Cambridge Assessment International Education

Cambridge O Level

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

Paper 1 **May/June 2021**

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 2021 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 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.

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

Question	Answer	Marks	Partial Marks
1(a)	$\frac{9}{20}$ final answer	**1**	
1(b)	$\frac{7}{10}$ $\frac{4}{5}$ $\frac{17}{20}$	**1**	
2	3 0 3 2	**2**	**B1** for any two correct
3	Sector 150° labelled banana Sector 90° labelled orange	**2**	**B1** for 90° or 150° seen or sector with correct angle drawn
4(a)	65 000 000	**1**	
4(b)	70, 50 and 0.2 seen **and** final answer 3000	**2**	**B1** for two of 70, 50 and 0.2 seen
5(a)	420	**2**	**M1** for $\frac{540}{7+2}$
5(b)	64	**1**	
6	Correct net	**3**	**M2** for 3 or 4 faces correct size and position or **M1** for height 3 soi or for net of 4 by 4 by n cuboid drawn where $n \neq 3$
7	0.13	**2**	**M1** for 1 – (0.15 + 0.3 + 0.42) or **B1** for 0.87 seen
8	$1\frac{13}{20}$ oe fraction final answer	**2**	**M1** for correct use of common denominator e.g. $\frac{68}{20}$ **and** $\frac{35}{20}$ or $\frac{8}{20}$ **and** $\frac{15}{20}$ or **B1** for 1.65
9(a)	Acceptable triangle with intersecting arcs	**2**	**B1** for acceptable C clearly indicated with no/incorrect arcs
9(b)	90 + *their* angle *ABC*	**1**	**FT** *their* triangle

Question	Answer	Marks	Partial Marks
10(a)	$2 \times 3^3 \times 5$	**2**	**B1** for 2, 3, 3, 3, 5 not as product or **M1** for any two stages correct in factor tree or ladder method
10(b)	45	**2**	**M1** for [225 =] 3 [×] 3 [×] 5 [×] 5 or for [HCF =] 3 × 3 × 5 seen
11	Correctly equating one set of coefficients or correct rearrangement of one equation	**M1**	
	Correct method to eliminate one variable	**M1**	
	$x = 3$ $y = -4$ nfww	**A2**	**A1** for $x = 3$ or $y = -4$ nfww or after **A0**, **SC1** for a pair of values that satisfy either equation or for correct answers with no working
12(a)	16 nfww	**3**	**B1** for [total distance =] 24 used or [total time =] 1.5 hours oe used **M1** for figs 24 ÷ *their* total time
12(b)	Correct graph	**2**	**B1** for line from (0, 10) to (80, 10) **B1FT** for line from *their* (80, 10) with gradient –0.5
13(a)	5.3×10^{-5} cao	**1**	
13(b)	1.2×10^{21} cao	**2**	**B1** for 12×10^{20} oe seen or for answer $A \times 10^{21}$ with $1 \leqslant A < 10$
14(a)	62.5	**1**	
14(b)	375 final answer	**2**	**B1** for 75 seen If 0 scored, **SC1** for answer 397.5 or 350
15(a)(i)	Arc at *S* radius 6 cm	**1**	
15(a)(ii)	Acceptable angle bisector of *Q* with correct arcs	**2**	**B1** for acceptable bisector with no/incorrect arcs or short bisector with arcs
15(b)	Correct region shaded	**1**	**FT** *their* arc from *S* and *their* angle bisector from *Q*
16(a)	$-\frac{5}{2}$ oe	**1**	

Question	Answer	Marks	Partial Marks
16(b)	$\frac{1}{8x^2}$ or $\frac{1}{8}x^{-2}$ final answer	**2**	**B1** for answer $\frac{1}{kx^2}$ or $\frac{1}{8x^k}$, $k \neq 0$ or for $\left(\frac{1}{2x^{\frac{2}{3}}}\right)^3$ or for $\frac{x}{8x^3}$ or for correct answer seen
17	160	**2**	**M1** for $\frac{(100-25)}{100}x = 120$ oe soi
18(a)	$\frac{3}{x^3}$ final answer	**2**	**M1** for $y = \frac{k}{x^3}$ soi
18(b)	81	**1**	**FT** (*their* 3) × 27 evaluated
19(a)(i)	$\begin{pmatrix}140\\145\end{pmatrix}$	**2**	**B1** for one element correct in a 2 by 1 matrix If 0 scored, **SC1** for answer (140 145)
19(a)(ii)	Total money for tickets on Monday and total money for tickets on Tuesday	**1**	
19(b)	$\begin{pmatrix}2.75\\2.20\end{pmatrix}$	**2**	**B1** for one element correct or for 2.75 oe and 2.20 oe seen If 0 scored, **SC2** for answer $\begin{pmatrix}154\\159.5\end{pmatrix}$ or $\begin{pmatrix}1.1\times \textit{their}140\\1.1\times \textit{their}145\end{pmatrix}$ evaluated or **SC1** for one element correct
20	$\frac{5n+7}{(n+3)^2}$ oe final answer	**4**	**B2** for *n*th term for numerator sequence $5n + 7$ oe final answer or **B1** for $5n + k$ oe seen AND **B2** for *n*th term for denominator sequence $(n + 3)^2$ oe final answer or **B1** for quadratic expression in *n* seen for denominator sequence **Maximum 3 marks if final answer incorrect**
21(a)	$(x + 5)^2 - 19$ final answer	**2**	**B1** for $(x + 5)^2$ seen or $\left(x+\frac{10}{2}\right)^2$ seen
21(b)	$-5 \pm \sqrt{19}$	**1**	**FT** *their* completed square expression in **(a)** with negative *b*

Question	Answer	Marks	Partial Marks
22	$\frac{5x+1}{(x-7)(x+5)}$ or $\frac{5x+1}{x^2-2x-35}$ final answer	**3**	**B1** for $3(x + 5) + 2(x – 7)$ oe isw **B1** for denominator $(x – 7)(x + 5)$ oe isw
23(a)	Rotation 90° clockwise oe (1, –1)	**3**	**B1** for each
23(b)	Triangle at (2, 0), (1, 0), (1, 2)	**2**	**B1** for two vertices correct or two correct pairs of coordinates soi
24(a)	Correct bar height 0.6	**1**	
24(b)	15	**3**	**M2** for $\frac{12}{20+6\times5+1.8\times10+12}[\times100]$ or **M1** for 6×5 and 1.8×10 soi as frequencies
25	[a =] –12 [b =] 3	**3**	**B2** for one correct or **M1** for $(x + 4)(x – 4)$ seen or for $(2x + b)(x – 4)$ seen or for $2x^3+8x^2-5x^2-20x+ax+4a=2x^3+bx$ oe seen