Cambridge Assessment International Education

Cambridge O Level

MATHEMATICS (SYLLABUS D) **4024/11**

Paper 1 **May/June 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.

Cambridge International is publishing the mark schemes for the May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U 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 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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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, 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.

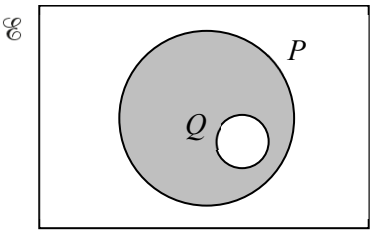
Abbreviations

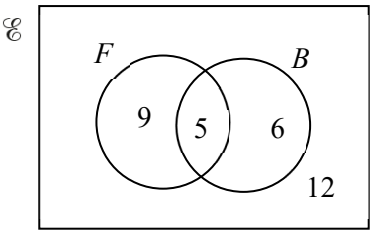
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

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Question	Answer	Marks	Partial Marks
1(a)	50 000 cao	**1**	
1(b)	35 690 cao	**1**	
2(a)	one	**1**	
2(b)	two	**1**	
3(a)	32	**1**	
3(b)	−45	**1**	
4(a)	3	**2**	**B1** for 125 seen or **M1** for $152 = 5^3 + x^3$ or better
4(b)	60	**1**	or 12 × *their* **(a)** if *their* **(a)** > 5
5	Cylinder radius 1.5 [cm] or diameter 3 [cm] height 6 [cm] or length 6 [cm]	**3**	**B1** for each
6(a)	11 or 13	**1**	
6(b)	Any irrational number between 10 and 15	**1**	
7(a)	1	**1**	
7(b)	1.8 oe	**2**	**M1** for (3× 0 + 8 × 1 + 3 × 2 + 4 × 3 + 0 × 4 + 2 × 5) ÷ 20 or **B1** for 36 seen
8(a)	$\frac{1}{15}$ oe	**1**	
8(b)	$\frac{9}{10}$ oe	**1**	
9	3300 mm 34 m 32 000 cm 3.1 km	**2**	**B1** for three correct when one is covered up or for correct order but reversed
10(a)	5 points plotted correctly	**2**	**B1** for 2 or more correct plots
10(b)	Negative	**1**	
10(c)	Ruled line of best fit	**1**	Dependent on at least B1 in **(a)**
10(d)	Reading at 4 km from their line of best fit	**1**	Dependent on ruled line of best fit with negative gradient
11(a)	$\frac{23}{100}$ oe	**1**	

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Question	Answer	Marks	Partial Marks
11(b)	360	**1**	
12	[0].3, 40 and 80 seen **and** final answer [0].15	**2**	**B1** for two of [0].3, 40 and 80 seen
13(a)(i)	$x^2 - x - 12$ final answer	**2**	**B1** for three of x^2, $+ 3x$, $- 4x$, $- 12$
13(a)(ii)	$x + 12$ final answer	**2**	**B1** for answer $x + k$ or $kx + 12$ or **M1** for $5x + 10 - 4x + 2$
13(b)	$\frac{17b}{9}$ final answer	**2**	**B1** for two correct fractions with a common denominator or for correct unsimplified single fraction
14(a)	8.63×10^{-4} cao	**1**	
14(b)(i)	Antarctica	**1**	
14(b)(ii)	$3.2 - 10^6$ cao	**2**	**B1** for answer figs 32 or for answer $A \times 10^6$ with $1 \leqslant A < 10$ or **M1** for 23×10^5 or for 0.9×10^6 or 2 300 000 and 900 000
15(a)	7	**1**	
15(b)	$\frac{1}{3}$	**1**	
15(c)	$2^4 \times 3^7 \times 5^8$ final answer	**2**	**B1** for 3^7 in final answer or for 2^4 **and** 5^8 in final answer
16(a)	$\begin{pmatrix}2\\3\end{pmatrix}$ drawn correctly with arrow	**1**	
16(b)	$\begin{pmatrix}-6\\4\end{pmatrix}$ drawn correctly with arrow	**1**	If 0 scored in **(a)** and **(b)**, **SC1** for two correct vectors with missing or incorrect arrows
16(c)	$\begin{pmatrix}5\\1\end{pmatrix}$ drawn correctly with arrow	**2**	**B1** for $\begin{pmatrix}5\\1\end{pmatrix}$ soi
17	1.5 oe	**2**	**M1** for 4 cm^2 = 1 km^2 soi or for answer figs 15
18(a)		**1**	

