Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

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

Paper 1 **May/June 2018**

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 2018 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).

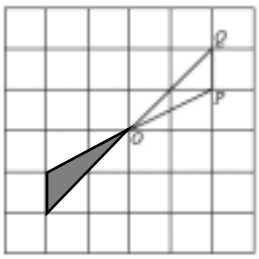
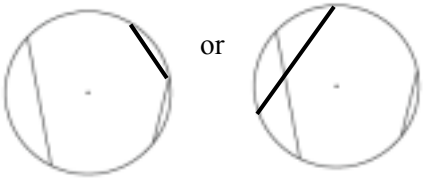
GENERIC MARKING PRINCIPLE 6:

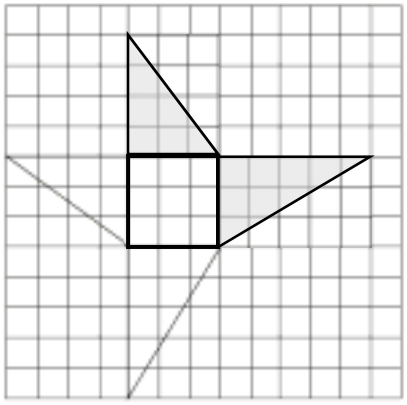
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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)	$\frac{6}{77}$	**1**	
1(b)	[0].0099	**1**	
2(a)	25 cao	**1**	
2(b)	40 cao	**1**	
2(c)	5 : 6 : 16 oe	**1**	
3(a)	–1.2 –0.3 0.05 0.2 1.3	**1**	
3(b)(i)	0.01 oe	**1**	
3(b)(ii)	2.5 oe	**1**	
4	360	**2**	**B1** for $k = 90$ if $y = \frac{k}{x^2}$ used or **M1** for $10 \times 3^2 = y \times \left(\frac{1}{2}\right)^2$ oe or **FTM1** for $y = \frac{their\ k}{\left(\frac{1}{2}\right)^2}$
5(a)	$(5t – 2)(5t + 2)$ final answer	**1**	
5(b)	$(x – 6)(x – 3y)$ final answer	**2**	**B1** for a correct partial factorisation e.g. [–]6$(x – 3y)$ or $x(x – 3y)$ or $x(x – 6)$ or [–]3$(xy – 6y)$, etc.
6(a)	63.5	**1**	
6(b)	200[.0]	**1**	

Question	Answer	Marks	Partial Marks
7(a)		**1**	
7(b)	A correct chord  or	**1**	
8	–1	**2**	**M1** for $4 \times 3x = x - 11$ or better or for $4 \times 3x - (x - 11) = 0$ or better
9(a)	$\frac{19}{6a}$ final answer	**1**	
9(b)	$\frac{2b}{3}$ final answer	**2**	**B1** for $\frac{20b^3}{30b^2}$ oe seen or **M1** for $\frac{5}{2b^2} \times \frac{4b^3}{15}$ or for $\frac{10b}{4b^3} \div \frac{15}{4b^3}$
10	600 **and** 16 **and** 0.30 seen **and** final answer 8000	**2**	**B1** for two of 600, 16, 0.30 seen
11(a)	$-\frac{1}{4}$ oe	**1**	
11(b)	$\frac{1-2x}{3x}$ oe final answer	**2**	**M1** for correct first step: $y(3x+2)=1$ or $x=\frac{1}{3y+2}$ or $3x+2=\frac{1}{y}$ or better
12(a)	$\frac{80}{400}$ oe	**1**	
12(b)	200	**1**	**FT** (*their*(**a**)) × 1000 where $0 <$ *their* **(a)** < 1
13(a)	1.1 0.5 0.2 0.1 oe	**2**	**B1** for 2 or 3 correct
13(b)	70 cao	**1**	

