



# Mark Scheme (Results)

Summer 2019

Pearson Edexcel GCSE (9 – 1)  
In Mathematics (1MA1)  
Higher (Calculator) Paper 3H

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Summer 2019

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## General marking guidance

These notes offer general guidance, but the specific notes for examiners appertaining to individual questions take precedence.

- 1 All candidates must receive the same treatment. Examiners must mark the last candidate in exactly the same way as they mark the first.

Where some judgement is required, mark schemes will provide the principles by which marks will be awarded; exemplification/indicative content will not be exhaustive. When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the response should be sent to review.

- 2 All the marks on the mark scheme are designed to be awarded; mark schemes should be applied positively. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme. If there is a wrong answer (or no answer) indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

**Questions where working is not required:** In general, the correct answer should be given full marks.

**Questions that specifically require working:** In general, candidates who do not show working on this type of question will get no marks – full details will be given in the mark scheme for each individual question.

- 3 **Crossed out work**

This should be marked **unless** the candidate has replaced it with an alternative response.

- 4 **Choice of method**

If there is a choice of methods shown, mark the method that leads to the answer given on the answer line.

If no answer appears on the answer line, mark both methods **then award the lower number of marks**.

- 5 **Incorrect method**

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review for your Team Leader to check.

- 6 **Follow through marks**

Follow through marks which involve a single stage calculation can be awarded without working as you can check the answer, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

**7 Ignoring subsequent work**

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question or its context. (eg. an incorrectly cancelled fraction when the unsimplified fraction would gain full marks).

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect (eg. incorrect algebraic simplification).

**8 Probability**

Probability answers must be given as a fraction, percentage or decimal. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

**9 Linear equations**

Unless indicated otherwise in the mark scheme, full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously identified in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

**10 Range of answers**

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and all numbers within the range.

**11 Number in brackets after a calculation**

Where there is a number in brackets after a calculation E.g.  $2 \times 6 (= 12)$  then the mark can be awarded **either** for the correct method, implied by the calculation **or** for the correct answer to the calculation.

**12 Use of inverted commas**

Some numbers in the mark scheme will appear inside inverted commas E.g. “12”  $\times 50$  ; the number in inverted commas cannot be any number – it must come from a correct method or process but the candidate may make an arithmetic error in their working.

**13 Word in square brackets**

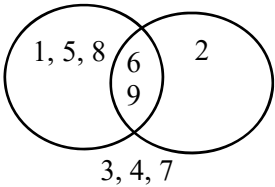
Where a word is used in square brackets E.g. [area]  $\times 1.5$  : the value used for [area] does **not** have to come from a correct method or process but is the value that the candidate believes is the area. If there are any constraints on the value that can be used, details will be given in the mark scheme.

**14 Misread**

If a candidate misreads a number from the question. Eg. uses 252 instead of 255; method or process marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review.

### Guidance on the use of abbreviations within this mark scheme

|              |                                                                                                                                                                                          |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>M</b>     | method mark awarded for a correct method or partial method                                                                                                                               |
| <b>P</b>     | process mark awarded for a correct process as part of a problem solving question                                                                                                         |
| <b>A</b>     | accuracy mark (awarded after a correct method or process; if no method or process is seen then full marks for the question are implied but see individual mark schemes for more details) |
| <b>C</b>     | communication mark awarded for a fully correct statement(s) with no contradiction or ambiguity                                                                                           |
| <b>B</b>     | unconditional accuracy mark (no method needed)                                                                                                                                           |
| <b>oe</b>    | or equivalent                                                                                                                                                                            |
| <b>cao</b>   | correct answer only                                                                                                                                                                      |
| <b>ft</b>    | follow through (when appropriate as per mark scheme)                                                                                                                                     |
| <b>sc</b>    | special case                                                                                                                                                                             |
| <b>dep</b>   | dependent (on a previous mark)                                                                                                                                                           |
| <b>indep</b> | independent                                                                                                                                                                              |
| <b>awrt</b>  | answer which rounds to                                                                                                                                                                   |
| <b>isw</b>   | ignore subsequent working                                                                                                                                                                |

