Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

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

Paper 1 **May/June 2019**

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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:

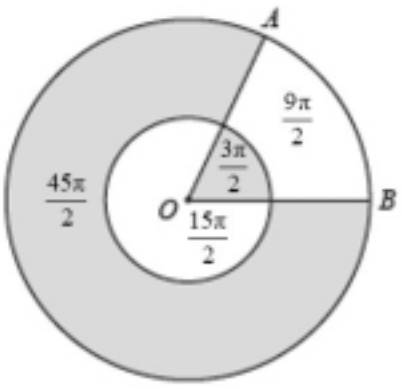
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

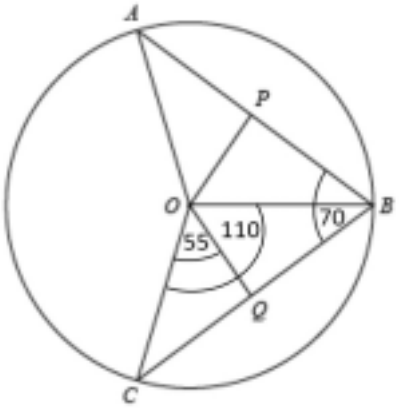
Abbreviations
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
nfww not from wrong working
soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)	$\frac{32}{35}$	**1**	
1(b)	3	**1**	
2	Acceptable bisector of $\angle ABC$ with correct arcs	**2**	**B1** for bisector with no / incorrect arcs
3(a)	85	**1**	
3(b)	–5	**2**	**B1** for –50 seen **M1** for $(-45 - 30 - 35 + 0 + 5 - 10 - 20 + 40 + 20 + 25) \div 10$ oe If 0 scored, **SC1** for answer 5
4	70 **and** 30 **and** 0.2 seen **and** final answer 1000	**2**	**B1** for two of 70, 30 and 0.2 seen If 0 scored, **SC1** for $72 - 32 = 40$ **and** $\frac{40}{0.2^2}$ or $\frac{40}{0.04}$ seen with final answer 1000
5	320	**2**	**M1** for $\frac{4}{50} \times 4000$ oe isw
6(a)	646	**2**	**M1** for $\frac{15}{100} \times 760$ oe or $\frac{85}{100} \times 760$ oe
6(b)	1344	**2**	**M1** for $1200 \times \frac{2}{100} \times 6$ oe isw
7	$\frac{27}{40}$ or equivalent fraction	**2**	**B1** for answer 0.675 or **M1** for correct use of a common denominator e.g. $\frac{12}{20}$ and $\frac{15}{20}$ seen or for $(0.6 + 0.75) \div 2$ oe

Question	Answer	Marks	Partial Marks
8	1200	**2**	**M1** for $\frac{3}{5}\times$ figs 2 **or** for $2\times\frac{8}{5}-2$ If 0 scored, **SC1** for answer 3200
9(a)	Correct graph	**2**	**B1** for ruled line from (0, 0) to (20, 15) **B1** for ruled line from (*their* 20, 15) to (*their* 20+ 40, 15)
9(b)	0.75 oe	**1**	
10(a)	$(P\cup R)\cap Q'$	**1**	
10(b)	Any irrational number in range $9 < x < 10$	**2**	**B1** for any irrational number as answer or any number in range $9 < x < 10$ as answer
11	Correct method to eliminate one variable	**M1**	
	$x = \frac{1}{3}$ oe , $y = -2$	**A2**	**A1** for either $x = \frac{1}{3}$ oe **or** $y = -2$ or after **A0**, **SC1** for a pair of values that satisfy either equation or for correct answers with no working
12(a)	1.7×10^{-5}, 3.5×10^{-4}, 4.2×10^{-4}, 2.1×10^{-3}	**1**	
12(b)(i)	5.5×10^{10} cao	**1**	
12(b)(ii)	$3[.0]\times10^{20}$ cao	**1**	
13(a)	$x^2 - 6x + 9$ final answer	**1**	
13(b)	$(5x - 6)(y - 3)$ final answer or $(6 - 5x)(3 - y)$ final answer	**2**	**B1** for one correct partial factorisation seen
14(a)	$\left(x-\frac{7}{2}\right)^2-\frac{29}{4}$	**2**	**B1** for $\left(x-\frac{7}{2}\right)^2$ seen or for answer $(x+a)^2-\frac{29}{4}$
14(b)	$-\frac{29}{4}$	**1**	**FT** *their* (a) provided in correct form

