Cambridge
O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

MATHEMATICS (SYLLABUS D) **4024/21**

Paper 2 Paper 2 **October/November 2018**

MARK SCHEME

Maximum Mark: 100

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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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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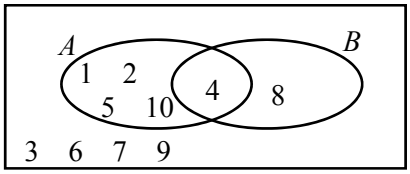
Abbreviations
cao correct answer only
soi seen or implied
isw ignore subsequent working
oe or equivalent
nfww not from wrong working
dep dependent
AG answer given

Question	Answer	Marks	Partial Marks
1(a)(i)	6 points plotted correctly	**2**	**B1** for 4 or 5 points plotted correctly
1(a)(ii)	Positive	**1**	
1(a)(iii)	$\frac{3}{5}$ **cao**	**2**	**B1** for $\frac{6}{10}$ **oe** seen
1(a)(iv)	Ruled line of best fit	**B1**	
1(a)(v)	54 to 58	**B1**	**FT** reading from *their* straight line of best fit at 48 km
1(b)(i)	$20 < t \leqslant 40$	**1**	
1(b)(ii)	39.5	**3**	**B1** for correct use of midpoints **soi** **M1** for $(10 \times 29 + 30 \times 38 + 50 \times 26 + 70 \times 21 + 90 \times 6) \div 120$ **oe**
1(b)(iii)	22.5	**2**	**B1** for 21 + 6 or 27 seen

Question	Answer	Marks	Partial Marks
2(a)	395.25 **cao**	**3**	**B2** for answer 79.05 OR **B1** for [time =] 7.75 **oe soi** **M1** for *their* 7.75×10.20 **oe**
2(b)	23.75	**2**	**M1** for $(19.80 \times 25 - 400) \div 400$ **oe** If 0 scored, **SC1** for answer 123.75 or 123.8
2(c)	14.5[0]	**2**	**M1** for $\frac{(100+8)}{100}x = 15.66$ **soi**
2(d)	3744.14 **final answer**	**3**	**M2** for $3500 \times \left(1+\frac{1.7}{100}\right)^4$ **oe** or **M1** for $3500 \times \left(1+\frac{1.7}{100}\right)^k$ **oe** where $k > 1$

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Question	Answer	Marks	Partial Marks
3(a)	$\cos A = \frac{95^2 + 174^2 - 132^2}{2 \times 95 \times 174}$	**M2**	or **M1** for $132^2 = 95^2 + 174^2 - 2 \times 95 \times 174 \times \cos A$
	$A = 48.56[7\ldots]$ or 48.57	**A1**	
3(b)	1580 to 1581	**4**	**M1** for $\frac{1}{2} \times 95 \times 174 \times \sin 48.6$ AND **M2** for *their* area × 3 ÷ 100 × 8.50 or **M1** for two operations correct in *their* area × 3 ÷ 100 × 8.50 or for 3 ÷ 100 × 8.50 **soi**

Question	Answer	Marks	Partial Marks
4(a)(i)		**2**	**B1** for 8 or 9 numbers correctly placed or for 1, 2, 4, 5, 8, 10 correctly placed with no numbers placed incorrectly
4(a)(ii)	6	**1**	**FT** n($A \cup B$) from *their* Venn diagram
4(a)(iii)	Factors of 10 **oe**	**1**	
4(b)(i)	10	**2**	**B1** for Venn diagram with at least 3 numbers correct Or **M1** for 30 = 8 + 12 + x **oe**
4(b)(ii)	$\frac{42}{870}$ or $\frac{7}{145}$ **oe**	**2**	**M1** for $\frac{\textit{their}\,7}{30} \times \frac{\textit{their}\,6}{29}$[×2] or **SC1** for answer $\frac{49}{900}$ **oe**, FT their Venn diagram

Question	Answer	Marks	Partial Marks
5(a)	–1.6 **oe**	**1**	
5(b)	Correct smooth curve	**3**	**B2FT** for 7 or 8 points correctly plotted or **B1FT** for 5 or 6 points correctly plotted
5(c)(i)	Tangent drawn at (–2, 0.8)	**B1**	
5(c)(ii)	–3.1 to –2.2	**B1**	Dependent on tangent drawn at $x = -2$
5(d)	–2.5 to –2.3 1.4 to 1.6 2.7 to 2.9	**3**	**FT** reading *their* graph at $y = 2$ Tolerance ± 1 mm **B1** for each one correct After 0 scored, **SC1** for $y = 2$ **soi**