| Paper: 1MA1/3H |                                     |      |                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                            |
|----------------|-------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question       | Answer                              | Mark | Mark scheme                                                                                                                                                                                                                                                                                                                                                         | Additional guidance                                                                                                                                                                                                                        |
| 1              | (a)                                 |      |                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                            |
|                | 6, 9                                | M1   | for 6, 9 in the intersection only                                                                                                                                                                                                                                                                                                                                   | Ignore all entries except the region you are marking for each method mark                                                                                                                                                                  |
|                | 1, 5, 8<br>2<br>3, 4, 7             | M1   | for 1, 5, 8 in set $A$ only<br>or 2 in set $B$ only<br>or 3, 4, 7 in set $(A \cup B)'$ only                                                                                                                                                                                                                                                                         |                                                                                                                                                         |
|                |                                     | C1   | for all numbers correctly placed in the Venn Diagram                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                            |
|                | (b)                                 |      |                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                            |
|                | $\frac{2}{9}$                       | M1   | ft for identification of 2 or 9 or ft diagram                                                                                                                                                                                                                                                                                                                       | Need not be written in correct form at this stage<br>eg could be a ratio 2 : 9<br>Repeated digits in the diagram should be counted as 2 elements<br>Accept any equivalent fraction, decimal form 0.22(22..) or percentage form 22(.22...)% |
|                |                                     | A1   | $\frac{2}{9}$ oe or ft diagram                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                            |
| 2              | 12272.70<br>12272.71 or<br>12272.72 | M1   | for evidence of using a correct first step<br>eg $200000 \times 0.015 (= 3000)$ or $200000 \times 1.015 (= 203000)$                                                                                                                                                                                                                                                 | values may be rounded or truncated to 2 dp                                                                                                                                                                                                 |
|                |                                     | M1   | for evidence of a compound interest method<br>eg $203000 \times 0.015 (= 3045)$ or $203000 \times 1.015 (= 206045)$<br><b>or</b> $206045 \times 0.015 (= 3090.675)$ or $206045 \times 1.015 (= 209135.675)$<br><b>or</b> $209135.675 \times 0.015 (= 3137.035...)$<br>or $209135.675 \times 1.015 (= 212272.710...)$<br><b>or</b> $200000 \times 1.015^t, t \geq 2$ |                                                                                                                                                                                                                                            |
|                |                                     | A1   | for 12272.7(0) or 12272.71 or 12272.72<br><br>SC B2 for 212272.7(0) or 212272.71 or 212272.72                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                            |

| Paper: 1MA1/3H |                                                                                       |                      |                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                        |
|----------------|---------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question       | Answer                                                                                | Mark                 | Mark scheme                                                                                                                                                                                                                                                                                                                                                                                                             | Additional guidance                                                                                                                                                                                                    |
| 3 (a)          | $40 < h \leq 50$                                                                      | B1                   | accept 40 – 50 oe                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                        |
| (b)            | <p>polygon drawn</p> <p>(15,7), (25,13)<br/>(35,14), (45,12)<br/>(55,16), (65,18)</p> | <p>B2</p> <p>(B1</p> | <p>for fully correct polygon with points plotted at the midpoints</p> <p>for points plotted correctly but not joined by straight lines</p> <p><b>or</b> joining points at correct heights consistently within intervals including plotting at end values</p> <p><b>or</b> correct frequency polygon with one point incorrect</p> <p><b>or</b> correct frequency polygon with first and last points joined directly)</p> | <p>Joining must be with line segments</p> <p>for example, at 10, 20, 30,...or at 20, 30, 40,...</p> <p>Ignore any histogram drawn and any part of frequency polygon outside range of first and last points plotted</p> |

