Cambridge Assessment International Education

Cambridge IGCSE™

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/42**

Paper 4 (Extended) **May/June 2023**

MARK SCHEME

Maximum Mark: 120

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 May/June 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U 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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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.

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method marks, awarded for a valid method applied to the problem.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation 'dep' is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

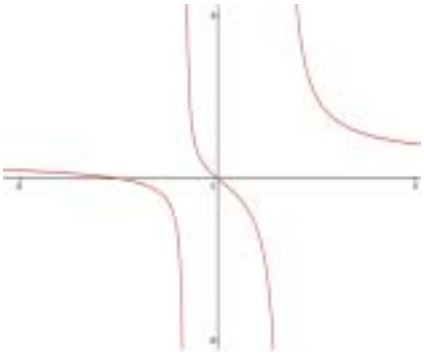
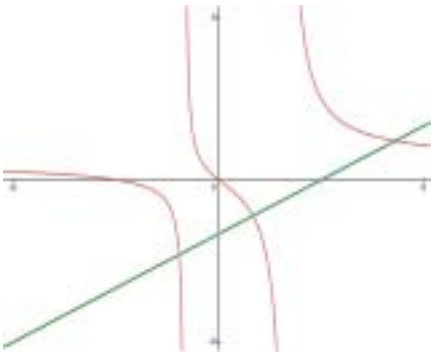
awrt answers which round to
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
nfww not from wrong working
oe or equivalent
rot rounded or truncated
SC Special Case
soi seen or implied

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Question	Answer	Marks	Partial Marks
1(a)	2	**1**	
	$20 - 3n$ oe final answer	**2**	**M1** for $k - 3n$ or for correct answer seen but then spoiled
1(b)	$\frac{6}{7}$	**1**	
	$\frac{n}{n+1}$ oe final answer	**1**	
1(c)	128	**1**	
	2^{n+1} oe final answer	**2**	**M1** for 2^{n+k} oe
1(d)	213	**1**	
	$n^3 - 3$ oe final answer	**2**	**B1** for any cubic seen or **M1** for third differences = 6 or for correct answer seen but then spoiled
2(a)	4.5 nfww	**2**	**M1** for $P\left(1-\frac{4}{100}\right) = 4.32$ oe or better
2(b)	3.52 or 3.522... nfww	**2**	**M1** for $4.32\left(1-\frac{4}{100}\right)^5$ oe
2(c)	2039 nfww	**4**	**B3** for answer 18.9 or 18.86 to 18.87 or 19 nfww OR **M3** for $n\log\left(1-\frac{4}{100}\right) = \log\left(\frac{2}{4.32}\right)$ oe or good sketch indicating value between 18 and 19 or correct trials as far as 18 and 19 or **M2** for $\left(1-\frac{4}{100}\right)^n = \frac{2}{4.32}$ oe or sketch that could lead to solution or at least 3 correct trials or **M1** for $4.32 \times \left(1-\frac{4}{100}\right)^n = 2$ soi. or at least 2 correct trials
3(a)	Triangle at (1, –6), (2, –4), (4, –4)	**2**	**B1** for reflection in $x = -1$ or $y = k$
3(b)	Triangle at (–4, 7), (–3, 5), (– 1, 5)	**2**	**B1** for translation $\begin{pmatrix}-5\\k\end{pmatrix}$ or $\begin{pmatrix}k\\3\end{pmatrix}$

