *their* bisector or **M1** for *their* distance in cm written and *their* answer is 20× this value
14(c)	800	**2**	**M1** for 1 cm^2 = 400 m^2 soi
15(a)	4.5 oe	**1**	
15(b)	$x < 4.5$ **and** $y < 6$ **and** $3y + 4x > 18$ oe	**2**	**FT** $x <$ *their* **(a)** if > 0 **B1** for one of $x <$ *their* 4.5 or $y < 6$ or $3y + 4x > 18$ oe
16(a)	(2, 7)	**1**	
16(b)(i)	$\frac{3}{2}$ oe	**2**	**M1** for $\frac{13-1}{6--2}$ oe

Question	Answer	Marks	Partial Marks
16(b)(ii)	$-\frac{1}{\textit{their}\ \textbf{(b)(i)}}$ oe	**1**	Strict FT *their* **(b)(i)**
17(a)	x^6 final answer	**1**	
17(b)	$[\pm]\frac{1}{3}$	**1**	
17(c)	$\frac{1}{2}$	**1**	
18	125	**2**	**B1** for $k = 5$ if $x = k(y + 1)^2$ used or **M1** for $\frac{x}{(4+1)^2} = \frac{45}{(2+1)^2}$ oe or **M1** for $x =$ *their* $k(4 + 1)^2$ when $x = k(y + 1)^2$ used
19	$\frac{16}{9}$ or $1\frac{7}{9}$ oe	**4**	**M1** for correct use of common denominator $\frac{4(3x-1)}{24} + \frac{6(x+2)}{24} = \frac{5}{3}$ or better **M1** for correct expansion of either of *their* brackets e.g. $6x - 2$ or $3x + 6$ **M1** for removing all fractions and isolating x terms with no errors e.g. $6x + 3x = 20 + 2 - 6$ oe
20(a)	10	**1**	
20(b)	Correct histogram	**3**	**FT** *their* **(a)** **B1FT** for 3 or 4 rectangles on correct bases **B1** for 3 or 4 rectangles with correct heights If 0 scored, **SC1** for frequency densities 3 and 2 soi

Question	Answer	Marks	Partial Marks
21(a)	$\frac{2(x-1)}{3}$ or $\frac{2x-2}{3}$ oe final answer	**3**	**B2** for $2(x-1) = 3y$ or $\frac{x-1}{3} = \frac{y}{2}$ or $[x =]\frac{2(y-1)}{3}$ or **B1** for correct first step e.g. $x = 1+\frac{3y}{2}$ or $y-1=\frac{3x}{2}$ or $-\frac{3x}{2}=1-y$ or $2y = 2 + 3x$ If 0 scored, **SC1** for final answer $\frac{2(x+1)}{3}$ oe
21(b)	$\frac{7}{5}$ oe	**3**	**M2** for $2 = -5(1 - x)$ or better or **M1** for $\frac{2}{1-x}=1+\frac{3\times-4}{2}$ or f(–4) = –5 seen
22(a)	$(3p + q)(3p – q)$ final answer	**1**	
22(b)	$(a – 3b)(c + 1)$ final answer	**2**	**B1** for one correct partial factorisation seen
23(a)	$\begin{pmatrix}5 & 4\\7 & 9\end{pmatrix}$	**1**	
23(b)(i)	$\begin{pmatrix}175\\347\end{pmatrix}$	**2**	**B1** for $\begin{pmatrix}175\\k\end{pmatrix}$ or $\begin{pmatrix}k\\347\end{pmatrix}$ or 175 **and** 347 seen in final answer
23(b)(ii)	Total cost of Adam's tickets and total cost of Ben's tickets	**1**	
24	130	**1**	
25	$\frac{x}{x+3}$ final answer	**3**	**B1** for $x(x – 4)$ seen **B1** for $(x – 4)(x + 3)$ seen

Question	Answer	Marks	Partial Marks
26(a)	$\frac{5}{3}\mathbf{b}-\frac{2}{3}\mathbf{a}$ final answer	**3**	**B2** for $\left[\overrightarrow{AC}=\right]\ \frac{5}{3}(\mathbf{b}-\mathbf{a})$ or $\frac{5}{3}\mathbf{b}-\frac{5}{3}\mathbf{a}$ or $\left[\overrightarrow{BC}=\right]\ \frac{2}{3}(\mathbf{b}-\mathbf{a})$ or $\frac{2}{3}\mathbf{b}-\frac{2}{3}\mathbf{a}$ or **M1** for a correct vector route for $\overrightarrow{OC}$ or $\left[\overrightarrow{AB}=\right]\ \mathbf{b}-\mathbf{a}$ If 0 scored, **SC1** for answer $-\frac{5}{3}\mathbf{b}+\frac{2}{3}\mathbf{a}$ oe
26(b)	$\overrightarrow{DB}=\frac{2}{5}\mathbf{a}$ or $\overrightarrow{BD}=-\frac{2}{5}\mathbf{a}$	**M1**	
	$\overrightarrow{DB}$ is a multiple of $\overrightarrow{OA}$, hence parallel oe	**A1**	Or $BD=\frac{2}{5}AO$, hence parallel