Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/43**

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

awrt	answers which round to
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
nfww	not from wrong working
oe	or equivalent
rot	rounded or truncated
SC	Special Case
soi	seen or implied

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Question	Answer	Marks	Partial Marks
1(a)	18593 cao	**2**	**M1** for $7437.05 \times 250 \div 100$ oe
1(b)	804.53 cao	**2**	**M1** for $5400 \div 671.20$ [$\times 100$] oe
1(c)(i)	2000	**2**	**M1** for $3500 \div (4 + 3)$ [$\times k$] oe
1(c)(ii)	1354.13 …	**3**	**M2** for (3500 – *their* **(c)(i)**) $\times \frac{77.05}{85.35}$ oe or **M1** for (3500 – *their* **(c)(i)**) ÷ figs 85.35 oe or for $\frac{77.05}{85.35}$ oe or for (3500 – *their* **(c)(i)**) × figs 77.05
1(c)(iii)	2 [h] 52 [min] nfww	**3**	**M2** for $\frac{2100 \text{ to } 2200}{740+10}$ or $\frac{2200-50}{740 \text{ to } 760}$ or **M1** for 2200 + 50 or 2200 – 50 or 740 + 10 or 740 – 10
2(a)	36.7 or 36.66 to 36.67 or $36\frac{2}{3}$	**2**	**M1** for $\frac{11}{8+6+11+5}$ [$\times 100$] oe
2(b)(i)	72, 132 and 60	**2**	**M1** for $360 \div (8 + 6 + 11 + 5)$ oe or $96 \div 8$
2(b)(ii)	Correct pie chart drawn	**2**	For 2 marks, strict **FT** *their* angles for correct pie chart only if angles add up to 360. **B1FT** for one correct sector
2(c)	29	**2**	**M1** for $8 \times \left(1+\frac{262.5}{100}\right)$ oe or **B1** for 21
2(d)(i)	1.5×10^9	**1**	
2(d)(ii)	70.8 or 70.75…	**2**	**M1** for 1500 [million] ÷ 21.2 [million]
3(a)	Rotation 90° [anticlockwise] oe (2, 7)	**3**	**B1** for each
3(b)(i)	Image at (–4, –1), (–3, –1), (–4, –4)	**2**	**B1** for reflection in $y = k$ or $x = 1$
3(b)(ii)	Image at (2, –4), (1, –4), (1, –1)	**2**	**B1** for translation by $\begin{pmatrix}5\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-7\end{pmatrix}$
3(b)(iii)	Image at (–4, 7), (–4, 1), (–2, 1)	**2**	**B1** for enlargement, factor 2 with other centre

Question	Answer	Marks	Partial Marks
4(a)	144	**2**	**M1** for $180 - \frac{360}{10}$ or $\frac{180(10-2)}{10}$ oe
4(b)	$w = 20$ $x = 20$ $y = 60$ $z = 45$	**5**	**B1** for w **B1FT** for x = *their* w **B2FT** for $y = 80 -$ *their* w or **B1** for angle $BDC = 20$ FT *their* w or angle $ADE = 55$ or angle $CAD = 25$ **B1FT** for $z = 25 +$ *their* w or $105 -$ *their* y
5(a)	28 and 45 on table	**B2**	**B1** for each
	Histogram correctly completed	**B3**	**B1** for each correct bar If 0 scored, **SC1** for two of FD's 3.8, 1.9 or 0.6 oe soi
5(b)	30.7 or 30.66 to 30.67	**4**	**M1** for midpoints **soi** **M1** for use of $\sum fh$ with h in correct interval including both boundaries **M1** (dep on 2nd M1) for $\sum fh \div$ (*their* 28 + *their* 45 + 57 + 38 + 12)
5(c)	Exact values are not known oe	**1**	
5(d)	$\frac{1254}{39\,697}$ oe	**4**	**M3** for $N\left(\frac{38+57}{57+38+12} \times \frac{12}{56+38+12} \times \frac{11}{56+38+11}\right)$ oe where $N = 1$, 2 or 3 or **M2** for $\frac{38+57}{57+38+12}$ and $\frac{12}{56+38+12}$ or $\frac{12}{57+38+12}$ and $\frac{11}{57+38+11}$ oe seen or **M1** for $\frac{38+57}{57+38+12}$ or $\frac{12}{57+38+12}$ oe seen If 0 scored **SC1** for answer $\frac{41040}{1225043}$ or 0.0335…
6(a)(i)	7	**1**	
6(a)(ii)	$\frac{1}{8}$ oe	**2**	**M1** for g(–0.5) or for $64^{5(x)-3}$ or better