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Question	Answer	Marks	Partial Marks
3(c)	Rotation 90° [anticlockwise] oe [Centre] origin or (0, 0)	**3**	**B1** for each
3(d)	Stretch [Factor] 2 x-axis (or $y = 0$) invariant	**3**	**B1** for each
4(a)	Correct cumulative frequency curve	**4**	**B2** for 5 or 6 correct heights or **B1** for 6, 24, 90, 130, 148, 160 soi **B1** for points plotted at right hand end of interval.
4(b)(i)	66 to 69	**1**	**FT** *their* curve
4(b)(ii)	10 to 15	**2**	**B1** for [lq] = 62 to 64 or [uq] = 74 to 77 **FT** *their* curve for **B1**
4(c)	61 to 63 nfww	**3**	**B2** for 34 soi or **M1** for 160 × 0.6 oe soi by 96
5(a)(i)	72	**1**	
5(a)(ii)	$\frac{5}{\sin\left(\frac{1}{2}their72\right)}$ oe	**M2**	**M1** for $\sin\left(\frac{1}{2}their72\right) = \frac{5}{OD}$ oe
	8.506 to 8.507	**A1**	
5(a)(iii)	172 or 172.0 to 172.2	**2**	**M1** for $\frac{1}{2} \times 8.51^2 \times \sin(their\ 72)$ oe or $\frac{1}{2} \times 8.51 \times (10 \text{ or } 5) \sin 54$ oe or $\frac{1}{2} \times (10 \text{ or } 5) \times 5 \tan 54$ oe
5(b)(i)	15.9 or 15.86...	**3**	**M2** for $18^2 - 8.51^2$ or **M1** for $VO^2 + 8.51^2 = 18^2$
5(b)(ii)	909 to 913	**2**	**M1** for $\frac{1}{3} \times (their172) \times (their15.9)$
5(b)(iii)	11.8 or 11.79 to 11.82	**3**	**M2** for $10 \times \sqrt[3]{\frac{1500}{their\textbf{(b)(ii)}}}$ oe or **M1** for $\sqrt[3]{\frac{1500}{their\textbf{(b)(ii)}}}$ or $\sqrt[3]{\frac{their\textbf{(b)(ii)}}{1500}}$ or $\frac{their\textbf{(b)(ii)}}{1500} = \left(\frac{10}{x}\right)^3$ oe

Question	Answer	Marks	Partial Marks
6(a)	Correct Sketch 	**3**	**B1** for each branch correct
6(b)	$x = 2, x = -1$	**2**	**B1** for each
6(c)	–3, 0	**2**	**B1** for each
6(d)(i)	Correct Sketch 	**1**	
6(d)(ii)	–1.16 or –1.162... 1 5.16 or 5.162...	**3**	**B1** for each
6(d)(iii)	$-1.16 < x < -1$ $1 < x < 2$ $x > 5.16$	**3**	**B1FT** from *their* **(d)(ii)** and *their* **(b)** for each. **FT** dep on answers to **(d)(ii)** that lead to three equivalent inequalities Same accuracy as **(d)(ii)**
7(a)	$y = \frac{1}{2}x + 6$ oe final answer	**3**	**B2** for $\frac{1}{2}x + 6$ OR **M1** for $\frac{10-2}{8-(-8)}$ oe **M1** for substituting (–8, 2) or (8, 10) into $y = (\textit{their } m)x + c$ oe
7(b)	$\frac{1}{2} \times 4 + 6 = 8$ oe	**1**	

Question	Answer	Marks	Partial Marks
7(c)	$y = -2x + 16$ oe final answer	**3**	**B2** for $-2x + 16$ OR **M1** for grad = $-\frac{1}{their\frac{1}{2}}$ **M1** for substituting (4, 8) into $y = (their\ m)x + c$ oe, $their\ m \neq their\ \frac{1}{2}$
7(d)(i)	(6, 4)	**2**	**B1** for each coordinate
7(d)(ii)	Kite	**1**	
7(d)(iii)	17.9 or 17.88 to 17.89 or $8\sqrt{5}$ oe	**2**	**M1** for $(8 - (-8))^2 + (10 - 2)^2$
7(d)(iv)	80 or 79.5 to 80.5	**3**	**M2** for $\frac{1}{2}$ × *their* **(d)(iii)** × *their BD* or $2 \times \frac{1}{2}$ × *their* **(d)(iii)** × *their BN* oe i.e. a correct method for the area of *ABCD*. or **B1**for [*BN* =] 4.47 or 4.472... or $2\sqrt{5}$ oe or [*BD* =] 8.94 or 8.944... or $4\sqrt{5}$ oe or **M1** for a correct method for the area of one of the triangles in *ABCD*.
8(a)	40.2 or 40.17 to 40.19	**5**	**B1** for 27 **M2** for $\sqrt{30^2 + (their\,27)^2 - 2 \times 30 \times (their\,27) \times \cos 140}$ oe or **M1** for $30^2 + (their27)^2 - 2\times30\times(their27)\times\cos 140$ **M1** for *their* 53.57 ÷ *their* time from *B* to *C*
8(b)	[0]18.9 or [0]18.89 to [0]18.91	**3**	**M2** for $\frac{their27\sin140}{their53.57}$ oe or **M1** for $\frac{\sin\theta}{their27} = \frac{\sin140}{their53.57}$
9(a)	$\frac{1}{10}$ oe	**1**	
9(b)	$\frac{2}{15}$ oe	**2**	**M1** for $\frac{4}{10} \times \frac{3}{9}$