Question	Answer	Marks	Partial Marks
15(a)	$2 \times 2 \times 2 \times 3 \times 7$ or $2^3 \times 3 \times 7$	**2**	**B1** for 2, 2, 2, 3, 7 as factors or **M1** for any two stages correct in factor tree or ladder method
15(b)	210 **and** 294 only	**2**	**B1** for one correct value seen or for answers $2 \times 3 \times 5 \times 7$ and $2 \times 3 \times 7^2$
16(a)	Translation $\begin{pmatrix}-3\\4\end{pmatrix}$	**2**	**B1** for translation **B1** for $\begin{pmatrix}-3\\4\end{pmatrix}$
16(b)	Correct enlargement, vertices (2, 5), (6, 5), (6, 3)	**2**	**B1** for correct size and orientation, incorrect position or for enlargement scale factor 2, centre (0, 3)
17(a)	$\frac{2}{6}$ on first branch $\frac{2}{5}, \frac{4}{5}, \frac{1}{5}$ on second set	**2**	**B1** for two or three completed correctly
17(b)	$\frac{14}{30}$ oe	**2**	**M1** for $\frac{4}{6} \times \frac{3}{5}$ oe **or** $their\frac{2}{6} \times their\frac{1}{5}$ oe
18(a)	-1.2 **or** $-\frac{6}{5}$ oe	**1**	
18(b)	$\frac{3r-2}{4+r}$ final answer	**3**	**M1** for eliminating fraction: $r(3 - p) = 4p + 2$ or better **M1FT** for isolating terms in p: $3r - 2 = 4p + rp$ or better **M1FT** for factorising and completing to $p = \ldots$
19(a)	1.6 oe	**2**	**B1** for 'k' = 160 oe if $y = \frac{"k"}{x^2}$ used or **M1** for $10 \times 4^2 = y \times 10^2$ oe or **M1FT** for $y = \frac{(their\,k)}{10^2}$ when $y = \frac{"k"}{x^2}$ used
19(b)	y is multiplied by 4	**1**	

Question	Answer	Marks	Partial Marks
20	$\frac{y^4}{3x}$ final answer	**2**	**B1** for final answer $\frac{y^4}{3x^k}$ **or** $\frac{y^k}{3x}$ **or** $\frac{y^4}{kx}$ **or** $\frac{x^{\frac{5}{2}}y^{\frac{9}{2}}}{3x^{\frac{7}{2}}y^{\frac{1}{2}}}$ or **M1** for $\left(\frac{y^8}{9x^2}\right)^{\frac{1}{2}}$ seen **or** for $\left(\frac{3x}{y^4}\right)^{-1}$ seen
21	12	**3**	**B2** for $y = 6$ or **M1** for $2 \times y^2 + 4 \times y \times 2y$ [= 360] oe If 0 scored, **SC1** for $ky^2 = 360$ seen, leading to $\sqrt{\frac{360}{k}}$
22(a)	9 12 15 12 17 22	**2**	**B1** for one row correct
22(b)	$5n - 3$ oe final answer	**2**	**B1** for $5n + k$ oe seen
22(c)	57	**2**	**M1** for *their* $(5n - 3) = 92$ or **B1** for $n = 19$ soi or for answer 19
23	24	**4**	**M1** for $\frac{60}{360} \times \pi \times 3^2$ oe **AND** **M2** for $\frac{300}{360} \times \pi \times \left(6^2 - 3^2\right)$ oe **or** $\pi \times 6^2 - \pi \times 3^2 - \frac{60}{360} \times \pi \times \left(6^2 - 3^2\right)$ oe or **M1** for $\frac{300}{360} \times \pi \times 6^2$ oe **or** $\frac{300}{360} \times \pi \times 3^2$ oe **or** $\pi \times 6^2$ oe **or** $\pi \times 3^2$ oe 

Question	Answer	Marks	Partial Marks
24(a)	$OA = OC$ radii $\angle APO = \angle CQO$ perpendicular to chord $AP = CQ$ midpoints [of equal chords] RHS **OR** $OA = OC$ radii $OP = OQ$ equal chords [equidistant from centre] $AP = CQ$ midpoints [of equal chords] SSS **OR** $OP = OQ$ equal chords [equidistant from centre] $\angle APO = \angle CQO$ perpendicular to chord $AP = CQ$ midpoints [of equal chords] SAS	**3**	**B1** for the correct pair of angles and one correct pair of sides or for two correct pairs of sides **B1** for correct reason for two pairs of sides/angles
24(b)	35°	**2**	**B1** for $\angle ABC = 70°$ soi or $\angle COB = 110°$ soi or $\angle COQ = 55°$ soi or $\angle OBQ = 35°$ soi 

Question	Answer	Marks	Partial Marks
25(a)	$\begin{pmatrix} 4 & 8 \\ -2 & -7 \end{pmatrix}$	**2**	**B1** for two or three correct elements
25(b)(i)	–2	**1**	
25(b)(ii)	$-\frac{1}{4}\begin{pmatrix} -2 & 1 \\ -2 & 3 \end{pmatrix}$ oe isw or $\begin{pmatrix} \frac{1}{2} & -\frac{1}{4} \\ \frac{1}{2} & -\frac{3}{4} \end{pmatrix}$ oe isw	**1**	**FT** $-\frac{1}{4}\begin{pmatrix} \textit{their } k & 1 \\ -2 & 3 \end{pmatrix}$