Question	Answer	Marks	Partial Marks
6(a)	$\angle TAO = \angle TCO$ tangent perpendicular to radius $AO = CO$ [equal] radii TO is common Congruent RHS	**3**	**B1** for one correct pair of equal angles and one correct pair of equal sides or for two correct pairs of equal sides **B1** for correct reason for two pairs of equal sides/angles
6(b)(i)	$90 - x$	**1**	
6(b)(ii)	$\frac{90 - x}{2}$ **oe**	**1**	**FT** *their* algebraic **(b)(ii)** ÷ 2
6(b)(iii)	$270 - x$	**1**	
6(c)	16.5 or 16.46[…]	**3**	**M2** for $[OT =]\ \frac{6}{\sin 35}$ or **M1** for $\sin 35 = \frac{6}{[OT]}$

Question	Answer	Marks	Partial Marks
7(a)	$\begin{pmatrix}2\\4\end{pmatrix}$	**1**	
7(b)	6.71 or 6.708…	**2**	**M1** for $6^2+(-3)^2$ **oe**
7(c)	(0, 5)	**2**	**FT** *their* **(a)** ((*their* 2 – 2), (*their* 4 + 1)) **B1** for one value in coordinates correct or for $\left[\overrightarrow{CB}=\right]\begin{pmatrix}2\\-1\end{pmatrix}$ **soi**
7(d)(i)	$y=-\frac{1}{2}x+4$ **oe final answer**	**3**	**B2** for $y=-\frac{1}{2}x+c$ **oe** OR **M1** for gradient = $\frac{-3}{6}$ **soi** **M1** for (–2, 5) substituted into $y = mx + c$
7(d)(ii)	$y=2x$ **oe**	**1**	**FT** *their* gradient from **(d)(i)**

Question	Answer	Marks	Partial Marks
8(a)	$n+5$ $n+10$	**1**	Both correct
8(b)(i)	$(n+5)^2$ and $n(n+10)$	**M1**	
8(b)(ii)	$n^2+5n+5n+25-n^2-10n=25$	**A1**	or $n^2+10n-n^2-5n-5n-25=-25$
8(c)	63	**3**	**M1** for $n + n + 5 + n + 10 = 174$ **oe** **A1** for $n = 53$ If 0 scored, **SC1** for answer 53

Question	Answer	Marks	Partial Marks
9(a)(i)	$\pi \times 3^2 \times 21 + \frac{2}{3} \times \pi \times 3^3$	**M3**	**B1** for cylinder height = 21 **soi** **M1** for $\pi \times 3^2 \times$ *their* height **M1** for $\frac{2}{3} \times \pi \times 3^3$
	= 650.3[…] or 650.4	**A1**	
9(a)(ii)	452 or 452.3 to 452.4…	**3**	**M2** for $2 \times \pi \times 3^2 + \pi \times 6 \times 21$ or **M1** for $2 \times \pi \times 3^2$ or $\pi \times 6 \times 21$
9(a)(iii)	21.2 or 21.22 to 21.23…	**2**	**B1** for $\sqrt[3]{\frac{450}{650}}$ **soi** or $\sqrt[3]{\frac{650}{450}}$ **soi**
9(b)	1.57	**3**	**B1** for 4.25 or 335 used **M1** for *their* 4.25 – 8 × *their* 335 ÷ 1000 or for *their* 4250 – 8 × *their* 335

Question	Answer	Marks	Partial Marks
10(a)(i)	$\frac{1}{2}x(x-4) \times 15 = 440$	**M2**	**B1** for height = $(x - 4)$
10(a)(ii)	Correct expansion and simplification leading to $3x^2 - 12x - 176 = 0$	**A1**	
10(b)(i)	$\frac{-(-12) \pm \sqrt{(-12)^2 - 4 \times 3 \times -176}}{2 \times 3}$	**B2**	**B1** for $\sqrt{(-12)^2 - 4 \times 3 \times -176}$ or for $\frac{-(-12) \pm \sqrt{their\ 2256}}{2 \times 3}$
10(b)(ii)	9.92 and –5.92	**B1**	
10(c)	5.92	**1**	**FT (***their* positive root – 4) if result positive
10(d)	18.2 or 18.21 to 18.22…	**4**	**M2** for $[AF =] \sqrt{15^2 + their\ 9.92^2}$ Or for $[BF =] \sqrt{their\ 9.92^2 + their\ 5.92^2 + 15^2}$ **oe** or **M1** for $AF^2 = 15^2 + their\ 9.92^2$ **soi** or for $BF^2 = their\ 9.92^2 + their\ 5.92^2 + 15^2$ **oe** AND **M1** for tan $[AFB] = \frac{their\ 5.92}{their\ 17.98}$ or sin $[AFB] = \frac{their\ 5.92}{their\ 18.93}$

Question	Answer	Marks	Partial Marks
11(a)	$\frac{1-2x}{(2x-3)(x-2)}$ or $\frac{1-2x}{2x^2-7x+6}$ **final answer**	**3**	**B1** for $4(x-2)-3(2x-3)$ **oe isw** **B1** for denominator $(2x-3)(x-2)$ **oe isw**
11(b)	$\frac{2x-3}{x-5}$ **final answer nfww**	**3**	**B1** for $(2x+3)(2x-3)$ seen **B1** for $(2x+3)(x-5)$ seen

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