



MATHEMATICS (SYLLABUS D)

4024/12

Paper 1

May/June 2019

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 May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U 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.

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.

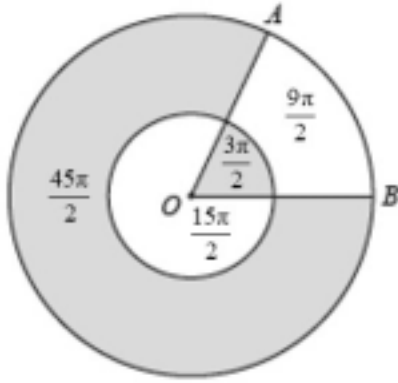
Abbreviations

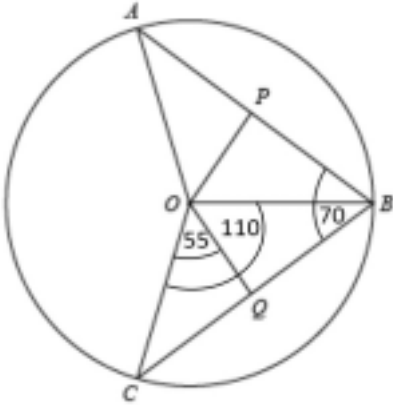
| | |
|------|----------------------------|
| cao | correct answer only |
| dep | dependent |
| FT | follow through after error |
| isw | ignore subsequent working |
| oe | or equivalent |
| SC | Special Case |
| nfww | not from wrong working |
| soi | seen or implied |

| Question | Answer | Marks | Partial Marks |
|----------|---|-------|---|
| 1(a) | $\frac{32}{35}$ | 1 | |
| 1(b) | 3 | 1 | |
| 2 | Acceptable bisector of $\angle ABC$ with correct arcs | 2 | B1 for bisector with no / incorrect arcs |
| 3(a) | 85 | 1 | |
| 3(b) | -5 | 2 | B1 for -50 seen M1 for $(-45 - 30 - 35 + 0 + 5 - 10 - 20 + 40 + 20 + 25) \div 10$ oe If 0 scored, SC1 for answer 5 |
| 4 | 70 and 30 and 0.2 seen and final answer 1000 | 2 | B1 for two of 70, 30 and 0.2 seen If 0 scored, SC1 for $72 - 32 = 40$ and $\frac{40}{0.2^2}$ or $\frac{40}{0.04}$ seen with final answer 1000 |
| 5 | 320 | 2 | M1 for $\frac{4}{50} \times 4000$ oe isw |
| 6(a) | 646 | 2 | M1 for $\frac{15}{100} \times 760$ oe or $\frac{85}{100} \times 760$ oe |
| 6(b) | 1344 | 2 | M1 for $1200 \times \frac{2}{100} \times 6$ oe isw |
| 7 | $\frac{27}{40}$ or equivalent fraction | 2 | B1 for answer 0.675 or M1 for correct use of a common denominator e.g. $\frac{12}{20}$ and $\frac{15}{20}$ seen or for $(0.6 + 0.75) \div 2$ oe |

| Question | Answer | Marks | Partial Marks |
|-----------|--|-----------|--|
| 8 | 1200 | 2 | M1 for $\frac{3}{5} \times \text{figs } 2$ or for $2 \times \frac{8}{5} - 2$ If 0 scored, SC1 for answer 3200 |
| 9(a) | Correct graph | 2 | B1 for ruled line from (0, 0) to (20, 15) B1 for ruled line from (<i>their</i> 20, 15) to (<i>their</i> 20+ 40, 15) |
| 9(b) | 0.75 oe | 1 | |
| 10(a) | $(P \cup R) \cap Q'$ | 1 | |
| 10(b) | Any irrational number in range $9 < x < 10$ | 2 | B1 for any irrational number as answer or any number in range $9 < x < 10$ as answer |
| 11 | Correct method to eliminate one variable | M1 | |
| | $x = \frac{1}{3}$ oe, $y = -2$ | A2 | A1 for either $x = \frac{1}{3}$ oe or $y = -2$ or after A0 , SC1 for a pair of values that satisfy either equation or for correct answers with no working |
| 12(a) | 1.7×10^{-5} , 3.5×10^{-4} , 4.2×10^{-4} , 2.1×10^{-3} | 1 | |
| 12(b)(i) | 5.5×10^{10} cao | 1 | |
| 12(b)(ii) | $3[.0] \times 10^{20}$ cao | 1 | |
| 13(a) | $x^2 - 6x + 9$ final answer | 1 | |
| 13(b) | $(5x - 6)(y - 3)$ final answer or $(6 - 5x)(3 - y)$ final answer | 2 | B1 for one correct partial factorisation seen |
| 14(a) | $\left(x - \frac{7}{2}\right)^2 - \frac{29}{4}$ | 2 | B1 for $\left(x - \frac{7}{2}\right)^2$ seen or for answer $(x + a)^2 - \frac{29}{4}$ |
| 14(b) | $-\frac{29}{4}$ | 1 | FT <i>their</i> (a) provided in correct form |

