Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/31**

Paper 3 (Core) **May/June 2023**

MARK SCHEME

Maximum Mark: 104

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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[Turn over

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.

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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

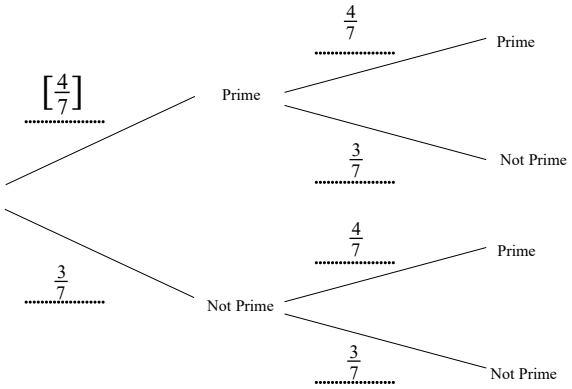
Question	Answer	Marks	Partial Marks
1(a)	40033	**1**	
1(b)	9	**1**	
1(c)	1.286 cao	**2**	**B1** for $\frac{9}{7}$ or 1.29 or 1.285 or 1.285……
1(d)	96	**2**	**B1** for 7776 or 81
1(e)	−21	**1**	
1(f)(i)	52	**1**	
1(f)(ii)	96	**1**	
1(g)	√123	**1**	
1(h)(i)	312	**2**	**B1** for 312*k* as final answer or **M1** for [24 =] 2 × 2 × 2 × 3 or $2^3 \times 3$ **and** [104 =] 2 × 2 × 2 × 13 or $2^3 \times 13$ or 2 correct factor trees or tables or a list of multiples of both 24 and 104 with at least 3 of each or 2 × 2 × 2 × 3 × 13 oe
1(h)(ii)	8	**2**	**B1** for 2 or 4 or 2 × 2 × 2 or 2^3 as final answer, or for a complete list of factors of 24 and 104
2(a)	Quadrilateral	**1**	
2(b)(i)	Rotation 90° clockwise oe (centre) (0, 0) oe	**3**	**B1** for each

Question	Answer	Marks	Partial Marks
2(b)(ii)	Enlargement (scale factor) $\frac{1}{2}$ oe (centre) (7, −8) oe	**3**	**B1** for each
2(c)(i)	Correct translation (4, 0), (7, −2), (7, −5), (3, −4)	**2**	**B1** for a translation of $\begin{pmatrix} k \\ -6 \end{pmatrix}$ or $\begin{pmatrix} 9 \\ k \end{pmatrix}$
2(c)(ii)	Correct reflection (−2, −3), (−2, −6), (−5, −8), (−6, −4)	**2**	**B1** for a reflection in $y = k$ or in $x = -1$
3(a)	0 | 9 1 | 5 8 2 | 0 3 6 3 | 1 2 4 6 7 9 4 | 0 1 1 5	**2**	**B1** for 3 fully correct rows or for a fully correct unordered stem-and-leaf diagram
3(b)	41	**1**	
3(c)	33	**1**	
3(d)	36	**1**	
3(e)	Correct bar chart	**2**	**FT** *their* stem-and-leaf diagram **B1FT** for 3 correct or follow through heights
3(f)	25	**1**	**FT** $\frac{\textit{their } k}{16} \times 100$ from the bar chart or from *their* stem-and-leaf diagram
4(a)(i)	*G*	**1**	

