# Cambridge IGCSE™

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| **MATHEMATICS (US)** | **0444/41** |
| Paper 4 (Extended) | **May/June 2020** |
| MARK SCHEME | |
| Maximum Mark: 130 | |

**Published**

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

This document consists of **8** 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.

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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.

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GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

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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.

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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.

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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).

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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 |  |
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| 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. |

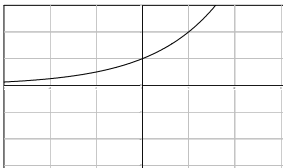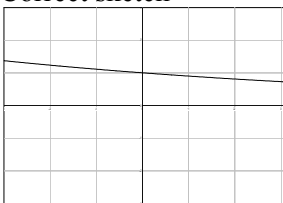| 2 | Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected. |
|---|---|
| 3 | Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas 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**

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|---|---|
| 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) | Triangle at (−4, −4) (−1, −3) (−4, −3) | 2 | **B1** for correct points not joined or for reflection in any $y = k$ or for reflection in $x = -1$ |
| 1(b) | Triangle at (1, 1) (1, 4) (2, 4) | 2 | **B1** for correct points not joined or rotation 90° clockwise around any point or rotation 90° anticlockwise around (0, 0) |
| 1(c) | Translation $\begin{pmatrix} 5 \\ -6 \end{pmatrix}$ | 2 | **B1** for translation or correct vector oe |
| 2(a)(i) | 7680 | 2 | **M1** for $0.24 \times 32\,000$ oe |
| 2(a)(ii) | 34 240 | 2 | **M1** for $32\,000 \times \dfrac{100 + 7}{100}$ oe |
| 2(b) | 5306.04 | 2 | **M1** for $5000 \times \left( \dfrac{100 + 2}{100} \right)^3$ oe |
| 2(c) | 26.7 or 26.66... to 26.67 | 4 | **B3** for 96 or $\dfrac{96}{360}$ oe <br><br> OR <br> **M3** for $(1 - \dfrac{1}{5}) \times (1 - \dfrac{2}{3}) \times 100$ oe <br><br> or **M2** for $(1 - \dfrac{1}{5})$ and $(1 - \dfrac{2}{3})$ oe <br><br> OR <br> **M1** for $360 \div 5 \,[\times 4]$ oe <br> **M1** for *their* $288 \div 3 \,[\times 2]$ |
| 2(d) | 33 500 | 2 | **M1** for $36\,515 \div \dfrac{100 + 9}{100}$ oe |
| 2(e) | 6525 | 4 | **M3** for $\left( \dfrac{65}{45} - \dfrac{63}{45} \right)[A] = 290$ oe <br><br> or **M2** for $\left( \dfrac{13}{9} - \dfrac{7}{5} \right)[A] = 290$ oe <br><br> or **M1** for correct attempt to convert to a common ratio value for Rohsin <br> or for $\dfrac{13}{9} - \dfrac{7}{5}$ oe |

