Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2023**

MARK SCHEME

Maximum Mark: 130

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.

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Cambridge International is publishing the mark schemes for the October/November 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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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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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, non-integer 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 or sign 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 A or B 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

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Question	Answer	Marks	Partial Marks
1(a)(i)	Image at (–5, 3), (–1, 3), (–1, 5)	**2**	**B1** for translation $\begin{pmatrix}-7\\k\end{pmatrix}$ or $\begin{pmatrix}k\\1\end{pmatrix}$
1(a)(ii)	Translation $\begin{pmatrix}7\\-1\end{pmatrix}$ cao	**1**	
1(b)	Image at (6, 4), (6, 6), (2, 6)	**2**	**B1** for reflection in line $x = 4$ or for reflection in line $y = k$
1(c)	Image at (2, –2), (2, –6), (4, –6)	**2**	**B1** for correct size and orientation or for rotation 90° anticlockwise about (0, 0)
1(d)(i)	Image at (–1, –1), (–3, –1), (–3, –2)	**2**	**B1** for correct size and orientation or for enlargement SF $\frac{1}{2}$, centre (0, 0)
1(d)(ii)	Enlargement and [centre] (0, 0) [factor] –2	**2**	**B1** for Enlargement **and** [centre] (0, 0) **B1** for [factor] –2
2(a)(i)	5	**1**	
2(a)(ii)	17	**1**	
2(a)(iii)	18	**1**	
2(a)(iv)	17.88	**3**	**M2** for (1×15 + 3×16 + 19×17 + 11×18 + 10×19 + 6×20) ÷ 50 oe or **M1** for 1×15 + 3×16 + 19×17 + 11×18 + 10×19 + 6×20 oe
2(b)(i)	1 | 8 2 | 0 0 1 1 1 2 5 3 | 0 3 4	**2**	**B1** for two rows correct or for fully correct unordered stem-and-leaf diagram
2(b)(ii)	21	**1**	
2(b)(iii)	10 nfww	**2**	**B1** for [upper qtile] = 30 or [lower qtile] = 20 soi
3(a)(i)	6925.5[0] cao	**2**	**M1** for $7695 \times \frac{100-10}{100}$ oe or **B1** for answer 769.5
3(a)(ii)	8550	**2**	**M1** for $X \times \frac{100-10}{100} = 7695$ oe

Question	Answer	Marks	Partial Marks
3(b)	660	**3**	**B2** for 60 or **M2** for $600 + \frac{600\times 2\times 5}{100}$ oe or **M1** for $\frac{600\times 2[\times 5]}{100}$ oe
3(c)	1.55 or 1.549 to 1.550	**3**	**M2** for $\sqrt[12]{\frac{601.35}{500}}$ or **M1** for $500\times(...)^{12} = 601.35$
3(d)(i)	26.3 or 26.25 to 26.26	**2**	**M1** for $[k]\left(\frac{100-3}{100}\right)^{10}$ oe
3(d)(ii)	23	**3**	**M2** for a correct trial evaluated with n =22 or n = 23 or **M1** for $[k]\ (0.97)^n < 0.5[k]$ oe soi or for $[k](0.97)^n = 0.5[k]$ oe soi, implied by one correct trial $n > 10$ or for $[k](0.97)^{23}$ oe seen If 0 scored **SC1** for answer 22
4(a)	72 or 72.0 cao nfww	**3**	**M2** for $\frac{x}{360}\times 2\times\pi\times 7.5=2\times\pi\times 1.5$ oe or **M1** for $\frac{x}{360}\times 2\times\pi\times 7.5$ or for $2\times\pi\times 1.5$ oe OR **M2** for $\frac{x}{360}\times\pi\times 7.5^2=\pi\times 1.5\times 7.5$ oe or **M1** for $\frac{x}{360}\times\pi\times 7.5^2$ or for $\pi\times 1.5\times 7.5$ oe
4(b)(i)	$2\times\sqrt{17^2-8^2}$ or $\sqrt{34^2-16^2}$ oe	**M2**	**M1** for $17^2 = 8^2 + d^2$ or $34^2 = 16^2 + k^2$
4(b)(ii)	29.3 or 29.30 to 29.31	**4**	**M3** for $([\pi]\times 8^2\times 30)\div\frac{4}{3}\times[\pi]\times 17^3$ [× 100] oe OR **M1** for $\pi\times 8^2\times 30$ oe **M1** for $\frac{4}{3}\times\pi\times 17^3$ oe