| Paper: 1MA1/3H |           |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
|----------------|-----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Question       | Answer    | Mark | Mark scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Additional guidance                                    |
| 4              | statement | B2   | <p>Two different statements</p> <p><b>Acceptable</b></p> <p>eg should be joined with straight lines (not curve)/should use a ruler</p> <p>1<sup>st</sup> (quarter) not shown/plotted/labelled/not all quarters labelled</p> <p>does not show all 4 seasons</p> <p>9.5 missing from vertical axes/not linear</p> <p>vertical (number) axis does not start at 0/the y axis starts at 6</p> <p>the graph does not begin at 0, it starts at 6</p> <p>it is not clear what 2, 3, 4 on the x-axis mean</p> <p>the scale of years doesn't make sense</p> <p>there is lack of clarity about what the numbers on the x axis represent</p> <p>graph is curved line</p> <p><b>Not acceptable</b></p> <p>eg no value plotted for 2 in 2016</p> <p>it does not start at 0 (no reference to vertical axis)/missing 0</p> <p>they should not have connected the dots like that</p> <p>the numbers on the x axis are repeated</p> <p>the numbers along the x axis 2, 3, 4</p> <p>the years on the x axis have not been written properly</p> <p>does not follow a sequence</p> <p>it needs a discontinuity wiggle on the axis</p> <p>no title</p> | Ignore additional statements provided no contradiction |
|                | statement | (B1  | One statement eg from those above.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                        |

| Paper: 1MA1/3H |                  |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                        |
|----------------|------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question       | Answer           | Mark | Mark scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Additional guidance                                                                                                                                                                                                                                                    |
| 5              | 162<br>supported | M1   | for method to find sum of the interior angles of a hexagon<br>eg $(6 - 2) \times 180 (= 720)$ oe<br><b>OR</b><br>for method to find sum of the interior angles of a pentagon,<br>eg $(5 - 2) \times 180 (= 540)$<br><b>OR</b><br>for method to find angle $AFC$ or $BCF$ , eg $(360 - 2 \times 117) \div 2 (= 63)$<br><b>OR</b><br>for dropping a perpendicular from $A$ or $B$ to $ED$ with $90^\circ$ marked on $ED$ and $27^\circ$ at the top                                                       | Must be a complete process that would lead to a figure of 720 if evaluated correctly.<br><br>For a pentagon there must be an indication that they have divided the hexagon into two halves.<br><br>63 may be shown on the diagram for angle $AFC$ or angle $BCF$       |
|                |                  | M1   | for method to use ratio $2 : 1$<br>eg marks as $2x$ and $x$ or as $x$ and $\frac{1}{2}x$ on diagram<br><b>OR</b><br>for $([\text{angle sum of hexagon}] - 2 \times 117) \div 6 (= 81)$ oe<br>or $([\text{angle sum of hexagon}] \div 2 - 117) \div 3 (= 81)$ oe<br><b>or</b> $117 + 117 + 2x + 2x + x + x = [\text{angle sum of hexagon}]$ oe<br><b>OR</b><br>eg $([\text{angle sum of pentagon}] - 117 - 180) \div 3 (= 81)$ oe<br><b>or</b> $117 + 180 + 2x + x = [\text{angle sum of pentagon}]$ oe | Ratio must be used correctly if awarded for diagram<br><br>Award provided [angle sum of hexagon] is greater than 700 or [angle sum of pentagon] is greater than 500<br>Algebraic route needs to show both sides of the equation.<br>LHS of equation may be simplified. |
|                |                  | M1   | for finding angle $FED = 81$ or for finding angle $CDE = 81$<br><b>OR</b><br>for complete process to find angle $AFE$<br>eg $([\text{angle sum of hexagon}] - 2 \times 117) \div 6 \times 2$ oe<br><b>OR</b><br>$([\text{angle sum of pentagon}] - 117 - 180) \div 3 \times 2$ oe                                                                                                                                                                                                                      | This may be shown by solving a correct equation to find the value of $x$ .                                                                                                                                                                                             |
|                |                  | C1   | for accurate working leading to angle $AFE = 162$                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Award marks for 162 on the diagram with working and not contradicted by the answer line.<br>Award 0 marks for 162 without working.                                                                                                                                     |