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 3(a)(i) | $1.5 < h \leqslant 1.6$ | 1 | |
| 3(a)(ii) | 1.62 or 1.623… nfww | 4 | **M1** for 1.35, 1.45, 1.55, 1.65, 1.75 1.85 soi<br>**M1** for $\Sigma fx$<br><br>**M1 dep** for *their* $\Sigma fx \div 120$ |
| 3(b)(i) | $\dfrac{14}{120}$ oe | 1 | |
| 3(b)(ii) | $\dfrac{21}{20060}$ oe | 4 | **M3** for $3\left( \dfrac{14}{120} \times \dfrac{7}{119} \times \dfrac{6}{118} \right)$<br><br>or **M2** for $\dfrac{14}{120} \times \dfrac{7}{119} \times \dfrac{6}{118}$ isw<br><br>or **M1** for $\dfrac{14}{120}, \dfrac{7}{119}, \dfrac{6}{118}$<br><br>If 0 scored, **SC1** for answer $\dfrac{343}{864000}$ or $\dfrac{343}{288000}$<br><br>oe |
| 3(c)(i) | 55, 79, 106, 120 | 2 | **B1** for 2 or 3 correct |
| 3(c)(ii) | Correct diagram | 3 | **B1** for correct horizontal plots<br>**B1FT** for correct vertical plots<br><br>**B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 6 points<br><br>If 0 scored, **SC1** for 5 out of 6 points correctly plotted |
| 3(d)(i) | 1.62 to 1.63 | 1 | |
| 3(d)(ii) | 1.57 to 1.58 | 2 | **B1** for 48 soi |
| 4(a) | 75.6 | 2 | **M1** for $5.2 \times 7 + \dfrac{1}{2} \times 1.6 \times 7^2$ |
| 4(b)(i) | $2a - 3b$ final answer | 2 | **B1** for answer $2a + kb$ or $ka - 3b$ or for $2a - 3b$ seen in working |
| 4(b)(ii) | $\dfrac{3}{4}$ | 2 | **B1** for $\dfrac{45x}{60x}$ oe single fraction |
| 4(c)(i) | −5 | 1 | |
| 4(c)(ii) | $-0.25$ or $-\dfrac{1}{4}$ | 3 | **M1** for $20 - 12x = 23$ or for $5 - 3x = \dfrac{23}{4}$<br><br>**M1** for correct completion to $ax = b$ **FT** *their* first step |

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 4(d) | $9x^6$ | **2** | **B1** for $9x^k$ or $kx^6$ |
| 4(e) | $6x^2 - 7xy - 5y^2$ | **2** | **M1** for 3 terms out of 4 from<br>$6x^2 - 10xy + 3xy - 5y^2$ |
| 5(a) | $[BC^2 =]\ 80^2 + 115^2 - 2 \times 80 \times 115\cos 72$ oe | **M1** | |
| | 118.06… | **A2** | **A1** for 13939. …. |
| 5(b) | 67.8 or 67.9 or 67.83 to 67.88 | **3** | **M2** for $[\sin B =]\ \dfrac{115 \times \sin 72}{118.1}$ oe<br><br>or **M1** for $\dfrac{115}{\sin B} = \dfrac{118.1}{\sin 72}$ oe |
| 5(c)(i) | 255 | **3** | **B1** for bearing of $B$ from $A$ is 75 soi<br>**M1** for $180 + 75$ oe |
| 5(c)(ii) | [00]7.2 | **2** | **M1** for *their* **(c)(i)** – *their* **(b)** – 180 |
| 5(d) | 11.8 or 11.82 to 11.83 | **3** | **M1** for $115 \div 35$ oe<br>**M1** for *their* speed in m/s $\times 60 \times 60 \div 1000$ |
| 5(e) | 76.1 or 76.08 to 76.09 | **3** | **M2** for $\dfrac{\text{distance}}{80} = \sin 72$ oe<br><br>or **M1** distance required is perpendicular to $AC$ soi |
| 6(a)(i) | Correct sketch labelled at 1 and –1 | **2** | **M1** for correct shape but inaccurate |
| 6(a)(ii) | Rotational [symmetry] order 2 [centre] (180, 0) | **2** | **M1** for rotational [symmetry] |
| 6(a)(iii) | Correct line sketched | **1** | |
| 6(a)(iv) | 30, 150 | **2** | **B1** for each |
| 6(b)(i) | $(x + 5)^2 - 11$ | **2** | **M1** for $(x + 5)^2 + k$ or<br>$(x + their\ 5)^2 + 14 - (their\ 5)^2$ or $a = 5$ |
| 6(b)(ii) | (–5, –11) | **2** | **B1** for each |
| 6(b)(iii) | Sketch of U-shaped parabola with a minimum in third quadrant | **1** | |
| 7(a) | 39[.0] or 39.03 to 39.04.. | **3** | **M2** for $\dfrac{165}{360} \times 2 \times \pi \times 8 + 16$<br><br>or **M1** for $\dfrac{165}{360} \times 2 \times \pi \times 8$ |

