Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 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.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the February/March 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).

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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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Maths-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, 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 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 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.

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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)(i)	$\frac{750}{8+7}\times 8$ [= 400]	**M1**	
1(a)(ii)(a)	37.5	**1**	
1(a)(ii)(b)	275	**3**	**M2** for $250 + \frac{250\times 2\times 5}{100}$ oe or **M1** for $\frac{250\times 2\times 5}{100}$ oe
1(a)(iii)	407[.00] cao nfww	**3**	**B2** for 406.5 to 406.7 or **M1** for $350\times\left(1+\frac{0.25}{100}\right)^{60}$ oe isw If 0 scored **SC1** for answer 354 or answer 406
1(b)	24	**2**	**M1** for [C : D =] 6 : 10 oe and [C : E =] 6 : 9 oe or for $\frac{6}{6+10+9}[\times 100]$ oe

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Question	Answer	Marks	Partial Marks
1(c)	56 000 nfww	**3**	**M2** for $60564 \div \left(1+\frac{3}{100}\right) \div \left(1+\frac{5}{100}\right)$ oe or **M1** for $[x\times]\left(1+\frac{3}{100}\right)\times\left(1+\frac{5}{100}\right)$ or for $60564 \div \left(1+\frac{3}{100}\right)$ oe or $60564 \div \left(1+\frac{5}{100}\right)$ If 0 scored, **SC1** for answer 65499 to 65500
1(d)	2.5[0] or 2.499...	**3**	**M2** for $\sqrt[8]{\frac{609.20}{500}}$ oe or **M1** for $500\times(...)^8 = 609.2[0]$ oe
2(a)(i)	7	**1**	
2(a)(ii)	8	**1**	
2(a)(iii)	8.31	**3**	**M1** for 3×6 + 32×7 + 19×8 + 29×9 + 11×10 + 6×11 oe **M1dep on M1** for $\frac{\sum fx}{100}$
2(a)(iv)	$\frac{23}{110}$ oe	**2**	**M1** for $\frac{k}{100}\times\frac{k-1}{99}$ oe, $k < 100$ or **B1** for $\frac{46}{100}$ and $\frac{45}{99}$
2(b)(i)	53	**1**	
2(b)(ii)	20	**1**	

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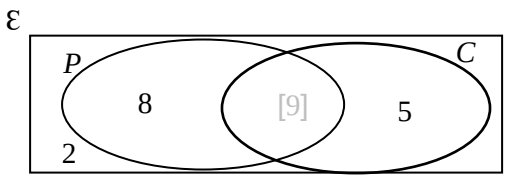
Question	Answer	Marks	Partial Marks
2(c)(i)	151.975	**4**	**M1** for 80, 155, 250 soi **M1** for $\sum fx$ where x is in correct interval including boundaries **M1 dep** for $\frac{\sum fx}{200}$ dep on second M1
2(c)(ii)	Correct histogram completed with widths 110 to 200 and 200 to 300 and heights 1.1 and 0.41	**2**	**B1** for one correct block If 0 scored, **SC1** for 1.1 and 0.41 seen
3(a)	$[h =] \frac{\frac{1}{2}\times\frac{4}{3}\times\pi\times3^3}{\pi\times12^2}$ oe leading to 0.125 or $3 - \frac{\pi\times12^2\times3-\frac{1}{2}\times\frac{4}{3}\times\pi\times3^3}{\pi\times12^2}$ oe leading to 0.125	**M3**	**M2** for $\pi\times12^2\times h=\frac{1}{2}\times\frac{4}{3}\times\pi\times3^3$ oe or for $\pi\times12^2\times3=\pi\times12^2\times x+\frac{2}{3}\times\pi\times3^3$ oe or for $\frac{\frac{1}{2}\times\frac{4}{3}\times\pi\times3^3}{\pi\times12^2\times3}=\frac{h}{3}$ oe or **M1** for $\pi\times12^2\times h$ or $\frac{1}{2}\times\frac{4}{3}\times\pi\times3^3$ oe or $\pi\times12^2\times3$

Question	Answer	Marks	Partial Marks
3(b)	4.8[0] or 4.795 to 4.796	**3**	**M2** for $\pi \times 12^2 \times (3 - 0.125) = \pi \times R^2 \times 18$ oe or $\pi \times 12^2 \times 3 - \frac{2}{3} \times \pi \times 3^3 = \pi \times R^2 \times 18$ or **B1** for $3 - 0.125$ or for 414π oe
3(c)	10.5 or 10.47 to 10.49	**3**	**M2** for $\frac{\frac{4}{3} \times \pi \times 3^3 - 30 \times 1.5^3}{\frac{4}{3} \times \pi \times 3^3}$ or $\frac{30 \times 1.5^3}{\frac{4}{3} \times \pi \times 3^3} \times 100$ oe or **M1** for $\frac{4}{3} \times \pi \times 3^3 - 30 \times 1.5^3$ or $\frac{30 \times 1.5^3}{\frac{4}{3} \times \pi \times 3^3}$ oe
4(a)(i)	Triangle at (3, –1), (9, –1), (9, 2)	**2**	**B1** for correct shape, size and orientation or for correct plots but no triangle
4(a)(ii)(a)	Triangle at (3, 3), (4, 3), (3, 5)	**2**	**B1** for correct shape size and orientation or for rotation about (4, 2) 90˚ anticlockwise or for correct plots but no triangle
4(a)(ii)(b)	Triangle at (4, 3), (5, 3), (5, 5)	**3**	**B2** for correct shape size and orientation or for correct plots but no triangle or **M1** for $x + y = 6$ drawn
4(a)(ii)(c)	Reflection $x = 4$	**2**	**B1** for each

