Cambridge Assessment International Education

Cambridge O Level

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

Paper 1 **October/November 2020**

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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This document consists of **7** printed pages.

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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.

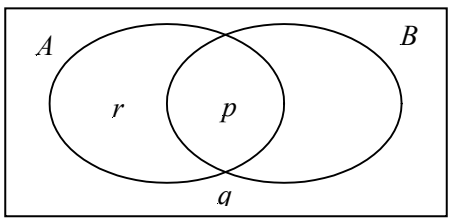
Mathematics Specific Marking Principles

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)	$\frac{2}{15}$ oe	**1**	
1(b)	0.54 oe	**1**	
2	$\frac{23}{35}$ cao	**2**	**B1** for $\frac{46}{70}$ or other unsimplified equivalent seen or **M1** for attempt to convert to a common denominator with one numerator correct
3(a)	$4t(3t-1)$ final answer	**1**	
3(b)	$(a-b)(x-y)$ final answer	**1**	
3(c)	$(x-3)(x+1)$ final answer	**1**	
4	433 cm $4\frac{1}{3}$ m 4340 mm 0.043 km	**2**	**B1** for three in the correct order when one is covered up
5	400	**2**	**M1** for $\frac{200-40}{40}$ [$\times 100$] or for $\frac{200}{40} \times 100$
6(a)	3.9	**1**	
6(b)	3	**1**	
7	6 **and** 200 **and** 0.3 seen, **and** final answer 0.6 or $\frac{3}{5}$	**2**	**B1** for two of 6, 200, 0.3 seen

Question	Answer	Marks	Partial Marks
8	255°	**2**	**B1** for 105° or 75° seen or **M1** for $8\frac{1}{2}\times\frac{360}{12}$ oe or $3\frac{1}{2}\times\frac{360}{12}$ oe
9(a)	$7a-8$ final answer	**2**	**M1** for final answer $7a+k$ or $ka-8$, for any $k\neq 0$ or for $9a - 12 + 4 - 2a$ seen
9(b)	7	**1**	
10	Correct method to eliminate one variable	**M1**	
	$x = 2$ **and** $y = –3$	**A2**	**A1** for either $x = 2$ **or** $y = –3$ Or after **A0**, **SC1** for a pair of values that satisfy either equation or for correct answers with no working
11(a)	3.4×10^{5} cao	**1**	
11(b)	$5\ [.0]\times10^{-15}$ cao	**2**	**B1** for 0.5×10^{-14} seen or $\frac{1}{2}\times10^{-14}$ seen or for final answer $A\times10^{-15}$ with $1 \leqslant A < 10$
11(c)	6.7	**1**	
12(a)	$8x^6$ final answer	**1**	
12(b)	$9t$ final answer	**2**	**B1** for final answer $9t^k$ or ht where $k\neq 0$, $h\neq 0$
13(a)	10 or $\text{n}(P\cup Q)=10$ cao	**1**	
13(b)		**3**	**B1** for each correct p, q and r.
14(a)	G **and** E	**1**	
14(b)	**BA or AB**	**1**	
14(c)	10	**2**	**M1** for $\frac{1}{2}\times2\times2\times5$ oe

Question	Answer	Marks	Partial Marks
15(a)	$\frac{6}{35}$ oe	**1**	
15(b)	0 oe	**1**	
15(c)	$\frac{17}{35}$ oe	**2**	**M1** for $\frac{3}{7}\times\frac{3}{5}$ oe or $\frac{4}{7}\times\frac{2}{5}$ oe
16(a)	40	**1**	
16(b)	Rectangle: base 25 to 40, height 2	**1**	
17(a)	328° to 332°	**1**	
17(b)(i)	Acceptable perpendicular bisector of *BC* with two pairs of correct arcs	**2**	**B1** for an acceptable perpendicular bisector with no/incorrect arcs
17(b)(ii)	Correct (bottom left) region shaded	**1**	**FT** *their* **(b)(i),** dep on attempt at perpendicular bisector
18(a)	5	**1**	
18(b)(i)	line from (08 30, 0) to (08 45, 1200)	**1**	
18(b)(ii)	400	**1**	**FT** *their***(b)(i)**
18(c)	4.8 or $4\frac{4}{5}$ or $\frac{24}{5}$	**2**	**M1** for $\frac{\text{figs}12}{\frac{1}{4}}$ oe or $\frac{\text{figs}12}{15}[\times 60]$ oe or $\frac{\text{figs}12}{900}\times 60[\times 60]$ oe
19(a)(i)	Reflection *x*-axis or $y = 0$	**2**	**B1** for each
19(a)(ii)	$\begin{pmatrix}1 & 0\\0 & -1\end{pmatrix}$	**2**	**B1** for second column correct or **SC1** for answer $\begin{pmatrix}-1 & 0\\0 & 1\end{pmatrix}$
19(b)	Triangle *C* at (–4, 1), (–4, 2), (–6, 2)	**2**	**B1** for triangle correct size and orientation, wrong centre or **SC1** for a triangle with vertices at (0, 2), (0, 3), (2, 2) or (–4, 4), (–4, 5), (–6, 4)
20(a)	Rectangle with base 7 dots, height 5 dots	**1**	

Question	Answer	Marks	Partial Marks
20(b)(i)	<table><tr><td>3</td><td>4</td></tr><tr><td>4</td><td>5</td></tr><tr><td>5</td><td>7</td></tr><tr><td>20</td><td>35</td></tr></table>	**1**	
20(b)(ii)	$n + 1$ oe final answer	**1**	
20(b)(iii)	$2n - 1$ oe final answer	**1**	
20(b)(iv)	$(n+1)(2n-1)$ or $2n^2 + n - 1$ oe	**1**	**FT** *their***(b)(ii)** × *their***(b)(iii)** provided both in terms of n only
21(a)	$y > 2$ **and** $y < 2x$ oe	**2**	**B1** for $y > 2$ or $y < 2x$ oe If 0 scored, **SC1** for both boundary lines, soi
21(b)	4 **and** 5	**2**	**B1** for one correct with no extras or **M1** for substituting $y = 7$ into $2x + 3y = 32$ or $y = 2x$ leading to $x = 5.5$ oe or $x = 3.5$ oe
22(a)	66	**2**	**M1** for $\frac{180 - 48}{2}$ soi
22(b)	108	**1**	
22(c)	126	**1**	
23	Use of Pythagoras leading to 10.5 oe	**4**	**B1** for $OP = 4$ **and** $PQ = x$ soi **M1** for $OQ^2 = OT^2 + TQ^2$ oe soi **B1** for $x^2 + 4x + 4x + 16$ seen or $x^2 + 8x + 16$ seen
24(a)	$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$	**2**	**B1** for two or three correct elements
24(b)	$(-6 \quad -4)$	**2**	**M1** for $[\mathbf{X} =] (0 \quad 2)\begin{pmatrix} 2 & 1 \\ -3 & -2 \end{pmatrix}$ or for using $\mathbf{X} = (a \quad b)$ to get as far as $(2a - 3b \qquad a - 2b)$ $[= (0 \quad 2)]$