| Paper: 1MA1/3H |              |      |                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------|--------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question       | Answer       | Mark | Mark scheme                                                                                                                                                                                                                                                                                                                                                                     | Additional guidance                                                                                                                                                                                                                                                                                                                                                                               |
| 6              | No Supported | P1   | for finding the area of a circle eg $\pi \times 0.8^2$ (= 2.01...)                                                                                                                                                                                                                                                                                                              | Must be area of circle and not part of a volume, eg $\pi r^2 h$<br>May be seen as $2\pi r^2$                                                                                                                                                                                                                                                                                                      |
|                |              | P1   | for finding the curved surface area eg $2\pi \times 0.8 \times 1.8$ (= 9.047...)                                                                                                                                                                                                                                                                                                | May be seen from $2\pi r h$ or from $\pi d h$                                                                                                                                                                                                                                                                                                                                                     |
|                |              | P1   | for use of the coverage information with an area<br>eg “2.01...” $\div 5$ (= 0.402...) or “4.02...” $\div 5$ (= 0.804...) or “9.047...” $\div 5$ (= 1.8095...) or “11.058” $\div 5$ (= 2.2116..) or “13.069...” $\div 5$ (= 2.6138...)<br><b>OR</b><br>for process to find total coverage for comparison<br>eg $5 \times 7$ (= 35)                                              | Accept numbers without working written to no less than 2dp<br>Do not award if a volume has been used as part of the calculation.<br><br>An independent mark for $5 \times 7$                                                                                                                                                                                                                      |
|                |              | P1   | (dep P1) for finding total surface area for 3 tanks<br>eg [total surface area] $\times 3$ (= 39.2...)<br><b>OR</b><br>for complete process to find the number of tins needed for total area of 3 tanks eg “13.069”... $\times 3 \div 5$ (= 7.84.....)<br><b>OR</b><br>for complete process to find coverage needed from each tin<br>eg “13.069”... $\times 3 \div 7$ (= 5.6...) | [total surface area] must come from the addition of two attempts at area, but not from volume.                                                                                                                                                                                                                                                                                                    |
|                |              | C1   | for conclusion “No” supported by accurate figures<br>eg 8 tins <b>or</b> 7.84 ( $> 7$ ) <b>or</b> 39.2 $> 35$ <b>or</b> 5.6 ( $> 5$ )                                                                                                                                                                                                                                           | Clear statement that there is <b>not</b> enough paint supported by correct figures for comparison.<br>NB: $2.6 \times 3 = 9$ tins needed is inaccurate<br>8 or 7.84 tins is sufficient without restating the 7, 5.6 m <sup>2</sup> is sufficient without restating the 5 but 39.2 and 35 are needed for comparison.<br>A statement of “No, 8 tins” alone gets 0 marks without supporting working. |

| Paper: 1MA1/3H |                       |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                 |
|----------------|-----------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Question       | Answer                | Mark         | Mark scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Additional guidance                                                                                                             |
| 7              | 0.319                 | M1<br><br>A1 | for partial method eg 1.70(499...) or 16.74 or $\frac{837}{50}$ or 0.101(8516...) or 0.102 or 0.32<br>for 0.319(1419...)                                                                                                                                                                                                                                                                                                                                                                    | Accept 0.319 or better. Condone incorrect digits after the 0.319; isw incorrect rounding if 0.319(1419...) is shown in working. |
| 8              | (a) Mistake described | C1           | for statement describing a mistake<br><b>Acceptable</b><br>eg should be $AC^2 - AB^2$<br>she should do $8^2 - 6^2$<br>she should be subtracting not adding the numbers<br>she thought that $BC$ was the hypoteneuse when it was actually $AC$<br>should be $BC^2 + AB^2 = AC^2$<br>.....should be $8^2 = 6^2 + BC^2$<br><b>Not acceptable</b><br>eg she has not used Pythagoras correctly<br>$6^2 + 8^2$ is 120<br>the answer should be $\sqrt{28}$ or 5 or 5.3 or 5.2915<br>$BC + AB = AC$ | Note that a diagram alone is insufficient.                                                                                      |
| (b)            | Explanation           | C1           | for explanation<br><b>Acceptable examples</b><br>the scale factor used is 2.5<br>$5 \div 2$ is not 1.5<br>$10 \div 4$ is more than 1.5<br>the scale factor is not 1.5<br>he has not used the correct scale factor<br>has enlarged it by too much<br>$ZY$ should be 6<br><b>Not acceptable examples</b><br>the grid is not large enough                                                                                                                                                      |                                                                                                                                 |