Question	Answer	Marks	Partial Marks
6(b)	$\frac{2-x}{x}$ or $\frac{2}{x}-1$ final answer	**3**	**M1** for $y(x+1)=2$ or $x=\frac{2}{y+1}$ or better **M1** for $\frac{2-y}{y}$ or $xy=2-x$ oe
6c	$-\frac{5}{6}$ –0.833 or better	**2**	**M1** for $[64^x=]\ 2^{6x}$ or $(2^6)^x$ or $6x=-5$
6(d)	$\frac{7-9x}{(5x-3)(x+1)}$ or $\frac{7-9x}{5x^2+2x-3}$ or $-\frac{9x-7}{5x^2+2x-3}$ final answer	**4**	**B1** for $\frac{1}{5x-3}-\frac{2}{x+1}$ **M1** for $x+1-2\,(5x-3)$ seen isw **M1** for $(5x-3)(x+1)$ seen isw
7(a)	0, –1.5 oe, –2.8	**3**	**B1** for each
7(b)	Correct graph	**4**	**B3 FT** for 10 or 11 correct points FT *their* table or **B2 FT** for 8 or 9 correct points FT *their* table or **B1 FT** for 6 or 7 correct points FT *their* table
7(c)	65 to 67	**1**	**FT** intersection of *their* graph with $y=-2$
7(d)	$y=2-\frac{x}{40}$ oe ruled	**M2**	**M1** for $[y=]\ 2-\frac{x}{40}$ oe soi or for $3\cos 2x=\ 2-\frac{x}{40}$ oe soi
	32 to 36	**B1**	
8(a)(i)	$\sin[BOC]=\frac{2}{6}$ or better oe	**M1**	
	19.47…	**A1**	
8(a)(ii)	64.6 or 64.55 to 64.58	**3**	**M2** for $\frac{360-135-19.5}{360}\times\pi\times6^2$ oe or **M1** for $\frac{k}{360}\times\pi\times6^2$ oe

Question	Answer	Marks	Partial Marks
8(a)(iii)	16.1 or 16 10 to 16.13	**5**	**M2** for $2 \times \sqrt{6^2 - 2^2}$ oe or $2 \times 6 \cos 19.5$ oe or **M1** for $OC^2 + 2^2 = 6^2$ oe or $6 \cos 19.5$ or better AND **M2** for $\sqrt{6^2 + \textit{their } OD^2 - 2 \times 6 \times \textit{their } OD \times \cos 135}$ OR **M1** for $6^2 + \textit{their } OD^2 - 2 \times 6 \times \textit{their } OD \times \cos 135$ **A1** for 259 to 260
8(a)(iv)	94.2 or 94.3 or 94.15 to 94.27… nfww	**4**	**M1** for ½ × 6 × *their OD* × sin 135 oe **M1** for ½ × 6 × 2 × sin(90 – 19.5) oe or for ½ × *their OC* × 2 **M1dep** for *their* **(a)(ii)** + *their* two triangle areas
8(b)	1000 cao	**3**	**M2** for $160 \times \left(\frac{20}{8}\right)^2$ or $160 \div \left(\frac{8}{20}\right)^2$ oe or **M1** for $\left(\frac{20}{8}\right)^2$ or $\left(\frac{8}{20}\right)^2$ oe OR **M2** for $\frac{\text{sector angle}}{360} \times \pi 20^2$ or **M1** for $\frac{160}{\pi 8^2} \times 360$ oe or better OR **M2** for $\frac{\text{percentage}}{100} \times \pi 20^2$ oe or better or **M1** for $\frac{160}{\pi 8^2}$ [× 100] oe or better
9(a)	[AB^2 =] $(3 - 0)^2 + (3 - 2)^2$ oe or better	**M1**	or $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$ oe
	[AC^2 =] $(0 - 2)^2 + (4 - 0)^2$ oe or better	**M1**	or $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$ oe
	[BC^2 =] $(0 - 3)^2 + (4 - 3)^2$ oe or better	**M1**	or $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$ oe

