## Cambridge Assessment International Education

Cambridge Ordinary Level

## MATHEMATICS (SYLLABUS D)

4024/21
Paper 2 Paper 2
October/November 2018
MARK SCHEME
Maximum Mark: 100

## 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 2018 series for most Cambridge IGCSE ${ }^{\text {TM }}$, Cambridge International A and AS Level components and some Cambridge O Level components.

## 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 |
| :--- | :--- |
| soi | seen or implied |
| isw | ignore subsequent working |
| oe | or equivalent |
| nfww | not from wrong working |
| dep | dependent |
| AG | answer given |


| Question | Answer | Marks | Partial Marks |
| :---: | :---: | :---: | :---: |
| 1(a)(i) | 6 points plotted correctly | 2 | B1 for 4 or 5 points plotted correctly |
| 1(a)(ii) | Positive | 1 |  |
| 1(a)(iii) | $\frac{3}{5} \text { cao }$ | 2 | B1 for $\frac{6}{10}$ oe seen |
| 1(a)(iv) | Ruled line of best fit | B1 |  |
| 1(a)(v) | 54 to 58 | B1 | FT reading from their straight line of best fit at 48 km |
| 1(b)(i) | $20<t \leqslant 40$ | 1 |  |
| 1(b)(ii) | 39.5 | 3 | B1 for correct use of midpoints soi <br> M1 for $\begin{aligned} & (10 \times 29+30 \times 38+50 \times 26+70 \times 21+90 \\ & \times 6) \div 120 \text { oe } \end{aligned}$ |
| 1(b)(iii) | 22.5 | 2 | B1 for $21+6$ or 27 seen |


| Question | Answer | Marks | Partial Marks |
| :---: | :---: | :---: | :---: |
| 2(a) | 395.25 cao | 3 | B2 for answer 79.05 <br> OR <br> B1 for [time = ] 7.75 oe soi <br> M1 for their $7.75 \times 10.20 \mathbf{o e}$ |
| 2(b) | 23.75 | 2 | M1 for $(19.80 \times 25-400) \div 400$ oe <br> If 0 scored, $\mathbf{S C 1}$ for answer 123.75 or 123.8 |
| 2(c) | 14.5[0] | 2 | M1 for $\frac{(100+8)}{100} x=15.66$ soi |
| 2(d) | 3744.14 final answer | 3 | M2 for $3500 \times\left(1+\frac{1.7}{100}\right)^{4}$ oe or M1 for $3500 \times\left(1+\frac{1.7}{100}\right)^{k}$ oe where $k>1$ |


| Question | Answer | Marks | Partial Marks |
| :---: | :---: | :---: | :---: |
| 3(a) | $\cos A=\frac{95^{2}+174^{2}-132^{2}}{2 \times 95 \times 174}$ | M2 | or M1 for $132^{2}=95^{2}+174^{2}-2 \times 95 \times 174 \times \cos A$ |
|  | $A=48.56[7 \ldots]$ or 48.57 | A1 |  |
| 3(b) | 1580 to 1581 | 4 | M1 for $\frac{1}{2} \times 95 \times 174 \times \sin 48.6$ <br> AND <br> M2 for their area $\times 3 \div 100 \times 8.50$ or M1 for two operations correct in their area $\times 3 \div 100 \times 8.50$ or for $3 \div 100 \times 8.50$ soi |


| Question | Answer | Marks | Partial Marks |
| :---: | :---: | :---: | :---: |
| 4(a)(i) |  | 2 | B1 for 8 or 9 numbers correctly placed or for $1,2,4,5,8,10$ correctly placed with no numbers placed incorrectly |
| 4(a)(ii) | 6 | 1 | FT $\mathrm{n}(A \cup B)$ from their Venn diagram |
| 4(a)(iii) | Factors of 10 0e | 1 |  |
| 4(b)(i) | 10 | 2 | B1 for Venn diagram with at least 3 numbers correct Or M1 for $30=8+12+x \mathbf{0 e}$ |
| 4(b)(ii) | $\frac{42}{870} \text { or } \frac{7}{145} \text { oe }$ | 2 | M1 for $\frac{\text { their } 7}{30} \times \frac{\text { their } 6}{29}[\times 2]$ or SC1 for answer $\frac{49}{900} \mathbf{o e}$, FT their Venn diagram |


| Question | Answer | Marks | Partial Marks |
| :---: | :--- | ---: | :--- |
| $5(\mathrm{a})$ | -1.6 oe | $\mathbf{1}$ | $\mathbf{3}$ |
| $5(\mathrm{~b})$ | Correct smooth curve | B2FT for 7 or 8 points correctly plotted <br> or B1FT for 5 or 6 points correctly plotted |  |
| $5(\mathrm{c})(\mathrm{i})$ | Tangent drawn at ( $-2,0.8$ ) | B1 |  |
| $5(\mathrm{c})($ (ii) | -3.1 to -2.2 | B1 | Dependent on tangent drawn at $x=-2$ |
| $5(\mathrm{~d})$ | -2.5 to -2.3 <br> 1.4 to 1.6 <br> 2.7 to 2.9 | $\mathbf{3}$ | FT reading their graph at $y=2$ <br> Tolerance $\pm 1$ mm <br> B1 for each one correct <br> After 0 scored, SC1 for $y=2$ soi |