| Paper: 1MA1/3H |        |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                        |
|----------------|--------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question       | Answer | Mark                   | Mark scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Additional guidance                                                                                                                                    |
| 9              | 10     | P1<br><br>P1<br><br>A1 | <p>he has used the wrong centre</p> <p>for a process to start to solve the problem<br/>eg <math>6 \times 9 (= 54)</math> machine days needed<br/>or 12 (machine days used in first 3 days)<br/>or 42 (machine days needed after first 3 days)<br/>or 6 (machine days not used in first 3 days)<br/>or <math>3 + 4 + 5</math> equivalent to 2 days with 6 machines<br/>or has used 48 machine days in first 9 days</p> <p>for "<math>42</math>" <math>\div 6 (= 7)</math> (more days needed)<br/>or <math>3 \text{ days} - 2</math> (equivalent) days <math>(= 1)</math> extra day needed to make up for the days not used</p> <p>cao</p> | <p>eg <math>3 + 4 + 5 (= 12)</math><br/>eg <math>6 \times 9 - 12 (= 42)</math><br/>eg <math>3 + 2 + 1 = 6</math><br/>eg <math>12 \div 6 = 2</math></p> |
| 10             | 1.8    | P1<br><br>P1<br><br>A1 | <p>process to find the amount of interest before tax<br/>eg <math>28.80 \div 20 \times 100 (= 144)</math><br/>OR<br/>for equation which would lead to <math>(x =) 0.018, 1.8</math> or <math>1.018</math><br/>eg <math>0.2 \times 8000 \times x = 28.8</math> or <math>\frac{8000(100+x)}{100} = 8144</math></p> <p>process to find the interest rate eg <math>\frac{144}{8000} (= 0.018)</math> or <math>\frac{8144}{8000} (= 1.018)</math></p> <p>cao</p>                                                                                                                                                                              | <p>These numerical expressions may be seen multiplied by 100, eg <math>\frac{144}{8000} \times 100</math></p>                                          |

| Paper: 1MA1/3H |             |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                          |
|----------------|-------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Question       | Answer      | Mark | Mark scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Additional guidance      |
| 11 (a)         | 130         | P1   | for process to divide eg $(3.9 \times 10^7) \div (3 \times 10^5)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Condone missing brackets |
|                |             | A1   | cao                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Accept $1.3 \times 10^2$ |
| (b)            | Explanation | C1   | Explanation referring to the time<br><b>Acceptable examples</b><br>The time will be more<br>It will take longer<br>The answer will be bigger<br><b>Not acceptable examples</b><br>The answer will be wrong<br>The answer will be different                                                                                                                                                                                                                                                                                                                                                    |                          |
| 12             | Explanation | C1   | for explanation eg needs to find 4th root or gives the correct answer of 2.828...<br><b>Acceptable examples:</b><br>He needs to find $\sqrt[4]{64}$<br>It should be 2.8..(or $2\sqrt{2}$ )<br>It is not asking for $64 \div 4$ , it is asking what number to the power of 4 = 64<br>$64^{\frac{1}{4}}$ means the fourth root not a quarter of 64<br>$64^{\frac{1}{4}}$ means square root and square root again, not divide by 4<br><b>Not acceptable examples:</b><br>It should be 2<br>The expression is 64 to the power of $\frac{1}{4}$<br>$64^{\frac{1}{4}}$ is not a $\frac{1}{4}$ of 64 |                          |

