



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.

This document consists of **15** printed pages.

PUBLISHED**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. |

Abbreviations

| | |
|-----|----------------------------|
| cao | correct answer only |
| dep | dependent |
| FT | follow through after error |
| isw | ignore subsequent working |
| oe | or equivalent |
| SC | Special Case |
| nfw | 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 nfw | 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 nfw | 3 | <p>M2 for $60564 \div \left(1 + \frac{3}{100}\right) \div \left(1 + \frac{5}{100}\right)$ oe</p> <p>or M1 for $[x \times] \left(1 + \frac{3}{100}\right) \times \left(1 + \frac{5}{100}\right)$</p> <p>or for $60564 \div \left(1 + \frac{3}{100}\right)$ oe or $60564 \div \left(1 + \frac{5}{100}\right)$</p> <p>If 0 scored, SC1 for answer 65499 to 65500</p> |
| 1(d) | 2.5[0] or 2.499... | 3 | <p>M2 for $\sqrt[8]{\frac{609.20}{500}}$ oe</p> <p>or M1 for $500 \times (\dots)^8 = 609.2[0]$ oe</p> |
| 2(a)(i) | 7 | 1 | |
| 2(a)(ii) | 8 | 1 | |
| 2(a)(iii) | 8.31 | 3 | <p>M1 for $3 \times 6 + 32 \times 7 + 19 \times 8 + 29 \times 9 + 11 \times 10 + 6 \times 11$ oe</p> <p>M1dep on M1 for $\frac{\sum fx}{100}$</p> |
| 2(a)(iv) | $\frac{23}{110}$ oe | 2 | <p>M1 for $\frac{k}{100} \times \frac{k-1}{99}$ oe, $k < 100$</p> <p>or B1 for $\frac{46}{100}$ and $\frac{45}{99}$</p> |
| 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 | <p>M1 for 80, 155, 250 soi</p> <p>M1 for $\sum fx$ where x is in correct interval including boundaries</p> <p>M1 dep for $\frac{\sum fx}{200}$ dep on second M1</p> |
| 2(c)(ii) | Correct histogram completed with widths 110 to 200 and 200 to 300 and heights 1.1 and 0.41 | 2 | <p>B1 for one correct block</p> <p>If 0 scored, SC1 for 1.1 and 0.41 seen</p> |
| 3(a) | $[h =] \frac{\frac{1}{2} \times \frac{4}{3} \times \pi \times 3^3}{\pi \times 12^2} \text{ oe}$ <p>leading to 0.125</p> <p>or</p> $3 - \frac{\pi \times 12^2 \times 3 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 3^3}{\pi \times 12^2} \text{ oe}$ <p>leading to 0.125</p> | M3 | <p>M2 for $\pi \times 12^2 \times h = \frac{1}{2} \times \frac{4}{3} \times \pi \times 3^3$ oe</p> <p>or for $\pi \times 12^2 \times 3 = \pi \times 12^2 \times x + \frac{2}{3} \times \pi \times 3^3$ oe</p> <p>or for $\frac{\frac{1}{2} \times \frac{4}{3} \times \pi \times 3^3}{\pi \times 12^2 \times 3} = \frac{h}{3}$ oe</p> <p>or M1 for $\pi \times 12^2 \times h$ or $\frac{1}{2} \times \frac{4}{3} \times \pi \times 3^3$ oe</p> <p>or $\pi \times 12^2 \times 3$</p> |

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| 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 | <p>B2 for correct unsimplified answer OR</p> <p>M2 for $\overline{HZ} = \frac{2}{7}(\mathbf{b} - \mathbf{a})$ or $\overline{KZ} = \frac{5}{7}(\mathbf{a} - \mathbf{b})$ oe or M1 for $\overline{HK} = -\mathbf{a} + \mathbf{b}$ or $\overline{KH} = -\mathbf{b} + \mathbf{a}$ or for a correct route</p> |
| 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 | <p>B2 for correct answer but unsimplified e.g. $\frac{s \div t}{0.5} - u$, $\frac{s}{\frac{1}{2}t} - u$, $\frac{s}{0.5t} - u$</p> <p>OR</p> <p>M1 for correct multiplication by 2 or division by 0.5 M1 for correctly rearranging terms to isolate term in v</p> <p>M1 for correct division by t Max 2 marks if final answer incorrect</p> |
| 5(c)(i) | $(2q - 3)(t + 2)$ final answer | 2 | B1 for $t(2q - 3) + 2(2q - 3)$ or $2q(t + 2) - 3(t + 2)$ |

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| 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 $\text{grad} = -\frac{4}{8}$ oe soi or $[y =]kx + 4$ |
| 6(c)(i) | Gradient = $\frac{-1}{\text{their gradient in (b)}}$ | M1 | Accept e.g. $2 \times -\frac{1}{2} = -1$ oe or states negative reciprocal of $-\frac{1}{2} = 2$ |
| | Substituting (2, 3) in <i>their</i> equation. | M1 | $3 = 2 \times \text{their } m + c$ |
| | 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 $(2 - \text{their } \frac{1}{2})^2 + (3 - \text{their } 0)^2$ oe or M1 for $(2 - \text{their } \frac{1}{2})$ and $(3 - \text{their } 0)$ oe |

