Cambridge Assessment International Education

# Cambridge O Level

**MATHEMATICS (SYLLABUS D)** **4024/11**

Paper 1 **October/November 2021**

MARK SCHEME

Maximum Mark: 80

**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 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.



© UCLES 2021

## 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.

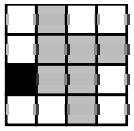
© UCLES 2021

| 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. |

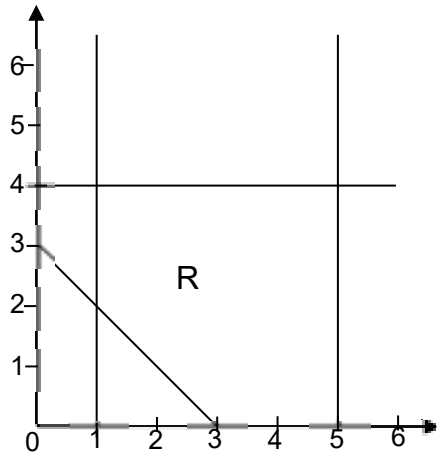
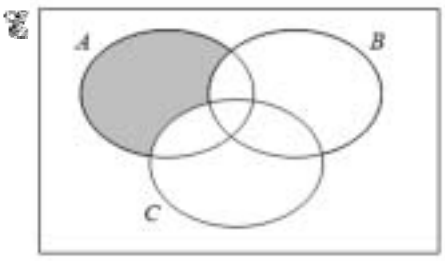
**Abbreviations**

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

© UCLES 2021

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 1(a) | $\frac{5}{8}$ oe | **1** | |
| 1(b) | 0.016 oe | **1** | |
| 2 | $\frac{3}{4}$, 0.8, 82%, 0.83, $\frac{17}{20}$ | **2** | **B1** for four correct when one is covered up<br>If 0 scored, **SC1** for<br>$\frac{17}{20}$, 0.83, 82%, 0.8, $\frac{3}{4}$ |
| 3 | 13.5 or $13\frac{1}{2}$ | **2** | **M1** for $\frac{45}{100}\times 30$ oe |
| 4(a) |  | **1** | |
| 4(b) |  | **1** | |
| 5 | $4a$ final answer | **1** | |
| 6(a) | Acceptable triangle with intersecting arcs | **2** | **B1** for acceptable vertex $C$ clearly indicated with no/incorrect arcs<br>If 0 scored, **SC1** for reflection of correct triangle with arcs |
| 6(b) | Acceptable perpendicular bisector of $AB$ with correct arcs | **2** | **B1** for acceptable perpendicular bisector with no/incorrect arcs |
| 6(c) | Shade inside triangle to left of perpendicular bisector | **1** | Dependent on at least B1 in **(b)** |
| 7(a) | 1 | **1** | |
| 7(b) | $m^8$ | **1** | |
| 8(a) | 6.3 | **1** | |
| 8(b) | 100 | **1** | |
| 9 | 15 | **2** | **M1** for $\frac{360}{180-156}$ oe or $\frac{180(n-2)}{n}=156$ oe |

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 10 | 50 | **3** | **M2** for $\frac{(180-55)}{(3+2)}\times k$ oe where $k = 1, 2$ or 3<br>or **M1** for $180 - 55$ oe or $\frac{n}{3+2}$<br><br>Alternative method:<br>**M2** for $\frac{3}{2}y + y = 125$ oe or $x + \frac{2}{3}x = 125$ oe<br>or **M1** for $x + y = 125$ oe or $\frac{x}{y} = \frac{3}{2}$ oe |
| 11 | 60 **and** 30 **and** 0.1 seen as rounded values, **and** final answer 20 | **2** | **M1** for two of 60, 30 and 0.1 seen as rounded values |
| 12 | Correct method to eliminate one variable | **M1** | |
| | $x = 5$, $y = -2$<br>Both correct solutions nfww | **A2** | **A1** for either $x = 5$ or $y = -2$ nfww<br>or after A0, **SC1** for a pair of values that satisfy either equation or correct values with no working |
| 13(a) | Translation $\begin{pmatrix}-5\\4\end{pmatrix}$ | **2** | **B1** for each |
| 13(b) | Vertices at (6, –1), (6, –5) and (4, –5) | **2** | **B1** for correct size and orientation, wrong centre |
| 14(a) | $2\times2\times3\times5$<br>or $2^2\times3\times5$ | **2** | **B1** for 2, 2, 3, 5<br>or **M1** for any two stages correct in factor tree or ladder method |
| 14(b) | 7 (packs of pens)<br>10 (packs of rulers) | **3** | **B2** for LCM = 420 soi or $2^2 \times 3 \times 5 \times 7$<br>or for simplified ratio pens : rulers = 10 : 7<br><br>or **B1** for $42 = 2 \times 3 \times 7$<br><br>or **M1** for three multiples of 60 and 42 listed |
| 15(a) | (–2, 5) | **2** | **B1** for each value<br>or for $\begin{pmatrix}-2\\5\end{pmatrix}$ seen |
| 15(b) | 13 | **2** | **M1** for $(-5)^2 + 12^2$ oe |