| Paper: 1MA1/3H |        |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                              |
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| Question       | Answer | Mark                             | Mark scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Additional guidance                                                                                                                                                                                                                                                                                                          |
| 13             | 1.01   | P1<br><br>P1<br><br>P1<br><br>A1 | for $1.09 \times 60 (= 65.4 \text{ or } \frac{327}{5})$ <b>or</b> $0.97 \times 128 (= 124.16 \text{ or } \frac{3104}{25})$<br><br>for $1.09 \times 60 (= 65.4 \text{ or } \frac{327}{5})$ <b>and</b> $0.97 \times 128 (= 124.16 \text{ or } \frac{3104}{25})$<br><b>or</b> “65.4” + “124.16” $(= 189.56 \text{ or } \frac{4739}{25})$<br><br>for a complete process to find the density of antifreeze<br>eg “65.4” + “124.16” $\div 188$ or $189.56 \div 188$ or $\frac{4739}{25} \div 188$<br><br>for answer in the range 1.00 to 1.01 | Note that the volumes may be converted to ml,<br>eg $1.09 \times 60000 (= 65400)$<br><br>Candidates working in ml must use 188,000<br><br>If an answer within the range is seen in working<br>but then rounded incorrectly award full marks.<br>Accept 1 for 1.00<br>Note that the correct value is 1.008.....               |
| 14             | 36     | P1<br><br>P1<br><br>P1<br><br>A1 | for process to find an expression for the area of triangle<br>eg $\frac{1}{2} \times 24 \times AE \times \sin 30 (= 6AE)$<br><br>(dep P1) for process to link the area of rectangle with the area of the triangle<br>eg $2 \times \frac{1}{2} \times 24 \times AE \times \sin 30 (= 12AE)$<br>or for $AB = 12$<br><br>(indep) for use of given ratio eg $AE = 3AB$ oe,<br>eg area of rectangle $= AE \times AB = 3x \times x$<br><br>cao                                                                                                | Accept any correct expression,<br>eg $\frac{1}{2} \times 24 \times y \times \sin 30$<br><br>May be shown on the diagram by labelling $AE$<br>and $AB$ with, for example, $3x, x$ or $x, \frac{1}{3}x$ or $\frac{3}{4}x, \frac{1}{4}x$<br>Do not accept 3, 1 or $1, \frac{1}{3}$ or $\frac{3}{4}, \frac{1}{4}$ for this mark. |

| Paper: 1MA1/3H |            |                                            |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                              |
|----------------|------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question       | Answer     | Mark                                       | Mark scheme                                                                                                                                                                                                                                                                                       | Additional guidance                                                                                                                                          |
| 15             | $(-7, -1)$ | M1<br><br><br><br><br><br><br><br>A1       | for a method which shows understanding of the type of transformation<br>eg reflection in the $y$ axis or translation $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ or “(0 units right and) 3 units down”<br><b>or</b> for $x$ coordinate as $-7$ <b>or</b> $y$ coordinate as $-1$<br><br>for $(-7, -1)$ | “Reflection” or “Translation” alone is insufficient.<br>Note that the $-7$ or the $-1$ may appear in the working space, not necessarily in the final answer. |
| 16             | $2n^2 - 3$ | M1<br><br><br><br><br>M1<br><br><br><br>A1 | begins to work with $2^{\text{nd}}$ differences<br><br><br>identifies $2n^2$ as part of the expression<br>eg gives the sequence 2, 8, 18, 32, ... or gives a quadratic expression which includes the term $2n^2$<br><br>oe                                                                        | 6   10   14   18   22<br>4   4   4   4<br><br>A quadratic expression of the form $2n^2 + bn + c$ can be awarded the first 2 marks                            |
| 17             | B, A, D, C | B2<br><br><br>(B1)                         | for all correct<br><br><br>for two or three correct)                                                                                                                                                                                                                                              |                                                                                                                                                              |