Question	Answer	Marks	Partial Marks
14(a)	3600	**2**	**M1** for $180 \times (22 - 2)$ oe or $\left(180 - \frac{360}{22}\right) \times 22$ oe
14(b)	163	**2**	**M1** for $2 \times 170 + 20x = \textit{their}\ 3600$ or for $(\textit{their}\ 3600 - 2 \times 170) \div 20$ oe
15(a)	(6) nfww	**2**	**B1** for 76 seen or for 70 seen or **M1** for $(30 \times 1.2 + 20 \times 2) - (40 \times -0.5 + 30 \times 3)$ oe
15(b)	Difference in profit between Week 1 and Week 2 oe	**1**	
16(a)	Correct completion of the curve	**1**	
16(b)(i)	1.7	**1**	
16(b)(ii)	1.3	**1**	
16(b)(iii)	75	**2**	**B1** for 125 seen or **SC1** for answer 74 or 76
17(a)	Correct net 	**2**	**B1** for one correct triangle in correct position
17(b)	36 nfww	**2**	**M1** for area of triangle $= \frac{1}{2} \times 3 \times 4$ or $\frac{1}{2} \times 3 \times 5$ soi
18	Correct region shaded bounded by $x = 2$, $x = 8$, $y = 5$, $y = 10$ and $x + y = 10$	**3**	**B1** for line $x + y = 10$ **B1** for at least three correct lines from $x = 2$, $x = 8$, $y = 5$, $y = 10$

Question	Answer	Marks	Partial Marks
19(a)	Acceptable perpendicular bisector of AB	**1**	
19(b)(i)	Arc, centre C, radius 7 cm	**1**	
19(b)(ii)	Bisector of angle BAC	**1**	
19(c)	P_1 and P_2 marked at intersections of *their***(a)** with **(b)(i)** and **(b)(ii)**	**1**	dependent on correct types of loci in **(b)**.
20(a)(i)	1.4×10^{11} cao	**1**	
20(a)(ii)	5×10^{-9} cao	**2**	**B1** for $\frac{1}{2}\times 10^{-8}$ seen or 0.5×10^{-8} seen or 0.000 000 005 seen
20(b)	5	**1**	
21(a)	71	**1**	
21(b)	[p =] 2 [q =] 1	**1**	Both correct
21(c)	$A = 2$ $B = 4$ $C = 1$	**2**	**B1** for two correct or for $(n + 1)^2 = n^2 + 2n + 1$ or for $(n + \textit{their } q)^2 = n^2 + 2n(\textit{their } q) + (\textit{their } q)^2$ $A + B + C = 7$ or **M1** for $4A + 2B + C = 17$ $9A + 3B + C = 31$
22(a)	106	**1**	
22(b)	127	**1**	
22(c)	59	**1**	
22(d)	31	**1**	**FT** 90 – *their***(c)**

Question	Answer	Marks	Partial Marks
23(a)	$\begin{pmatrix} -2 & -1 \\ -4 & -2 \end{pmatrix}$	**2**	**B1** for two or three correct elements or **M1** for $\begin{pmatrix} 6 & -3 \\ 0 & -2 \end{pmatrix} - 2\begin{pmatrix} 4 & -1 \\ 2 & 0 \end{pmatrix}$ oe or **SC1** for answer $\begin{pmatrix} 2 & 1 \\ 4 & 2 \end{pmatrix}$
23(b)	$\frac{1}{2}\begin{pmatrix} 0 & 1 \\ -2 & 4 \end{pmatrix}$ or $\begin{pmatrix} 0 & \frac{1}{2} \\ -1 & 2 \end{pmatrix}$ oe	**3**	**B2** for $k\begin{pmatrix} 0 & 1 \\ -2 & 4 \end{pmatrix}$ oe with $k \neq \frac{1}{2}$ or for $\frac{1}{2}\begin{pmatrix} . & . \\ . & . \end{pmatrix}$ oe or for 3 or 4 correct elements in $\begin{pmatrix} 0 & \frac{1}{2} \\ -1 & 2 \end{pmatrix}$ seen or **M1** for $\mathbf{Y} = \mathbf{A}^{-1}$; or for $\mathbf{Y} = \mathbf{A}^{-1}\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ or for determinant of $\mathbf{A} = 2$ or **B1** for $\begin{pmatrix} 4 & -1 \\ 2 & 0 \end{pmatrix}\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 4a-c & 4b-d \\ 2a & 2b \end{pmatrix}$
24(a)	2	**1**	
24(b)	Triangle with vertices (5, –1), (8, –1), (8, 1)	**2**	**B1** for two correct vertices, soi or **M1** for a line joining (10, –4) to a vertex of triangle B.
24(c)	$\begin{pmatrix} 5 \\ -1 \end{pmatrix}$	**1**	
25(a)	$\frac{u}{10}$	**1**	
25(b)	$\frac{u}{2}$	**1**	
25(c)	$55u$	**2**	**M1** for attempt to find a relevant area under the graph, soi by $50u$ or $5u$ or $60u$