| Question | Answer | Marks | Partial Marks |
|----------|--------|-------|---------------|
| 7(b) | 2.71 or 2.708.. | 4 | **M3** for $\sqrt{\dfrac{\frac{165}{360}[\times\pi]\times 8^2}{4[\times\pi]}}$ oe <br><br> or **M2** for $r^2 = \dfrac{\frac{165}{360}[\times\pi]\times 8^2}{4[\times\pi]}$ oe <br><br> or **M1** for $\dfrac{165}{360}\times\pi\times 8^2$ oe seen |
| 7(c)(i) | 3.67 or 3.666 to 3.667 | 2 | **M1** for $\dfrac{165}{360}\times 2[\times\pi]\times 8 = 2[\times\pi]\times r$ or better <br><br> or for $\dfrac{165}{360}[\times\pi]\times 8^2 = [\pi\times]r\times 8$ or better |
| 7(c)(ii) | 100 or 100.0 to 100.1… final answer | 4 | **M3** for $\frac{1}{3}\pi\times(\textit{their }\textbf{(c)(i)})^2\times\sqrt{8^2 - \textit{their }\text{radius}^2}$ <br><br> or **M2** for $\sqrt{8^2 - \textit{their }\text{radius}^2}$ <br> or **M1** for $(\textit{their }\textbf{(c)(i)})^2 + h^2 = 8^2$ |
| 8(a) | 15.7 or 15.65... | 3 | **M2** for $\sqrt{(4-10)^2 + (4--3)^2}$ oe <br> or **M1** for $(-4-10)^2 + (4--3)^2$ oe |
| 8(b) | $\dfrac{-10-4}{4--3}[=-2]$ oe | **M1** | |
| | $10 = -2(-3) + c$ <br> or $-4 = -2(4) + c$ <br> and correct completion to <br> $y = -2x + 4$ | **A1** | |
| 8(c) | $y = \dfrac{1}{2}\,x + \dfrac{11}{4}$ oe | 4 | **M1** for grad = $\dfrac{1}{2}$ soi <br><br> **M1** for [midpoint =] $(\dfrac{1}{2}, 3)$ <br><br> **M1** for substitution of $(\dfrac{1}{2}, 3)$ into *their* $y = mx + c$ <br> oe |
| 9(a) | $a = 35$, $p = 46$ | 5 | **B1** for $5a + p = 221$ (or 2.21) <br> **B1** for $3a + 2p = 197$ (or 1.97) <br><br> **M1** for correctly eliminating one variable <br> **A1** for one correct answer <br><br> If zero scored, **SC1** for correct substitution and evaluation to find other variable |

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 9(b) | $\frac{1}{3}$ oe | 4 | **M2** for $(6x-1)(x+1) = \left[ 2 \times \frac{1}{2} \right](2x)(3x+1)$ <br><br> or **M1** for $(6x-1)(x+1)$ or $\frac{1}{2}(2x)(3x+1)$ <br><br> **M1** for correct linear equation from correctly expanding two quadratic expressions |
| 10(a) | $y = 4$ ruled correctly | 1 | |
| | $y = 10$ ruled correctly | 1 | |
| | $y = x$ ruled correctly | 1 | |
| | $3x + 2y = 30$ ruled correctly | 2 | **B1** for correct freehand or ruled line through (10, 0) or (0, 15) when extended |
| 10(b) | Correct region labelled cao | 1 | |
| 10(c)(i) | 4 | 1 | |
| 10(c)(ii) | 13 | 1 | |
| 10(d) | Correct region labelled | 1 | |
| 11(a) | Correct sketch  | 1 | |
| 11(b) | Correct sketch  | 1 | |
| 11(c) | –2.5 oe | 2 | **M1** for $\frac{1}{2^{2.5}}$ |
| 11(d)(i) | 4 | 1 | |
| 11(d)(ii) | $7(0.98)^x$ | 2 | **M1** for $(1-0.02)^x$ or better seen |