Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

MATHEMATICS (SYLLABUS D) **4024/22**

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.

Cambridge International is publishing the mark schemes for the October/November 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level 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

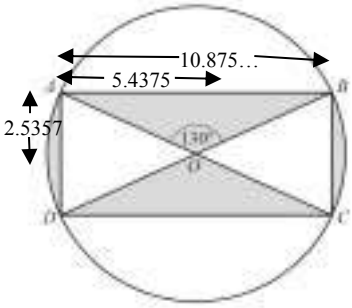
Question	Answer	Marks	Partial Marks
1(a)	23 068.5[0]	**3**	**M1** for $32\,500 \times 0.91$ oe **M1** for *their* $29\,575 \times 0.78$ oe
1(b)	1311.96 cao	**3**	**M2** for $1200 \times \left(1 + \frac{1.8}{100}\right)^5$ oe or **M1** for $1200 \times \left(1 + \frac{1.8}{100}\right)^k$ oe where $k > 1$
1(c)	750	**3**	**M2** for $\left(\frac{100 + 5 \times 2.1}{100}\right)x = 828.75$ soi or **B1** for 5×2.1[%] or better soi
1(d)	181.5[0]	**3**	**M2** for $(275 - 79.20 \div 0.72) \times 1.10$ oe or **M1** for $79.20 \div 0.72$ oe or (275 – *their* 110) × 1.10 oe

Question	Answer	Marks	Partial Marks
2(a)	Correct cumulative frequency curve	**2**	**B1** for at least 5 correct plots
2(b)(i)	118 to 120	**1**	
2(b)(ii)	14 to 18 nfww	**2**	**M1** for reading at CF 150 or 50
2(c)	On average Lim's tomatoes had lower masses oe	**B1**	**Strict FT** their median
	Masses of Ravi's tomatoes were more consistent oe	**B1**	**Strict FT** their IQR
2(d)(i)	46, 26	**1**	
2(d)(ii)	$110 < m \leqslant 120$	**1**	**FT** their frequency table

Question	Answer	Marks	Partial Marks
2(d)(iii)	118.8	**3**	**B1** for correct use of midpoints soi **M1** for (20×90 + 28×105 + 64×115 + *their* 46×125 + *their* 26×135 + 16×150) ÷ 200 oe

Question	Answer	Marks	Partial Marks
3(a)	$\frac{23-2y}{(y-1)(y+6)}$ or $\frac{23-2y}{y^2+5y-6}$ final answer	**3**	**B1** for $3(y+6)-5(y-1)$ oe isw **B1** for denominator $(y-1)(y+6)$ oe isw
3(b)	$\frac{2v+3}{v+4}$ final answer nfww	**3**	**B1** for $(2v+3)(v-4)$ seen **B1** for $(v+4)(v-4)$ seen
3(c)	$3x^2 - 11x + 9$ [= 0]	**B1**	
	$\frac{-(-11)\pm\sqrt{(-11)^2-4\times3\times9}}{2\times3}$ OR $x=\frac{11}{6}\pm\sqrt{\frac{13}{36}}$	**B2**	**B1** for $\sqrt{(-11)^2-4\times3\times9}$ soi or for $\frac{11\pm\sqrt{their\,13}}{2\times3}$ OR **B1** for $3\left(x-\frac{11}{6}\right)^2-\frac{121}{12}+9=0$ oe
	2.43 and 1.23	**B3**	

Question	Answer	Marks	Partial Marks
4(a)	49.7 or 49.72 to 49.74	**3**	**M1** for [time =] $\frac{25}{82}+\frac{36}{60}$ oe or 36 + $\left(\frac{25}{82}\right)\times60$ oe **M1** for 45 ÷ *their* time
4(b)	45.6	**3**	**B1** for 47.5 or 62.5 used **M1** for $\frac{their\,47.5}{their\,62.5}$[×60]
4(c)	$\frac{9}{64}$	**2**	**M1** for $\frac{3}{8}\times\frac{3}{8}$

Question	Answer	Marks	Partial Marks
5(a)	13.8 or 13.78 to 13.79	**2**	**M1** for $\frac{1}{2}\times 6\times 6\times \sin 130$ oe After 0, **SC1** for answer 55.2 or 55.15 to 55.16
5(b)	15.7 or 15.70 to 15.71	**2**	**M1** for $\frac{180-130}{360}\times \pi \times 6^2$ oe After 0, **SC1** for answer 62.8 or 62.83 to 62.84
5(c)	27.7 or 27.8 or 27.74 to 27.80…  	**4**	**M2** for $2\times \textit{their}\,13.8+2\times$ $(\textit{their}\,15.71-\frac{1}{2}\times 6^2\times \sin(180-130))$ or **M1** for $\textit{their}\,15.71-\frac{1}{2}\times 6^2\times \sin(180-130)$ AND **M1** for $\frac{\textit{their}\,31.42}{\pi\times 6^2}$ [×100]