Question	Answer	Marks	Partial Marks
	Triangle is isosceles [with 10, 20 and 10 or better shown]	**A1**	or Triangle is isosceles and only vector *AB* and *BC* have the same magnitude [because they have the same components]
9(b)(i)	[y =] $-\frac{1}{2}x + 2$ oe	**3**	**M1** for $\frac{0-2}{4-0}$ oe **M1** for substituting (0, 2) or (4, 0) into $y = $ *their* $mx + c$ oe or **B1** for answer $y = kx + 2$
9(b)(ii)	[y =] $2x - 3$	**4**	**M1** for $\frac{-1}{\textit{their}\ \text{grad}\ \textbf{(b)(i)}}$ **B1** for (2, 1) **M1** for substituting *their* (2, 1) into $y = $ *their* $px + d$ oe
9(b)(iii)	(–2, –7)	**3**	**B2** for $w = -2$ or **M1** for $4w + 1 = 2w - 3$ FT *their* **(b)(ii)** or for $2 = \frac{4w+1-3}{w-3}$
10(a)	$14x - 22$ or $2(7x - 11)$ final answer	**2**	**B1** for answer $kx - 22$ or $14x + c$ or for $8x - 4$ or $-18 + 6x$ or for correct answer seen in working
10(b)(i)	$3xy(2x + 3)$ final answer	**2**	**M1** for answer $3(2x^2y + 3xy)$ or $3x(2xy + 3y)$ or $3y(2x^2 + 3x)$ or $xy(6x + 9)$ **B1** for correct answer seen and spoilt
10(b)(ii)	$(2x + y)(2x - y + 4)$ final answer	**3**	**M1** for $(2x + y)(2x - y)$ **M1** for $4(2x + y)$ If 0 scored, SC1 for answer $4x(x + 2) + y(4 - y)$ oe
10(c)(i)	$\frac{100}{x} + \frac{150}{x+10} = 4\frac{1}{3}$ oe or $150 = \left(\frac{13}{3} - \frac{100}{x}\right)(x+10)$	**M1**	
	$\frac{100(x+10)+150x}{x(x+10)}$ [= *their* $4\frac{1}{3}$] or better	**M1**	
	$300x + 3000 + 450x = 13x^2 + 130x$ oe or better	**B1**	Allow correct multiples
	$13x^2 - 620x - 3000 = 0$	**A1**	With no errors or omissions

Question	Answer	Marks	Partial Marks
10(c)(ii)	$\frac{[--]620 \pm \sqrt{(-620)^2 - 4(13)(-3000)}}{2(13)}$ or $-\frac{(-620)}{2\times13} \pm \sqrt{\frac{620^2}{4\times13^2} - \frac{(-3000)}{13}}$ both oe or better	**M2**	**M1** for $\sqrt{(-620)^2 - 4\times13\times-3000}$ oe or for $\frac{--620+\sqrt{p}}{2(13)}$ or $\frac{--620-\sqrt{p}}{2(13)}$ oe
	52.1 final answer	**B1**	
11(a)	(–2, 0) (0, 18) (4.5, 0) oe	**4**	**B1** for $B = (0, 18)$ **B3** for $A = (–2, 0)$ and $C = (4.5, 0)$ oe or **B2** for $x = –2$ and $x = 4.5$ oe or **B1** for $(9 – 2x)(2 + x)$ oe or either A or C correct
11(b)	$5 – 4x$ final answer	**2**	**B1** for one correct term when simplified
11(c)	(– 3, –15)	**3**	**B2FT** for $x = – 3$ OR **M1** for *their* **(b)** = 17 **M1 dep** for correct substitution of *their* x into $18 + 5x – 2x^2$ shown

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