Question	Answer	Marks	Partial Marks
4(a)(ii)	180	**3**	**M2** for $6 \times 5 + 6 \times 9 + 6 \times 5 + 6 \times 3 + 2 \times \frac{1}{2} \times (9 + 3) \times 4$ or $6 \times 22 + 2 \times \frac{1}{2} \times (9 + 3) \times 4$ oe or better or **M1** for [2 ×] $\frac{1}{2}(9+3) \times 4$ oe or $6 \times 5 + 6 \times 9 + 6 \times 5 + 6 \times 3$ or 22×6 oe
4(a)(iii)	Prism trapezium	**2**	**B1** for prism or trapezium
4(a)(iv)	A recognisable attempt at a prism with trapezium cross section	**1**	
4(b)	15	**2**	**M1** for $6 \times 6 \times x = 540$ oe or better
5(a)	$240\,000 \div 5 \times 8 - 240\,000$ or $240\,000 \times \frac{3}{5}$	**M2**	**M1** for $240\,000 \div 5 \times 8$
5(b)(i)(a)	25 000	**2**	**M1** for $45\,000 \div 9$ oe
5(b)(i)(b)	40 000	**1**	
5(b)(ii)	34 000	**2**	**FT** 99 000 – (*their* 25 000 + *their* 40 000) **M1** for 144 000 – 45 000 – (*their* 25 000 + *their* 40 000) oe
5(c)	33 020	**3**	**B2** for 7620 or **M2** for $25\,400 + \frac{25400 \times 5 \times 6}{100}$ oe or **M1** for $\frac{25400 \times 5 \times 6}{100}$ oe
5(d)	17.1 or 17.1[4…]	**2**	**M1** for $\frac{656-560}{560}[\times 100]$ oe or $\left(\frac{656}{560} \times 100\right)[-100]$ oe or $\left(\frac{656}{560} - 1\right)[\times 100]$ oe

Question	Answer	Marks	Partial Marks
6(a)	−5 5 7 5 1	**3**	**B2** for 3 or 4 correct or **B1** for 1 or 2 correct
6(b)	Correct and accurate curve	**4**	**B3FT** for 7 or 8 points correctly plotted or **B2FT** for 5 or 6 points correctly plotted or **B1FT** for 3 or 4 points correctly plotted
6(c)	$x = 1.5$ oe	**1**	
6(d)(i)	−1 1 5	**2**	**B1** for 2 correct
6(d)(ii)	Correct ruled line	**1**	
6(e)	(−1.7 to −1.4, −2.4 to −1.8) (2.4 to 2.7, 5.8 to 6.4)	**3**	**FT** *their* curve and *their* line **B2FT** for 3 values correct or **B1FT** for 2 values correct
7(a)(i)(a)	Diameter	**1**	
7(a)(i)(b)	Tangent	**1**	
7(a)(ii)	Angle between tangent and radius = 90 Angles in a triangle add to 180	**2**	**B1** for each
7(a)(iii)	Opposite angles are equal	**1**	
7(a)(iv)(a)	90	**1**	
7(a)(iv)(b)	59	**2**	**M1** for (180 – 62) ÷ 2 oe
7(a)(iv)(c)	149	**2**	**B1** for $OEB = 31$ or **B1FT** for 180 – *their a* + *their b* or 298 – (*their a* + *their b)*
7(b)	Equal sides Equal angles	**2**	**B1** for each
7(c)	144	**2**	**M1** for 180 – (360 ÷ 10) oe or $\frac{(10-2)\times 180}{10}$ oe
8(a)	9	**2**	**M1** for 6 ÷ 40 [× 60] oe
8(b)(i)	Ruled straight line from (10 40, 6) to (12 20, 6)	**1**	
8(b)(ii)	1 [h] 40 [min]	**1**	

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Question	Answer	Marks	Partial Marks
8(c)	Ruled straight line from (10 15, 10) to (10 55, 6)	**3**	**B1** for (10 15, 10) marked **M1** for 4 ÷ 6 [× 60] If 0 scored, then **SC1** for straight line from (10 15, 0) to (11 15, 6)
8(d)	Ruled straight line from (*their*12 20, 6) to (12 45, 0) Ruled straight line from (*their* 12 20, 6) to (12 50, 10)	**2**	**FT** **B1** for each
9(a)	Primes 2, 3, 5 and 7 and no others in the explanation There are 7 possible outcomes oe	**2**	**B1** for each
9(b)(i)		**2**	**B1** for 2, 3 or 4 correct
9(b)(ii)	$\frac{16}{49}$ oe	**2**	**FT** *their* tree diagram **M1** for $\frac{4}{7}$ ×*their* $\frac{4}{7}$
10(a)	26.9 or 26.92 to 26.93…..	**4**	**M3** for $0.5 \times 8.9 \times 13.2 - 0.5 \times \pi \times 4.5^2$ oe or **M1** for $0.5 \times 8.9 \times 13.2$ and **M1** for $0.5 \times \pi \times 4.5^2$ and **M1** for subtraction of *their* areas
	cm^2	**1**	
10(b)	15.9 or 15.92[……]	**2**	**M1** for $8.9^2 + 13.2^2$ or better