Cambridge Assessment International Education

Cambridge IGCSE™

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

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.

This document consists of **9** printed pages.

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.

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.

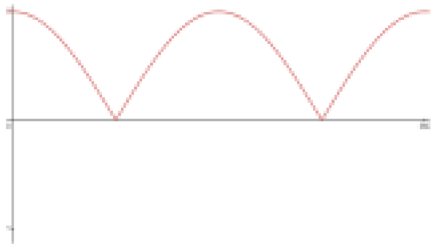
A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

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

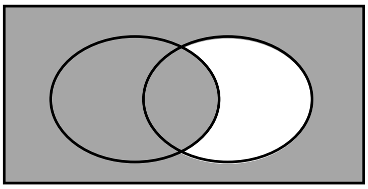
awrt answers which round to
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
nfww not from wrong working
oe or equivalent
rot rounded or truncated
SC Special Case
soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	5	**1**	
1(a)(ii)	5	**1**	
1(a)(iii)	6	**1**	
1(a)(iv)	1.5	**2**	**B1** for [u.q. =] 6.5 or [l.q. =] 5
1(a)(v)	5.6 or $5\frac{3}{5}$	**2**	**M1** for $(1 \times 3 + 3 \times 4 + 8 \times 5 + 7 \times 6 + 7 \times 5 + 1 \times 8) \div 25$
1(b)	72	**2**	**M1** for $\frac{5}{25}[\times 360]$ or $\frac{360}{25}[\times 5]$
1(c)	12	**2**	**M1** for $\frac{8}{3}[\times 4.5]$ or $\frac{4.5}{3}[\times 8]$
2(a)(i)	75	**2**	**M1** for $5^2[\times 3]$
2(a)(ii)	268 or 268.0 to 268.1...	**2**	**M1** for $\frac{4}{3} \times \pi \times 4^3$
2(b)	2.52 or 2.522 to 2.523...	**2**	**M1** for $\pi \times r^2 \times 6 = 120$ or better
2(c)	7.42 or 7.422 to 7.423	**3**	**M1** for $\frac{1}{3} \times \pi \times r^2 \times 6 = 120$ oe or better **M1** for $6^2 + (\textit{their } r)^2$ or better
3(a)	Correct sketch 	**2**	**B1** for correct shape but inaccurate or different domain
3(b)	90, 270	**2**	**B1** for each –1 if *y* cords (0) included
3(c)(i)	60, 120, 240, 300	**2**	**B1** for two or three correct with no extras or four correct with extras –1 if *y* cords (0.5) included
3(c)(ii)	$60 < x < 120$, $240 < x < 300$	**2**	**B1** for each
3(c)(iii)	Correct areas shaded, i.e. below $y = 0.5$ and above $y = \mathrm{f}(x)$	**1**	
3(d)	$0\ [< k <]\ 1$	**1**	

Question	Answer	Marks	Partial Marks
4(a)(i)	792 or 792.35	**2**	**M1** for $650 \times \left(1+\frac{2}{100}\right)^{10}$
4(a)(ii)	22	**4**	**B3** for 21.8 or 21.75... OR **M3** for $n\log\left(1+\frac{2}{100}\right)=\log\left(\frac{1000}{650}\right)$ oe or sketch indicating value between 21 and 22 or correct trials as far as 21 and 22 or **M2** for $\left(1+\frac{2}{100}\right)^{n}=\frac{1000}{650}$ oe or graph which could lead to solution, e.g. $y=1.02^x$ and $y=\frac{1000}{650}$ or at least 3 correct trials with $n > 10$ or **M1** for $650\left(1+\frac{2}{100}\right)^{n}=1000$ oe or at least 2 correct trials
4(b)	573	**2**	**M1** for $(...) \times \left(1+\frac{3}{100}\right)^{2}=607.90$ oe
4(c)	1.2[0] or 1.199 to 1.200	**3**	**M2** for $\sqrt[18]{\frac{247.9}{200}}$ or **M1** for $200 \times [\ldots]^{18} = 247.90$ oe or better
5(a)(i)	4	**1**	
5(a)(ii)	(0, 7)	**1**	
5(b)(i)	8.94 or 8.944...	**3**	**M2** for $(5-1)^2+(11-3)^2$ oe soi by 4^2+8^2 or **M1** for $(5-1)$ or $(11-3)$ or $(1-5)$ or $(3-11)$ soi by ±4 or ±8

Question	Answer	Marks	Partial Marks
5(b)(ii)	$-2x + 17$	**5**	**B1** for (7, 3) **M1** for gradient = $\frac{5-1}{11-3}$ oe **M1** for perp gradient = $-\frac{1}{their\ \frac{1}{2}} = m$ **M1** for *their* 3 = *their m* × *their* 7 + *c* oe
6(a)	6	**1**	
6(b)	100	**2**	**M1** for $h((2+1)^2)$ oe or $((x+1)^2+1)^2$
6(c)	$4 - 2x$ or $2(2 - x)$ final answer	**2**	**M1** for $3 - 2x + 1$
6(d)	$\frac{3-x}{2}$ oe final answer	**2**	**M1** for $y + 2x = 3$ or for $\frac{y}{2} = \frac{3}{2} - x$ or for $x = 3 - 2y$ or $y - 3 = -2x$ or $\frac{3-y}{2}$ oe
6(e)	3.73 or 3.732… or $2+\sqrt{3}$	**2**	**M1** j(75) oe
7(a)(i)	26.6 or 26.56 to 26.57	**2**	**M1** for $\tan = \frac{6}{12}$ oe
7(a)(ii)	13.4 or 13.41 to 13.42	**2**	**M1** for $6^2 + 12^2$ oe
7(a)(iii)	56.4 to 56.5	**3**	**M2** for $2 \times 10 + 2 \times 12 + \frac{2 \times theirCMN}{360} \times 2 \times \pi \times their\ MC$ or **M1** for $\frac{2 \times theirCMN}{360} \times 2 \times \pi \times their\ MC$ oe
7(a)(iv)	203 to 205	**5**	**M1** for $\frac{2 \times theirCMN}{360} \times \pi \times (their\ MC)^2$ **M2** for $\frac{1}{2} \times 12 \times \sqrt{10^2 - 6^2}$ oe or **M1** for $10^2 - 6^2$ **B1** for 144 or 72 or 36