Question	Answer	Marks	Partial Marks
4(c)	12.7 or 12.73 to 12.74	**3**	**B2** for 2.26 or 2.261 to 2.262…. soi or **M2** for $\left(20^2 \times 15 - \frac{4}{3} \times \pi \times 6^3\right) \div 20^2$ oe or for $15 - \left(\frac{4}{3} \times \pi \times 6^3 \div 20^2\right)$ oe or **M1** for $20^2 \times 15 - \frac{4}{3} \times \pi \times 6^3$ oe or $20^2 \times D = \frac{4}{3} \times \pi \times 6^3$ oe If 0 scored, **SC1** for answer 11[.0] or 10.97 to 10.98
5(a)	20	**2**	**M1** for $11x = 10(x + 2)$ oe

Question	Answer	Marks	Partial Marks
5(b)(i)	$\frac{95}{y}+\frac{147}{y+2}=12$	**M2**	**M1** for $\frac{95}{y}$ or $\frac{147}{y+2}$
	$95(y+2)+147y=12y(y+2)$ oe	**M1**	Allow correct or for clearing *their* equation with algebraic fractions in y and $y + 2$ Allow $95y+190+147y=12y^2+24y$ oe
	leading to $6y^2 – 109y – 95 = 0$	**A1**	With all brackets shown expanded and no errors or omissions
5(b)(ii)	$(6y + 5)(y – 19)$	**2**	**B1** for $(6y + a)(y + b)$ with $ab = –95$ or $a + 6b = –109$ or $(3y + a)(2y + b)$ with $ab = –95$ or $2a + 3b = –109$ or for partial factorisation $y(6y + 5) – 19(6y + 5)$ or $6y(y – 19) + 5(y – 19)$
5(b)(iii)	19	**1**	Correct or FT *their* positive answer from factors dep on B1 earned
6	11.9 or 11.91 to 11.92	**7**	**B5** for $t = 1.055$ or 1.0550... **M1** for $\tan w=\frac{\textit{their } t}{5}$ oe OR **M1** for $(2t+3)^2=t^2+5^2$ oe seen isw **M2** for $3t^2+12t-16[=0]$ oe seen isw or **B1** for $4t^2+6t+6t+9$ **M1FT** for $\frac{-12\pm\sqrt{12^2-4(3)(-16)}}{2(3)}$ oe **M1** for $\tan w=\frac{\textit{their } t}{5}$ oe
7(a)(i)	21.5 or 21.52...	**2**	**M1** for $\tan(\ldots)=\frac{2.8}{7.1}$ oe
7(a)(ii)	10.2 or 10.17 to 10.18	**3**	**M2** for $\left(\frac{2.8}{\tan 21}\right)^2+7.1^2$ oe or **M1** for $\frac{2.8}{PR}=\tan 21$ oe