Question	Answer	Marks	Partial Marks
6(a)	Acceptable justification eg Length = $\frac{18}{x}$ leading to answer **or** $y=x+x+\frac{18}{x}$	**1**	
6(b)(i)	20, 13, 20	**2**	**B1** for two correct
6(b)(ii)	Correct smooth curve	**3**	**B2FT** for 8 or 9 points correctly plotted or **B1FT** for 6 or 7 points correctly plotted
6(c)	1.6 to 1.8 and 5.2 to 5.4	**2**	**FT** reading their graph at $y = 14$ Tolerance ± 1 mm **B1FT** for one correct
6(d)(i)	240	**2**	**B1** for $y = 12$ soi
6(d)(ii)	7.4 to 7.7	**2**	**B1** for 17.5 soi

Question	Answer	Marks	Partial Marks
7(a)(i)	Triangle B at (–4, –2), (–6, –2), (–4, –6)	**2**	**B1** for two vertices correct or two correct pairs of coordinates soi or correct size and orientation but wrong position
7(a)(ii)	Enlargement, centre (0, 0) oe, scale factor –2	**2**	**B1** for enlargement
7(a)(iii)	1 : 4 oe	**1**	
7(b)	Triangle *C* at (–4, 2), (–6, 2), (–4, 6)	**2**	**FT** reflection of *their* triangle *B* in *x*-axis **B1FT** for two vertices correct
7(c)	$\frac{1}{3}\begin{pmatrix}3 & 0\\0 & 1\end{pmatrix}$ or $\begin{pmatrix}1 & 0\\0 & \frac{1}{3}\end{pmatrix}$ isw	**2**	**B1** for $k\begin{pmatrix}3 & 0\\0 & 1\end{pmatrix}$ oe with $k \neq \frac{1}{3}$ or for $\frac{1}{3}\begin{pmatrix}. & .\\. & .\end{pmatrix}$

Question	Answer	Marks	Partial Marks
8(a)(i)	Ruled line from (–4, 2) to (0, –2)	**2**	**B1** for short or unruled line or for two correct coordinates soi
8(a)(ii)	Correct region shaded	**2**	**B1** for line $y = 2$ drawn
8(b)	Gradient of $2y = x + 4$ is $\frac{1}{2}$ soi so Gradient of line *L* is –2	**B1**	
	$8 = -2 \times 1 + c$	**M1**	**FT** substitution of (1, 8) into $y =$ *their* $mx + c$ for *L*
	Rearrangement to $c = 10$ and hence showing $y = 10 - 2x$	**A1**	
8(c)	(8.4, 6.2) oe from algebra	**3**	**M1** for a correct method to eliminate one variable **A1** for either $x = 8.4$ or $y = 6.2$ nfww After **A0**, **SC1** for a pair of values that satisfy either equation or for correct answers with no working

Question	Answer	Marks	Partial Marks
9(a)	$AE^2 = \left(\frac{4.3}{2}\right)^2 + \left(\frac{6.2}{2}\right)^2$ oe or $FX^2 = 9.5^2 - \left(\frac{4.3}{2}\right)^2$ or $FY^2 = 9.5^2 - \left(\frac{6.2}{2}\right)^2$	**M2**	**M1** for $AC^2 = 4.3^2 + 6.2^2$ oe or $FX^2 + \left(\frac{4.3}{2}\right)^2 = 9.5^2$ or $FY^2 + \left(\frac{6.2}{2}\right)^2 = 9.5^2$
	$\left[EF^2 =\right]\ 9.5^2 - their\ AE^2$ oe or $\left[EF^2 =\right] their FX^2 - \left(\frac{6.2}{2}\right)^2$ or $\left[EF^2 =\right] their FY^2 - \left(\frac{4.3}{2}\right)^2$	**M1**	Dep on M2
	8.718 to 8.719	**A1**	
9(b)	77.47 to 77.50	**2**	**M1** for $\frac{1}{3} \times 6.2 \times 4.3 \times 8.72$
9(c)	38.1° or 38.09…°	**3**	**M2** for $2\sin^{-1}\left(\frac{3.1}{9.5}\right)$ oe or **M1** for $\sin^{-1}\left(\frac{3.1}{9.5}\right)$ oe Alternative method: **M2** for $\cos AFB = \frac{9.5^2 + 9.5^2 - 6.2^2}{2 \times 9.5 \times 9.5}$ or **M1** for $6.2^2 = 9.5^2 + 9.5^2 - 2 \times 9.5 \times 9.5 \times \cos AFB$
9(d)	76.1° or 76.2° or 76.14 to 76.18°	**2**	**M1** for $\tan[...] = \frac{8.72}{4.3 \div 2}$ oe

Question	Answer	Marks	Partial Marks
10(a)	$\angle BCX = \angle DCY$, [vertically] opposite $\angle XBC = \angle BCX$, $\angle YDC = \angle DCY$, angles in isosceles [triangles] Hence $\angle XBC = \angle YDC$ $\angle CXB = \angle DYC$, third angle in triangle Hence triangles similar	**3**	**B1** for two correct pairs of angles **B1** for correct reason for one pair of angles
10(b)(i)	$90 - x$ oe final answer	**1**	
10(b)(ii)	$180 - 2x$ oe final answer	**1**	**FT** $2 \times$ *their* algebraic (b)(i)
10(c)	16.64	**3**	**B2** for $CY = 5.12$ soi OR **M1** for $\frac{CY}{5.6} = \frac{3.2}{3.5}$ soi **M1** for $2 \times$ *their* $CY + 2 \times 3.2$ After 0, **SC1** for answer 5.12