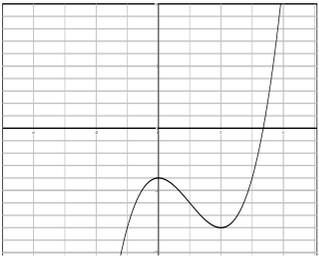
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| Question | Answer | Marks | Partial Marks |
|----------|-----------------------------|-------|--|
| 7(a) | Completed Venn diagram. | 2 | B1 for two correct values |
| 7(b)(i) | 8 | 1 | FT <i>their (a) their 8 dep</i> < 24 |
| 7(b)(ii) | 19 | 1 | FT <i>their (a) 24 – their 5 dep</i> on positive answer |
| 7(c) | $\frac{15}{92}$ oe | 3 | M2 for $[2\times]\frac{9}{24} \times \frac{\text{their } 5}{23}$ oe or M1 for $\frac{9}{24}$ and $\frac{\text{their } 5}{23}$ or $\frac{\text{their } 5}{24}$ 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 $\frac{1}{2} \times 12 \times 9$ |

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| 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 $2x^2 + 10x + 3x + 15$ |
| | $\frac{-13 \pm \sqrt{13^2 - 4(2)(-85)}}{2(2)} \text{ oe}$ or $-\frac{13}{4} \pm \sqrt{\frac{85}{2} + \left(\frac{13}{4}\right)^2} \text{ oe}$ | M2 | M1 for $\sqrt{13^2 - 4 \times 2 \times -85}$ 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 <i>their</i> $3x^2 - 6x = 0$ or stating $\frac{dy}{dx} = 0$ oe M1 for correct method to solve <i>their</i> $3x^2 - 6x = 0$ |

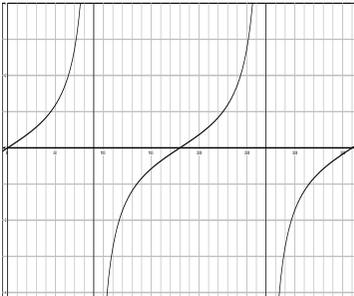
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| Question | Answer | Marks | Partial Marks |
|----------|---|-----------|---|
| 9(c) | Correct sketch  | 2 | Max on negative y-axis and min in correct quadrant and extends into first quadrant B1 for positive cubic graph and two turning points |
| 10(a) | $\cos 31 = \frac{AB}{12.3} \text{ oe}$ | M1 | |
| | 10.543... | A1 | |
| 10(b) | $\cos = \frac{12.3}{16.5} \text{ oe}$ | 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 |

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| Question | Answer | Marks | Partial Marks |
|----------|--------------------------|-------|--|
| 10(d) | 18.9 to 20.7... nfw | 4 | <p>M1 for $\sin 31 = \frac{BC}{12.3}$ oe or better and $\sin 41.8[0] = \frac{CD}{16.5}$ oe</p> <p>M2dep on M1 for $\cos [DBC] = \frac{their(c)^2 + 6.34^2 - 10.998^2}{2 \times their(c) \times 6.34}$</p> <p>or M1dep on M1 for $10.998^2 = their(c)^2 + 6.34^2 - 2 \times their(c) \times 6.34 \times \cos DBC$</p> |
| 10(e) | 2.05 to 2.24... nfw | 4 | <p>M1 for $\sin 31 = \frac{BC}{12.3}$ oe or better or $\sin 41.8[0] = \frac{CD}{16.5}$ oe</p> <p>M2dep on M1 for $\frac{\text{dist}}{theirBC} = \sin(\text{their angle } CBD)$ or $\frac{\text{dist}}{theirCD} = \sin(\text{their angle } CDB)$</p> <p>or M1 for recognition of shortest distance</p> |
| 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 | <p>M1 for $\frac{1}{2x-1}$ and $3\left(\frac{1}{x}\right) + 2$ oe</p> <p>B1 for $x + 3(2x-1) + 2x(2x-1)$ oe or better isw</p> <p>B1 for common denominator = $x(2x-1)$ isw</p> <p>If 0 scored, SC1 for answer $\frac{4x^2 + 9x + 3}{x(2x+1)}$</p> |
| 11(e) | h(x) indicated | 1 | |
| 12(a) | <p>Correct sketch</p>  | 2 | <p>Condone curve touching asymptotes but not crossing</p> <p>B1 for one section correct</p> <p>or for 3 sections in correct part of graph but with incorrect curvature and no other sections in incorrect part of graph</p> |
| 12(b) | 30 and 210 final answer | 2 | <p>B1 for each</p> <p>If 0 scored SC1 for two answers (one acute and one reflex) with a difference of 180</p> |