| Question | Answer | Marks | Partial Marks |
|----------|--|-------|--|
| 15(a) | $2 \times 2 \times 2 \times 3 \times 7$ or $2^3 \times 3 \times 7$ | 2 | B1 for 2, 2, 2, 3, 7 as factors or M1 for any two stages correct in factor tree or ladder method |
| 15(b) | 210 and 294 only | 2 | B1 for one correct value seen or for answers $2 \times 3 \times 5 \times 7$ and $2 \times 3 \times 7^2$ |
| 16(a) | Translation $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$ | 2 | B1 for translation B1 for $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$ |
| 16(b) | Correct enlargement, vertices (2, 5), (6, 5), (6, 3) | 2 | B1 for correct size and orientation, incorrect position or for enlargement scale factor 2, centre (0, 3) |
| 17(a) | $\frac{2}{6}$ on first branch $\frac{2}{5}, \frac{4}{5}, \frac{1}{5}$ on second set | 2 | B1 for two or three completed correctly |
| 17(b) | $\frac{14}{30}$ oe | 2 | M1 for $\frac{4}{6} \times \frac{3}{5}$ oe or <i>their</i> $\frac{2}{6} \times \text{their } \frac{1}{5}$ oe |
| 18(a) | -1.2 or $-\frac{6}{5}$ oe | 1 | |
| 18(b) | $\frac{3r-2}{4+r}$ final answer | 3 | M1 for eliminating fraction: $r(3-p) = 4p + 2$ or better M1FT for isolating terms in p : $3r - 2 = 4p + rp$ or better M1FT for factorising and completing to $p = \dots$ |
| 19(a) | 1.6 oe | 2 | B1 for ' k ' = 160 oe if $y = \frac{"k"}{x^2}$ used or M1 for $10 \times 4^2 = y \times 10^2$ oe or M1FT for $y = \frac{(\text{their } k)}{10^2}$ when $y = \frac{"k"}{x^2}$ used |
| 19(b) | y is multiplied by 4 | 1 | |

| Question | Answer | Marks | Partial Marks |
|----------|-------------------------------|-------|--|
| 20 | $\frac{y^4}{3x}$ final answer | 2 | <p>B1 for final answer $\frac{y^4}{3x^k}$ or $\frac{y^k}{3x}$ or $\frac{y^4}{kx}$</p> <p>or $\frac{x^{\frac{5}{7}}y^{\frac{9}{1}}}{3x^2y^2}$</p> <p>or M1 for $\left(\frac{y^8}{9x^2}\right)^{\frac{1}{2}}$ seen or for $\left(\frac{3x}{y^4}\right)^{-1}$ seen</p> |
| 21 | 12 | 3 | <p>B2 for $y = 6$</p> <p>or M1 for $2 \times y^2 + 4 \times y \times 2y [= 360]$ oe</p> <p>If 0 scored, SC1 for $ky^2 = 360$ seen, leading to $\sqrt{\frac{360}{k}}$</p> |
| 22(a) | 9 12 15 12 17 22 | 2 | B1 for one row correct |
| 22(b) | $5n - 3$ oe final answer | 2 | B1 for $5n + k$ oe seen |
| 22(c) | 57 | 2 | <p>M1 for <i>their</i> $(5n - 3) = 92$</p> <p>or B1 for $n = 19$ soi or for answer 19</p> |
| 23 | 24 | 4 | <p>M1 for $\frac{60}{360} \times \pi \times 3^2$ oe</p> <p>AND</p> <p>M2 for $\frac{300}{360} \times \pi \times (6^2 - 3^2)$ oe</p> <p>or $\pi \times 6^2 - \pi \times 3^2 - \frac{60}{360} \times \pi \times (6^2 - 3^2)$ oe</p> <p>or M1 for $\frac{300}{360} \times \pi \times 6^2$ oe or $\frac{300}{360} \times \pi \times 3^2$ oe</p> <p>or $\pi \times 6^2$ oe or $\pi \times 3^2$ oe</p>  |

| Question | Answer | Marks | Partial Marks |
|----------|---|-------|--|
| 24(a) | <p>$OA = OC$ radii $\angle APO = \angle CQO$ perpendicular to chord $AP = CQ$ midpoints [of equal chords] RHS</p> <p>OR</p> <p>$OA = OC$ radii $OP = OQ$ equal chords [equidistant from centre] $AP = CQ$ midpoints [of equal chords] SSS</p> <p>OR</p> <p>$OP = OQ$ equal chords [equidistant from centre] $\angle APO = \angle CQO$ perpendicular to chord $AP = CQ$ midpoints [of equal chords] SAS</p> | 3 | <p>B1 for the correct pair of angles and one correct pair of sides or for two correct pairs of sides</p> <p>B1 for correct reason for two pairs of sides/angles</p> |
| 24(b) | 35° | 2 | <p>B1 for $\angle ABC = 70^\circ$ soi or $\angle COB = 110^\circ$ soi or $\angle COQ = 55^\circ$ soi or $\angle OBQ = 35^\circ$ soi</p>  |

| Question | Answer | Marks | Partial Marks |
|-----------|---|----------|---|
| 25(a) | $\begin{pmatrix} 4 & 8 \\ -2 & -7 \end{pmatrix}$ | 2 | B1 for two or three correct elements |
| 25(b)(i) | -2 | 1 | |
| 25(b)(ii) | $-\frac{1}{4}\begin{pmatrix} -2 & 1 \\ -2 & 3 \end{pmatrix}$ oe isw or $\begin{pmatrix} \frac{1}{2} & -\frac{1}{4} \\ \frac{1}{2} & -\frac{3}{4} \end{pmatrix}$ oe isw | 1 | FT $-\frac{1}{4}\begin{pmatrix} \textit{their } k & 1 \\ -2 & 3 \end{pmatrix}$ |