Question	Answer	Marks	Partial Marks
7(b)	248	**3**	**M2** for $558\times\left(\sqrt[3]{\dfrac{240}{810}}\right)^2$ oe or **M1** for $\left(\sqrt[3]{\dfrac{240}{810}}\right)^2$ or $\left(\sqrt[3]{\dfrac{810}{240}}\right)^2$ or for $\left(\dfrac{810}{240}\right)^2=\left(\dfrac{558}{area}\right)^3$ oe
8(a)	$2t + c = 1470$	**B1**	
	$3t + 2c = 2480$	**B1**	
	Correctly eliminating one variable	**M1**	
	460	**B1**	
8(b)(i)	$\dfrac{969}{x}=\dfrac{969}{x+6}+2$ oe	**M1**	
	$969(x + 6) = 969x + 2x(x + 6)$ oe	**M1**	**dep** fractions cleared from equation with two algebraic fractions with linear denominators
	Leading to $x^2 + 6x - 2907$ [= 0]	**A1**	With at least one step and no errors or omissions
8(b)(ii)	–57 and 51	**B2**	**M1** for $(x + 57(x - 51)$ or $\dfrac{-6\pm\sqrt{(-6)^2-4(1)(-2907)}}{2\times1}$ or sketch of parabola (+ve x^2) with one positive x intercept and one negative
8(b)(iii)	19	**B1**	**FT** $\dfrac{969}{their\ 51}$ FT only if *their* 51 and answer are positive integers
9(a)	235	**2**	**M1** for 180 + 55 or for 360 – 125 or for 270 – 35 or for 35 or 55 or 125 or 145 correctly indicated at C.
9(b)	55.1 or 55.06...	**2**	**M1** for $\dfrac{1}{2}\times 12\times 16\sin 35$ oe

Question	Answer	Marks	Partial Marks
9(c)	40.4 or 40.41...	4	**M2** for [sin$C$ =] $\frac{5\sin 118}{12}$ or **M1** for $\frac{12}{\sin 118} = \frac{5}{\sin C}$ oe **M1 dep** for 180 – 118 – *their C* dependent on sine rule used to find angle.
9(d)	15.5 or 15.51... nfww	3	**M2** for $\sqrt{5^2+16^2-2\times 5\times 16\cos(35+theirA)}$ or **M1** for $5^2 + 16^2 - 2 \times 5 \times 16\cos(35 + theirA)$ **A1** for 241 or 240.6 to 240.7...
10(a)(i)		1	
10(a)(ii)	$(A \cup B) \cap C'$ oe	1	
10(b)(i)	10	1	
10(b)(ii)	18	1	
10(b)(iii)	$\frac{8}{20}$ oe	1	
10(b)(iv)	$\frac{33}{95}$ oe	2	**M1** for $\frac{n}{20} \times \frac{n-1}{19}$, $n < 20$
10(b)(v)(a)	$\frac{4}{13}$	2	**M1** for $\frac{n}{14} \times \frac{n-1}{13}$, $n < 14$
10(b)(v)(b)	$\frac{48}{91}$	3	**M2** for $\frac{6}{14} \times \frac{8}{13} + \frac{8}{14} \times \frac{6}{13}$ oe or **M1** for [2 ×] $\frac{n}{14} \times \frac{14-n}{13}$ oe $n < 14$
11(a)(i)	2.1×10^{-5}	1	
11(a)(ii)	3.431×10^{-17}	1	
11(a)(iii)	8×10^{-101}	2	**B1** for 0.8×10^{-100} seen
11(a)(iv)	$2.5\times 10^{2p+1}$	2	**B1** for 25×10^{2p} or $2.5\times 10\times 10^{2p}$ seen
11(b)	$\log y$ or $\log_{10} y$ final answer	1	

Question	Answer	Marks	Partial Marks
11(c)	1.36 or 1.356… or $\dfrac{\log 14}{\log 7}$ or $\log_7 14$ final answer	**1**	
11(d)	$\dfrac{10x^3}{\sqrt{w}}$ or $\dfrac{10x^3}{w^{\frac{1}{2}}}$ or $10x^3w^{-\frac{1}{2}}$ or $\dfrac{10x^3\sqrt{w}}{w}$ final answer	**4**	**M1** log10 soi **M1** for $\log w^{\frac{1}{2}}$ or $\log \sqrt{w}$ or $\log x^3$ **M1** for correct use of $\log p - \log q = \dfrac{p}{q}$ or correct use of $\log p + \log q = \log pq$