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 16(a) | 17 | **3** | **M2** for $\frac{1\times6+2\times5+3\times13+4p}{6+5+13+p}=3$ oe<br><br>or **M1** for either $1\times6+2\times5+3\times13+4p$<br><br>or for $3\times(6+5+13+p)$ |
| 16(b) | $\frac{5}{41}$ oe | **1** | **FT** $\frac{5}{24+\textit{their}}$ **(a)** |
| 17(a) | $(2b + c)(2b – c)$ final answer | **1** | |
| 17(b) | $(x + 6)(x – 1)$ final answer | **2** | **B1** for final answer $(x + a)(x + b)$ where $ab = –6$ or $a + b = 5$<br><br>or for $x(x – 1) + 6(x – 1)$ seen<br><br>or for $x(x + 6) – [1](x + 6)$ seen<br><br>or for correct answer seen and spoilt |
| 18 |  | **4** | **B1** for $y = 3 – x$ correctly drawn<br>**B1** for $y = 4$ correctly drawn<br>**B1** for $x = 1$ and $x = 5$ correctly drawn |
| 19(a)(i) | 2, 3, 5 | **1** | |
| 19(a)(ii) | $\frac{4}{12}$ oe | **1** | |
| 19(b) |  | **1** | |
| 20(a) | 128 | **1** | |

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 20(b)(i) | $2^{n+1} - 3$ final answer | **1** | |
| 20(b)(ii) | $2^{n+1} + 5n + 1$ oe final answer | **2** | **B1** for $2^{n+1} + 5n + k$ oe<br>or **M1** for 6 11 16 21 [26] |
| 21(a) | 2 | **1** | |
| 21(b) | $2 - \frac{6}{x}$ oe or $\frac{2x-6}{x}$ oe final answer | **3** | **B2** for $2 - y = \frac{6}{x}$ or $2x - 6 = xy$<br>or $2 - \frac{6}{y} = x$ or $\frac{2y-6}{y} = x$<br>or **M1** for correct first step e.g. $x = \frac{6}{2-y}$<br>or $y(2-x) = 6$ or better |
| 21(c) | –0.5 or $-\frac{1}{2}$ nfww | **3** | **B2** for 2 – t = 2 – (5t + 2) oe or t = 5t + 2 oe<br>OR<br>**B1** for $\left[\frac{6}{2-t} =\right] \frac{6}{2-(5t+2)}$ oe<br>**M1** for correct removal of *their* different algebraic denominators |
| 22(a) | $\angle ACB = \angle ECD$ [vertically] opposite<br>$\angle CAB = \angle CDE$ alternate<br>$\angle ABC = \angle CED$ alternate<br>Three angles equal therefore the triangles are similar | **3** | **B2** for two correct pairs of angles with correct reasons<br>or<br>**B1** for one correct pair of angles with correct reason or two correct pairs of angles with incorrect/no reasons |
| 22(b) | 5 | **2** | **B1** for $\left(\frac{2}{6}\right)^2$ oe or $\left(\frac{6}{2}\right)^2$ oe soi |
| 23(a) | $x^2 + 3x - 10$ final answer | **2** | **B1** for 3 terms out of $x^2 + 5x - 2x - 10$ soi |
| 23(b) | $\frac{5x+7}{(x+5)(x-4)}$ or $\frac{5x+7}{x^2+x-20}$ final answer | **3** | **B1** for $3(x + 5) + 2(x - 4)$ oe isw<br>**B1** for denominator $(x + 5)(x - 4)$ oe isw |
| 24(a) | $\begin{pmatrix} 38 & -4 \\ -2 & 18 \end{pmatrix}$ | **2** | **B1** for two or three correct elements in final answer |
| 24(b) | 4 | **2** | **B1** for [ $\lvert\mathbf{B}\rvert$ =] $-3x - 2(-5)$ soi |