| Paper: 1MA1/3H |                                  |      |                                                                                                                                                                                                                    |                                                                                                           |
|----------------|----------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Question       | Answer                           | Mark | Mark scheme                                                                                                                                                                                                        | Additional guidance                                                                                       |
| 18 (a)         | $6x^3 + 35x^2 + 58x + 21$        | M1   | for a method to find the product of two linear expressions, 3 correct terms out of 4 terms<br>e.g. $2x^2 + x + 6x + 3$ or $3x^2 + 7x + 9x + 21$ or $6x^2 + 14x + 3x + 7$                                           | Note that, for example, $7x + 3$ is regarded as three terms in the expansion of $(2x + 1)(x + 3)$         |
|                |                                  | M1   | for a complete method to obtain all terms, at least half of which are correct<br>(ft their first product) e.g. $6x^3 + 32x^2 + 42x + 3x^2 + 16x + 21$                                                              | First product must be a 3 or 4 term quadratic but need not be simplified or may be simplified incorrectly |
|                |                                  | A1   | cao                                                                                                                                                                                                                | Accept $a = 6, b = 35, c = 58, d = 21$                                                                    |
| (b)            | $\frac{2}{5} < x < 1\frac{3}{5}$ | M1   | for first step of finding the square root of both sides eg $1 - x < \pm\frac{3}{5}$<br><br><b>OR</b> for writing in the form $ax^2 + bx + c (< 0)$ eg $x^2 - 2x + \frac{16}{25} (< 0)$ or $25x^2 - 50x + 16 (< 0)$ | Condone use of an “=” sign; accept one square root (eg $\frac{3}{5}$ ) only shown.                        |
|                |                                  | M1   | for showing critical values $\frac{2}{5}$ (= 0.4) and $1\frac{3}{5}$ (= 1.6) oe                                                                                                                                    | Critical values can be stated, or shown in an expression (which may have incorrect inequality symbols)    |
|                |                                  | A1   | for $\frac{2}{5} < x < 1\frac{3}{5}$ oe                                                                                                                                                                            | Could be written as two separate expressions eg $x > \frac{2}{5}$ and $x < 1\frac{3}{5}$ oe               |

| Paper: 1MA1/3H |             |      |                                                                                                                                                                                                                                         |                                            |
|----------------|-------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Question       | Answer      | Mark | Mark scheme                                                                                                                                                                                                                             | Additional guidance                        |
| 19 (a)         | 81.0662     | M1   | for one of 26.15 or 26.25 or 4.25 or 4.35                                                                                                                                                                                               | Accept 26.249 for 26.25 and 4.349 for 4.35 |
|                |             | M1   | for a correct process to find the upper bound for $D$<br>$[\text{UB of } u]^2 \div [2 \times \text{LB of } a]$ eg $\frac{26.25^2}{2 \times 4.25}$<br>where $26.2 < \text{UB of } u \leq 26.25$ and $4.25 \leq \text{LB of } a < 4.3$    | Award for $\frac{26.25^2}{4.25}$           |
|                |             | A1   | for answer given in the range 81.0661 to 81.0662 from correct working                                                                                                                                                                   |                                            |
|                | (b)         |      |                                                                                                                                                                                                                                         |                                            |
|                | 80          | B1   | for 80 ft answer to (a) with 78.6003                                                                                                                                                                                                    |                                            |
|                | explanation | C1   | for explanation relating to the upper bound found in (a)<br><b>Acceptable examples</b><br>bounds agree when rounded to 80<br>bounds agree to nearest 10<br><b>Not acceptable examples</b><br>80<br>79.83325<br>rounded to nearest tenth |                                            |