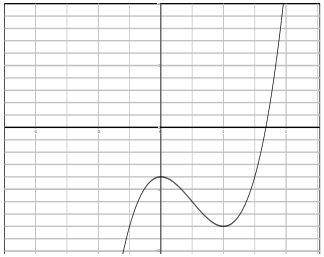
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Question	Answer	Marks	Partial Marks
4(b)	$\frac{5}{7}\mathbf{a} + \frac{2}{7}\mathbf{b}$ final answer	**3**	**B2** for correct unsimplified answer OR **M2** for $\overrightarrow{HZ} = \frac{2}{7}(\mathbf{b}-\mathbf{a})$ or $\overrightarrow{KZ} = \frac{5}{7}(\mathbf{a}-\mathbf{b})$ oe or **M1** for $\overrightarrow{HK} = -\mathbf{a} + \mathbf{b}$ or $\overrightarrow{KH} = -\mathbf{b} + \mathbf{a}$ or for a correct route
5(a)	$6p^4 - 13p^2 + 6$ final answer	**2**	**B1** for three of $6p^4 - 9p^2 - 4p^2 + 6$ seen
5(b)(i)	175	**2**	**M1** for $\frac{1}{2}(20+30)\times 7$ oe
5(b)(ii)	$\frac{2s-ut}{t}$ or $\frac{2s}{t} - u$ final answer	**3**	**B2** for correct answer but unsimplified e.g. $\frac{s \div t}{0.5} - u$, $\frac{s}{\frac{1}{2}t} - u$, $\frac{s}{0.5t} - u$ **OR** **M1** for correct multiplication by 2 or division by 0.5 **M1** for correctly rearranging terms to isolate term in v **M1** for correct division by t Max 2 marks if final answer incorrect
5(c)(i)	$(2q-3)(t+2)$ final answer	**2**	**B1** for $t(2q-3)+2(2q-3)$ or $2q(t+2)-3(t+2)$

Question	Answer	Marks	Partial Marks
5(c)(ii)	$x(x+5)(x-5)$ final answer	**3**	**B2** for $(x^2-5x)(x+5)$ or $(x^2+5x)(x-5)$ or for correct answer seen then spoiled or **B1** for $x(x^2-25)$
6(a)	$y = 4$ oe	**1**	
6(b)	$[y =]-\frac{1}{2}x+4$ final answer	**2**	**B1** for grad = $-\frac{4}{8}$ oe soi or $[y =]kx+4$
6(c)(i)	Gradient = $\frac{-1}{\textit{their}\text{ gradient in }(b)}$	**M1**	Accept e.g. $2 \times -\frac{1}{2} = -1$ oe or states negative reciprocal of $-\frac{1}{2} = 2$
	Substituting (2, 3) in *their* equation.	**M1**	$3 = 2 \times$ *their* $m + c$
	leading to $y = 2x - 1$	**A1**	No errors or omissions
6(c)(ii)	3.35 or 3.354...	**5**	**B2** for $\left(\frac{1}{2}, 0\right)$ soi or x-coordinate of $D = \frac{1}{2}$ or **M1** for $2x - 1 = 0$ **M2** for $(2-\textit{their}\,\frac{1}{2})^2+(3-\textit{their}\,0)^2$ oe or **M1** for $(2-\textit{their}\,\frac{1}{2})$ and $(3-\textit{their}\,0)$ oe

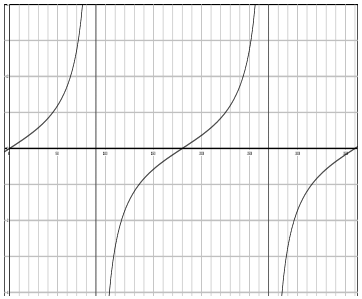
Question	Answer	Marks	Partial Marks
7(a)	Completed Venn diagram.  	**2**	**B1** for two correct values
7(b)(i)	8	**1**	**FT** *their* **(a)** *their* 8 dep < 24
7(b)(ii)	19	**1**	**FT** *their* **(a)** 24 – *their* 5 dep on positive answer
7(c)	$\frac{15}{92}$ oe	**3**	**M2** for $[2\times]\frac{9}{24}\times\frac{their\,5}{23}$ oe or **M1** for $\frac{9}{24}$ and $\frac{their\,5}{23}$ **or** $\frac{their\,5}{24}$ and $\frac{9}{23}$ If 0 scored **SC1** for answer $\frac{5}{32}$ oe
7(d)	$\frac{9}{34}$ oe	**2**	**B1** for $\frac{9}{17}$ seen
8(a)	54	**2**	**M1** for $\frac{1}{2}\times 12\times 9$

