Cambridge Assessment International Education

# Cambridge IGCSE™

**MATHEMATICS** **0580/31**

Paper 3 (Core) **October/November 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 October/November 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.



© UCLES 2023

## 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.

© UCLES 2023

**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.

© UCLES 2023

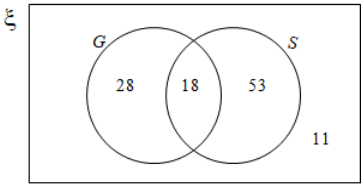
**Abbreviations**
cao – correct answer only
dep – dependent
FT – follow through after error
isw – ignore subsequent working
oe – or equivalent
SC – Special Case
nfww – not from wrong working
soi – seen or implied

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 1(a) | 6 500 000 | **1** | |
| 1(b) | 38 000 | **1** | |
| 1(c)(i) | 6 or 9 | **1** | |
| 1(c)(ii) | 36 | **1** | |
| 1(c)(iii) | 9 or 36 | **1** | |
| 1(c)(iv) | 31 | **1** | |
| 1(c)(v) | $\sqrt{1000}$ | **1** | |
| 1(d)(i) | $(24 - 4) \times 3 + 2 = 62$ | **1** | |
| 1(d)(ii) | $24 - 4 \times (3 + 2) = 4$ | **1** | |
| 1(e) | 0.75 | **1** | |
| 1(f) | 54 | **1** | |
| 1(g) | 2 | **1** | |
| 1(h) | $\frac{17}{3}$ or $\frac{11}{5}$ | **B1** | Correct step for dealing with mixed numbers, allow e.g. $\frac{17k}{3k}$ or $\frac{11k}{5k}$ |
| | $\frac{85}{15}$ and $\frac{33}{15}$ | **M1** | FT Correct method to find a common denominator |
| | $3\frac{7}{15}$ cao | **A1** | |
| | | | Alternative methods<br>$3\frac{2}{3} - \frac{1}{5}$ B1, $\frac{10}{15}$ and $\frac{3}{15}$ M1, $3\frac{7}{15}$ cao A1<br>$5\frac{10}{15}$ and $2\frac{3}{15}$ M1, $3\frac{7}{15}$ cao B1 A1<br>$\frac{10}{15}$ and $\frac{3}{15}$ M1, $3\frac{7}{15}$ cao B1A1 |

© UCLES 2023

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 2(a)(i) | 84 | **1** | |
| 2(a)(ii) | Any chord | **1** | |
| 2(b)(i) | Accurate position marked | **2** | **B1** for accurate distance or accurate angle |
| 2(b)(ii) | 57 | **2** | **FT** *their* diagram for **1** and **2** marks<br>**B1** for 9.2 to 9.6 seen<br>or **M1** for *their* length × 6 |
| 2(c)(i) | $180 - \frac{360}{8}$ or $\frac{(8-2)\times 180}{8}$ | **M1** | |
| 2(c)(ii) | 135 + 135 + 90 = 360 | **M1** | |
| 2(d) | 41 | **2** | **M1** for 180 – 90 – 49 oe<br>or angle *DEF* identified as 90° |
| 3(a)(i) | 9 | **1** | |
| 3(a)(ii) | India | **1** | |
| 3(a)(iii) | 7 | **1** | |
| 3(a)(iv) | 23.75 | **2** | **M1** for $\frac{19}{80}$ [× 100] |
| 3(b)(i) | 10 | **1** | |
| 3(b)(ii) | −5 | **1** | |
| 3(c) | Correct pie chart | **4** | **B3** for 2 correct sectors<br>or **B2** for 1 correct sector or for 54°, 117° and 189°<br>or **M1** for $\frac{360}{80}$ or 4.5 or $\frac{k}{80} \times 360$<br>($k$ = 12, 26 or 42) |
| 4(a)(i) | Fully correct net | **3** | **B2** for 3 or 4 extra correct faces in the correct places<br>or **B1** for 1 or 2 extra correct faces in the correct places |
| 4(a)(ii) | 62 | **2** | **M1** for [2 ×] (5 × 2 + 3 × 2 + 5 × 3) oe |