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Question	Answer	Marks	Partial Marks
9(c)	$\frac{1}{40}$ oe	**3**	**M2** for $k \times \frac{1}{10} \times \frac{3}{9} \times \frac{1}{8}$ oe, $k = 3, 4, 5$ or 6 or **M1** for $\frac{1}{10} \times \frac{3}{9} \times \frac{1}{8}$ oe If 0 scored **SC1** for indicating 6 possibilities
9(d)	5	**3**	**M2** for $\left(\frac{4}{10}\right)^{n-1} \times \left(\frac{6}{10}\right) = \frac{48}{3125}$ oe or **M1** for $\left(\frac{4}{10}\right)^{k} \times \left(\frac{6}{10}\right)$, $k \geqslant 2$ oe
10(a)	$7x - 11y$ Final answer	**2**	**B1** for $7x - ky$ or $kx - 11y$ k not zero
10(b)	$x^2 + 2x$ Final answer	**1**	
10(c)	$(5b + 4c)(2a - 3b)$ Final answer	**2**	**M1** for $2a(5b + 4c) - 3b(5b + 4c)$ or $5b(2a - 3b) + 4c(2a - 3b)$ or correct answer seen but spoiled
10(d)(i)	$2(x - 3) - 5(2x + 1) = 3(2x + 1)(x - 3)$ oe or better	**M1**	
	$2x - 6 - 10x - 5$ or better	**B1**	
	$[3](2x^2 - 6x + x - 3)$ oe or better	**B1**	
	completion to $6x^2 - 7x + 2$ [= 0]	**A1**	at least one step with no errors or omissions
10(d)(ii)	$(2x - 1)(3x - 2)$ [= 0] or sketch of parabola showing two positive solutions or $\frac{-(-7) \pm \sqrt{(-7)^2 - 4(6)(2)}}{2 \times 6}$	**M2**	**M1** for pair of brackets giving two terms correct or sketch of any parabola for +ve x^2 or correct formula with $\frac{-(-7)}{2 \times 6}$ or $\sqrt{(-7)^2 - 4(6)(2)}$ seen
	$\frac{1}{2}, \frac{2}{3}$ oe	**B1**	
11(a)	1	**1**	
11(b)	–2	**3**	**B2** for $-6x = 12$ oe or better or **M1** for $2(1 - 3x) + 5 = 19$
11(c)	$\frac{1-x}{3}$ oe Final answer	**2**	**M1** for $x = 1 - 3y$ or $y + 3x = 1$ or $\frac{y}{3} = \frac{1}{3} - x$ or $y - 1 = -3x$

Question	Answer	Marks	Partial Marks
11(d)	$\frac{1-5y}{2y+3}$ oe Final answer	**3**	**M1** for $y(2x + 5) = 1 – 3x$ oe **M1FT dep** for $2xy + 3x = 1 – 5y$ dependent on 4 term equation with 2 terms in x. **M1FT** for factorising and dividing to form $\frac{a+by}{c+dy}$ Max 2 marks if final answer is incorrect.