| Question | Answer | Marks | Partial Marks |
| :---: | :--- | ---: | :--- |
| 6(a) | $\angle T A O=\angle T C O$ tangent perpendicular to <br> radius <br> $A O=C O$ [equal] radii <br> $T O$ is common <br> Congruent RHS | $\mathbf{3}$ | B1 for one correct pair of equal angles and <br> one correct pair of equal sides <br> or for two correct pairs of equal sides <br> B1 for correct reason for two pairs of equal <br> sides/angles |
| 6(b)(i) | $90-x$ | $\mathbf{1}$ |  |
| 6(b)(ii) | $\frac{90-x}{2}$ oe | $\mathbf{1}$ | FT their algebraic (b)(ii) $\div 2$ |
| 6(b)(iii) | $270-x$ | $\mathbf{1}$ | M2 for $[O T=] \frac{6}{\sin 35}$ |
| 6(c) | 16.5 or $16.46[\ldots]$ | or M1 for $\sin 35=\frac{6}{[O T]}$ |  |


| Question | Answer | Marks | Partial Marks |
| :---: | :---: | :---: | :---: |
| 7(a) | $\binom{2}{4}$ | 1 |  |
| 7(b) | 6.71 or 6.708... | 2 | M1 for $6^{2}+(-3)^{2}$ oe |
| 7(c) | $(0,5)$ | 2 | FT their (a) ((their 2-2), (their $4+1)$ ) <br> B1 for one value in coordinates correct or for $[\overrightarrow{C B}=]\binom{2}{-1}$ soi |
| 7(d)(i) | $y=-\frac{1}{2} x+4$ oe final answer | 3 | B2 for $y=-\frac{1}{2} x+c$ oe OR <br> M1 for gradient $=\frac{-3}{6} \mathbf{~ s o i}$ M1 for $(-2,5)$ substituted into $y=$ their $m x+c$ |
| 7(d)(ii) | $y=2 x$ oe | 1 | FT their gradient from (d)(i) |


| Question | Answer | Marks | Partial Marks |
| :---: | :--- | ---: | :--- |
| $8(\mathrm{a})$ | $n+5$ <br> $n+10$ | $\mathbf{1}$ | Both correct |
| $8(\mathrm{~b})(\mathrm{i})$ | $(n+5)^{2}$ and $n(n+10)$ | M1 | A1 |
| $8(\mathrm{~b})(\mathrm{ii})$ | $n^{2}+5 n+5 n+25-n^{2}-10 n=25$ | $\mathbf{3}$ | M1 for $n+n+5+n+10=174$ oe <br> $\mathbf{A 1}$ for $n=53$ <br> If 0 scored, $\mathbf{S C} \mathbf{1}$ for answer 53 |
| $8(\mathrm{c})$ | 63 |  |  |


| Question | Answer | Marks | Partial Marks |
| :---: | :---: | :---: | :---: |
| 9(a)(i) | $\pi \times 3^{2} \times 21+\frac{2}{3} \times \pi \times 3^{3}$ | M3 | B1 for cylinder height $=21$ soi M1 for $\pi \times 3^{2} \times$ their height M1 for $\frac{2}{3} \times \pi \times 3^{3}$ |
|  | $=650.3[\ldots]$ or 650.4 | A1 |  |
| 9(a)(ii) | 452 or 452.3 to 452.4... | 3 | M2 for $2 \times \pi \times 3^{2}+\pi \times 6 \times 21$ or M1 for $2 \times \pi \times 3^{2}$ or $\pi \times 6 \times 21$ |
| 9(a)(iii) | 21.2 or 21.22 to $21.23 \ldots$ | 2 | B1 for $\sqrt[3]{\frac{450}{650}}$ soi or $\sqrt[3]{\frac{650}{450}}$ soi |
| 9(b) | 1.57 | 3 | B1 for 4.25 or 335 used <br> M1 for their $4.25-8 \times$ their $335 \div 1000$ or for their $4250-8 \times$ their 335 |


| Question | Answer | Marks | Partial Marks |
| :---: | :---: | :---: | :---: |
| 10(a)(i) | $\frac{1}{2} x(x-4) \times 15=440$ | M2 | B1 for height $=(x-4)$ |
| 10(a)(ii) | Correct expansion and simplification leading to $3 x^{2}-12 x-176=0$ | A1 |  |
| 10(b)(i) | $\frac{-(-12) \pm \sqrt{(-12)^{2}-4 \times 3 \times-176}}{2 \times 3}$ | B2 | B1 for $\sqrt{(-12)^{2}-4 \times 3 \times-176}$ or for $\frac{-(-12) \pm \sqrt{\text { their } 2256}}{2 \times 3}$ |
| 10(b)(ii) | 9.92 and -5.92 | B1 |  |
| 10(c) | 5.92 | 1 | FT (their positive root - 4) if result positive |
| 10(d) | 18.2 or 18.21 to $18.22 \ldots$ | 4 | $\mathbf{M} 2$ for $[A F=] \sqrt{15^{2}+\text { their } 9.92^{2}}$ Or for $[B F=]$ $\sqrt{\text { their } 9.92^{2}+\text { their } 5.92^{2}+15^{2}}$ oe or M1 for $A F^{2}=15^{2}+$ their $9.92^{2}$ soi or for $B F^{2}=$ their $9.92^{2}+$ their $5.92^{2}+15^{2}$ oe AND M1 for $\tan [A F B]=\frac{\text { their } 5.92}{\text { their } 17.98}$ or $\sin [A F B]=\frac{\text { their } 5.92}{\text { their } 18.93}$ |


| Question | Answer | Marks | Partial Marks |
| :---: | :---: | :---: | :---: |
| 11(a) | $\frac{1-2 x}{(2 x-3)(x-2)}$ or $\frac{1-2 x}{2 x^{2}-7 x+6}$ final answer | 3 | B1 for $4(x-2)-3(2 x-3)$ oe isw <br> B1 for denominator $(2 x-3)(x-2)$ oe isw |
| 11(b) | $\frac{2 x-3}{x-5}$ final answer nfww | 3 | B1 for $(2 x+3)(2 x-3)$ seen B1 for $(2 x+3)(x-5)$ seen |