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 4(b) | 12 | **4** | **M3** for $18x = 216$ oe or $216 \div 18$ oe<br>OR<br>**M1** for $6^3$ or $6 \times 6 \times 6$ or 216<br>**M1** for $\frac{1}{2} \times 4 \times x \times 9$ oe or $18x$<br>**M1** for *their* $18x = 216$ oe or better |
| 5(a) | 14 10 | **1** | |
| 5(b) | 4 | **1** | |
| 5(c) | 2 | **2** | **B1** for 40 or 38 |
| 5(d) | 14 25 | **1** | |
| 5(e) | 34.5 | **3** | **M2** for $\frac{23}{40} \times 60$ oe<br>or **M1** for $\frac{23}{\textit{their}\ \text{time}}$ |
| 6(a) | Translation<br>$\begin{pmatrix} 2 \\ -3 \end{pmatrix}$ | **2** | **B1** for each |
| 6(b) | Enlargement<br>(sf = ) 3<br>(centre = ) (4, 6) | **3** | **B1** for each |
| 6(c) | Correct reflection<br>points (1, 7), (1, 9), (5, 9) | **2** | **B1** for correct reflection in line $y = k$ |
| 7(a) | $7a - b$ final answer | **2** | **B1** for $7a$ or $-b$ in final answer or $7a - b$ seen then spoilt |
| 7(b) | 4.5 | **2** | **M1** for $21 = 8x + 3 \times -5$ oe or better |
| 7(c) | $\sqrt{\frac{S}{k}}$ final answer | **2** | **M1** for $v^2 = \frac{S}{k}$ or $\sqrt{S} = \sqrt{k} \times v$ |
| 7(d) | $x^2 + 2x - 15$ final answer | **2** | **B1** for three correct terms from $x^2 - 3x + 5x - 15$ |

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 7(e) | 18 | **5** | **B1** for $x + 15$ or $3 \times$ *their* $(x + 15)$ oe<br><br>**M1** for<br>$x$ + *their* $(x + 15)$ + *their* $(3(x + 15))$ = 150 or better<br><br>**M1** for $5x + 60 = 150$ or better<br>or *their* linear equation simplified to $ax + b = 150$<br><br>**M1** for *their* $[ax + b = c]$<br>solved to $x = \frac{150 - b}{a}$ |
| 8(a) | $[y =] 2x - 5$ final answer | **2** | **B1** for answer of $2x + c$ or $mx - 5$ $(m \neq 0)$ |
| 8(b)(i) | Correct ruled line | **1** | |
| 8(b)(ii) | (5, 5) | **1** | **FT** *their* ruled $y = x$ |
| 8(c)(i) | −2 −4 −8 8 4 2 | **3** | **B2** for 3, 4 or 5 correct<br>or **B1** for 1 or 2 correct |
| 8(c)(ii) | Correct curve | **4** | **B3FT** for 9 or 10 points correctly plotted<br>or **B2FT** for 7 or 8 points correctly plotted<br>or **B1FT** for 5 or 6 points correctly plotted |
| 9(a) | Less<br>with working leading to 252 | **4** | **M3** for $\frac{1}{24} \times 9 \times 16 \times 42$ oe<br>or<br>**M2** for three of these multiplied<br>or<br>**M1** for any two of these multiplied |
| 9(b) | 630 | **2** | **M1** for $\frac{1080}{21+14+1}$ $[\times k]$ oe<br><br>where $k$ =1,14 or 21 oe |
| 9(c)(i) |  | **2** | **B1** for two or three in the correct places |
| 9(c)(ii) | 18 | **1** | **FT** *their* diagram |
| 9(c)(iii) | $\frac{28}{110}$ oe | **1** | **FT** *their* 28 from *their* diagram |

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 9(d) | $E \cup F$ cao | **1** | |
| 10(a) | 19.2 | **2** | **M1** for $\frac{14.4}{9.6} = \frac{VW}{12.8}$ oe or better |
| 10(b) | 8.4 | **3** | **M2** for $9.1^2 - 3.5^2$ oe or better<br>or **M1** for $[\ldots]^2 + 3.5^2 = 9.1^2$ oe or better |
| 10(c) | 6.88 to 6.881 | **2** | **M1** for $\cos 35 = \frac{[...]}{8.4}$ oe or better<br>or $\sin 55 = \frac{[\ldots]}{8.4}$ oe or better |
| 10(d) | 51.3[4…] | **2** | **M1** for $\tan[\ldots =] \frac{10}{8}$ oe or better |