Question	Answer	Marks	Partial Marks
7(b)	76.5 or 76.52 to 76.53	**3**	**M2** for $[\sin =]\frac{16.7\sin 32}{9.1}$ oe or **M1** for $\frac{9.1}{\sin 32}=\frac{16.7}{\sin M}$ oe
7(c)(i)	$\frac{1}{2}\times 12.3\times 21.5\sin(...)=62.89$ or better	**M1**	
	28.40 to 28.41…	**A1**	
7(c)(ii)	12.2 or 12.17 to 12.18	**3**	**M2** for $\sqrt{12.3^2+21.5^2-2\times 12.3\times 21.5\times\cos 28.4}$ OR **M1** for $12.3^2 + 21.5^2 – 2 \times 12.3 \times 21.5 \times \cos 28.4$ **A1** for 148 or 148.2 to 148.3
7(c)(iii)	6.6[0] to 6.62	**3**	**M2** for $21.5\cos 28.4 – 12.3$ or **M1** for $21.5\cos 28.4$
8(a)(i)	$\frac{1}{6}$ oe	**1**	
8(a)(ii)	25	**1**	**FT** *their* **(a)(i)** dep on $0 <$ **(a)** < 1
8(b)(i)	$\frac{11}{36}$ oe	**3**	**M2** for $\frac{1}{6}\times\frac{2}{6}+\frac{3}{6}\times\frac{3}{6}$ oe or correct possibility diagram with 11 outcomes identified or **M1** for $\frac{1}{6}\times\frac{2}{6}$ or $\frac{3}{6}\times\frac{3}{6}$ oe or lists the 11 required outcomes or for possibility diagram but required outcomes not indicated
8(b)(ii)	$\frac{2}{11}$ oe	**2**	**M1** for $\frac{2}{k}$ or $\frac{p}{their\,11}$ seen oe leading to answer
8(c)	6	**2**	**M1** for $\left(\frac{4}{6}\right)^k\times\frac{2}{6}=\frac{32}{729}$ written oe soi by one trial with $k > 1$ or $2^{n-1}=32$ or better or $3^n=729$ or better
9(a)	$12x^2-4x^3$ oe final answer	**2**	**B1** for $12x^2$ or $–4x^3$ in final answer or for correct answer seen

Question	Answer	Marks	Partial Marks
9(b)	(3, 27)	**3**	**B2** for $x = 3$ OR **M1** for *their* $12x^2 - 4x^3 = 0$ or better or states $\frac{dy}{dx} = 0$ **M1dep** for substituting *their* x into $y = 4x^3 - x^4$ shown
9(c)	–64	**3**	**M1** for $4x^3 - x^4 = 0$ **B1** for $x = 4$
10(a)	[*DEF*], *BCD* *ADF*, *ADB*	**2**	**B1** for each pair
10(b)	*OQ* *OQT* Tangent perpendicular to radius RHS equal	**5**	**B1** for each
11(a)	4	**1**	
11(b)	$7 - 3x$ final answer	**2**	**M1** for $1 - 3(x - 2)$
11(c)	$\frac{1-x}{3}$ oe final answer	**2**	**M1** for $x = 1 - 3y$ or $y - 1 = -3x$ or $1 - y = 3x$ or $\frac{y}{3} = \frac{1}{3} - x$
11(d)	$a = 2$, $b = 5$, $c = -1$	**5**	**B4** for two correct values <u>only</u> after correct substitution seen i.e. $(1 - 3x - 1)^2 - (x - 1)^2(1 - 3x)$ or for correct unsimplified expansion or a correct simplified expansion. OR **M1** for $(1 - 3x - 1)^2 - (x - 1)^2(1 - 3x)$ **B2** for correct expansion of $[-](x - 1)^2(1 - 3x)$ $[-](x^2 - x - x + 1 - 3x^3 + 3x^2 + 3x^2 - 3x)$ or better or **B1** for expansion of one pair of brackets $[(x-1)^2 =]x^2 - x - x + 1$ or better or $[(x - 1)(1 - 3x) =] - 3x^2 + x + 3x - 1$

Question	Answer	Marks	Partial Marks
11(e)	$\frac{3-x+3x^2}{x}$ final answer	**3**	**B1** for $3-x(1-3x)$ or better **B1** for common denominator x isw
11(f)	–7	**1**	
12(a)(i)	$\begin{pmatrix}2\\5\end{pmatrix}$	**1**	
12(a)(ii)	$\begin{pmatrix}-6\\4\end{pmatrix}$	**1**	
12(b)	$[y=]-\frac{2}{3}x+\frac{19}{3}$ oe	**3**	**M1** for gradient = $\frac{1-5}{8-2}$ oe **M1** for substituting (8, 1) or (2, 5) into $y = $ *their* $mx + c$
12(c)	$[y=]\frac{3}{2}x-\frac{9}{2}$ oe	**4**	**B1** for (5, 3) oe **M1** for gradient = $-\frac{1}{\textit{their}\text{ gradient of }AB}$ **M1** substituting *their* midpoint into $y =$ *their* $mx + c$
12(d)	$\frac{65}{6}$ oe	**2**	**M1** for *their* $\frac{19}{3}$ – *their* $-\frac{9}{2}$ oe