Question	Answer	Marks	Partial Marks
18(b)		**2**	**B1** for Venn diagram with 2 or 3 correct
19(a)	75	**1**	
19(b)	150	**1**	
19(c)	27	**2**	**B1** for $D\hat{B}G = 105$
20(a)	4	**1**	
20(b)	$\frac{5x-2}{6}$ oe final answer	**3**	**B2** for $[x =]\frac{5y-2}{6}$ or $6y = 5x - 2$ or **B1** for $x = \frac{6y+2}{5}$ or $5y = 6x + 2$ or $y - \frac{2}{5} = \frac{6x}{5}$
21	[0].32 or $\frac{32}{100}$ oe	**2**	**B1** for $k = 32$ if $y = \frac{k}{(x+1)^2}$ used or **M1** for $2 \times (3 + 1)^2 = y \times (9 + 1)^2$ oe or **M1** for $y = \frac{theirk}{(9+1)^2}$
22(a)	$(5x - 3y)(a - 2c)$ final answer	**2**	**M1** for any correct partial factorisation
22(b)	$(3x + 1)(5x - 4)$ final answer	**2**	**M1** for brackets which give two of the three correct terms in a quadratic expression or for $5x(3x + 1) - 4(3x + 1)$ seen or for $3x(5x - 4) + [1](5x - 4)$ seen
23	$\frac{2+y}{2y-3}$ oe final answer	**4**	**M1** for elimination of fractions **M1FT** for expanding **M1FT** for isolation of terms in x **M1FT** for factorising and completing to $x =$ Maximum 3 marks if answer incorrect
24	$3\frac{1}{2}$ or $\frac{7}{2}$ or 3.5	**3**	**M2** for $4k + 3 = 17$ oe OR **B1** for [**NM** =] $\begin{pmatrix} k & 0 \\ 17 & 12 \end{pmatrix}$ **B1** for [**MN** =] $\begin{pmatrix} k & 0 \\ 4k+3 & 12 \end{pmatrix}$

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Question	Answer	Marks	Partial Marks
25(a)(i)	$12\mathbf{a} + 6\mathbf{b}$ or $6(2\mathbf{a} + \mathbf{b})$ final answer	**1**	
25(a)(ii)	$7\mathbf{a} + 4\mathbf{b}$ final answer	**2**	**M1** for $\overrightarrow{AD} = \overrightarrow{AC} + \overrightarrow{CD}$ or *their* $\overrightarrow{AC} - \overrightarrow{DC}$ or *their* $\overrightarrow{AC} - (5\mathbf{a} + 2\mathbf{b})$
25(b)	$\overrightarrow{EB} = \overrightarrow{EA} + \overrightarrow{AB}$ or ½ *their* $\overrightarrow{DA} + 6\mathbf{a} + 3\mathbf{b}$ or $-$ ½ *their* $\overrightarrow{AD} + 6\mathbf{a} + 3\mathbf{b}$ or $-$ ½$(7\mathbf{a} + 4\mathbf{b}) + 6\mathbf{a} + 3\mathbf{b}$	**M1**	Or equivalent vector route stated e.g. $\overrightarrow{EB} = \overrightarrow{ED} + \overrightarrow{DC} + \overrightarrow{CB}$
	[$\overrightarrow{EB}$ =] $2.5\mathbf{a} + \mathbf{b}$ or equivalent 2-term expression	**A1**	
	$\overrightarrow{EB}$ is parallel to $\overrightarrow{DC}$ because $\overrightarrow{EB} = k\overrightarrow{DC}$ oe	**A1**	

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