Question	Answer	Marks	Partial Marks
8(b)	$2x^2+13x-85\,[=0]$	**B3**	**M1** for $\frac{1}{2}(2x+3)(x+5)\ [=50]$ oe **B1** for $2x^2+10x+3x+15$
	$\frac{-13\pm\sqrt{13^2-4(2)(-85)}}{2(2)}$ oe or $-\frac{13}{4}\pm\sqrt{\frac{85}{2}+\left(\frac{13}{4}\right)^2}$ oe	**M2**	**M1** for $\sqrt{13^2-4\times2\times-85}$ oe or for $\frac{-13+\text{or}-\sqrt{p}}{2(2)}$ oe or for $[2]\left(x+\frac{13}{4}\right)^2$
	4.03 cao	**B1**	
9(a)	–3	**3**	**B2** for $3x^2-6x$ or **B1** for $3x^2-kx$ or for kx^2-6x or for $3x^2-6x+c$
9(b)	(0, –4) and (2, –8)	**4**	**B3** for $x = 0$ and 2 or for (2, –8) OR **M1** for *their* $3x^2-6x=0$ or stating $\frac{dy}{dx}=0$ oe **M1** for correct method to solve *their* $3x^2-6x=0$

Question	Answer	Marks	Partial Marks
9(c)	Correct sketch 	**2**	Max on negative *y*-axis and min in correct quadrant and extends into first quadrant **B1** for positive cubic graph and two turning points
10(a)	$\cos 31 = \frac{AB}{12.3}$ oe	**M1**	
	10.543...	**A1**	
10(b)	$\cos = \frac{12.3}{16.5}$ oe	**M1**	
	41.801 to 41.802	**A1**	
10(c)	16.7 or 16.8 or 16.74 to 16.75…	**3**	**M2** for $\sqrt{10.54^2 + 16.5^2 - 2\times 10.54\times 16.5\times\cos(31+41.8)}$ or for $\sqrt{6.33^2 + 11^2 - 2\times 6.33\times 11\times\cos(180-31)}$ OR **M1** for $10.54^2 + 16.5^2 - 2\times 10.54\times 16.5\times\cos(31+41.8)$ or for $6.33^2 + 11^2 - 2\times 6.33\times 11\times\cos(90+90-31)$ oe **A1** for 280 or 281 or 280.4 to 280.6

Question	Answer	Marks	Partial Marks
10(d)	18.9 to 20.7… nfww	**4**	**M1** for $\sin 31 = \frac{BC}{12.3}$ oe or better and sin 41.8[0] = $\frac{CD}{16.5}$ oe **M2dep on M1** for cos [*DBC*] = $\frac{their(c)^2 + 6.34^2 - 10.998^2}{2 \times their(c) \times 6.34}$ or **M1dep on M1** for 10.998^2 = *their* **(c)**^{2} +6.34^2 – 2 × *their* **(c)** ×6.34 × cos *DBC*
10(e)	2.05 to 2.24… nfww	**4**	**M1** for $\sin 31 = \frac{BC}{12.3}$ oe or better or sin 41.8[0] = $\frac{CD}{16.5}$ oe **M2dep on M1** for $\frac{\text{dist}}{their BC} = \sin(their \text{ angle } CBD)$ or $\frac{\text{dist}}{their CD} = \sin(their \text{ angle } CDB)$ or **M1** for recognition of shortest distance
11(a)	1	**1**	
11(b)	$-\frac{1}{5}$ or –0.2	**2**	**M1** for $2x - 1 + 3x + 2 = 0$ oe isw
11(c)	$9x + 8$ final answer	**2**	**M1** for $3(3x + 2) + 2$

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Question	Answer	Marks	Partial Marks
11(d)	$\frac{4x^2+5x-3}{x(2x-1)}$ final answer	**4**	**M1** for $\frac{1}{2x-1}$ and $3\left(\frac{1}{x}\right)+2$ oe **B1** for $x+3(2x-1)+2x(2x-1)$ oe or better isw **B1** for common denominator = $x(2x-1)$ isw If 0 scored, **SC1** for answer $\frac{4x^2+9x+3}{x(2x+1)}$
11(e)	h(x) indicated	**1**	
12(a)	Correct sketch 	**2**	Condone curve touching asymptotes but not crossing **B1** for one section correct or for 3 sections in correct part of graph but with incorrect curvature and no other sections in incorrect part of graph
12(b)	30 **and** 210 final answer	**2**	**B1** for each If 0 scored **SC1** for two answers (one acute and one reflex) with a difference of 180

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