| Paper: 1MA1/3H |                                                             |      |                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                     |
|----------------|-------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question       | Answer                                                      | Mark | Mark scheme                                                                                                                                                                                                                                                                                                                                                                                                                    | Additional guidance                                                                                                                                                                                                                                                                                 |
| 20             | $x = 3\frac{2}{5}, y = -\frac{4}{5}$<br><br>$x = 5, y = -2$ | M1   | for substitution of a rearrangement<br>eg $x = \frac{7-4y}{3}$ or $y = \frac{7-3x}{4}$ into $x^2 - 4y^2 = 9$<br><b>or</b> expansion of $\left(\frac{7-4y}{3}\right)^2 = \frac{49-56y+16y^2}{9}$ or $\left(\frac{7-3x}{4}\right)^2 = \frac{49-42x+9x^2}{16}$                                                                                                                                                                    | Expansion may not be in simplest form but must be correct<br><br><br><br><br>Note we do not need to see “= 0”; just the LHS is sufficient.<br><br><br>Can be implied by both $x$ values correct or both $y$ values correct.<br><br><br>Answers must be correctly paired.<br>Accept coordinate pairs |
|                |                                                             | M1   | for correct expansion <b>and</b> substitution<br>eg $\frac{49-56y+16y^2}{9} - 4y^2 = 9$<br><b>or</b> $x^2 - 4\left(\frac{49-42x+9x^2}{16}\right) = 9$                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                     |
|                |                                                             | A1   | for forming quadratic ready for solving<br>eg $-20y^2 - 56y - 32 (= 0)$ or $5y^2 + 14y + 8 (= 0)$ oe<br><b>or</b> $5x^2 - 42x + 85 (= 0)$ oe                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                     |
|                |                                                             | M1   | ft a 3 term quadratic , factorising<br>eg $(5y + 4)(y + 2) (= 0)$ <b>or</b> $(5x - 17)(x - 5) (= 0)$<br>or correct use of formula eg $(y =) \frac{-14 \pm \sqrt{14^2 - 4 \times 5 \times 8}}{2 \times 5}$<br><b>or</b> $(x =) \frac{-42 \pm \sqrt{42^2 - 4 \times 5 \times 85}}{2 \times 5}$<br><b>or</b> completing the square, eg $(y + \frac{7}{5})^2 - \frac{9}{25} (= 0)$ or $(x - \frac{21}{5})^2 - \frac{16}{25} (= 0)$ |                                                                                                                                                                                                                                                                                                     |
|                |                                                             | A1   | correctly pairs $x$ and $y$ values: $x = 3\frac{2}{5}, y = -\frac{4}{5}$ oe , $x = 5, y = -2$                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                     |



| Paper: 1MA1/3H |        |      |                                                                                                                                         |                                                                                                                                                                                                               |
|----------------|--------|------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question       | Answer | Mark | Mark scheme                                                                                                                             | Additional guidance                                                                                                                                                                                           |
| 22             | 2.5    | P1   | use of $\sin 30 = \frac{1}{2}$ to find $OA$ ( $= 8$ ) or $OAB = 90^\circ$<br>eg $OA = 16\sin 30^\circ$ or right angle marked on diagram |                                                                                                                                                                                                               |
|                |        | P1   | recognition that equation of circle is $x^2 + y^2 = r^2$                                                                                | Accept $3p^2 + p^2 = r^2$ for the award of this mark                                                                                                                                                          |
|                |        | P1   | Correct substitution of $p$ , $3p$ and $r$ in $x^2 + y^2 = r^2$<br>eg $9p^2 + p^2 = OA^2$ or $(3p)^2 + p^2 = "8^2"$                     | Do not accept $3p^2 + p^2 = 8^2$ for the award of this mark                                                                                                                                                   |
|                |        | A1   | for answer in the range 2.5 to 2.53                                                                                                     | Accept $\sqrt{6.4}$ or $\frac{4\sqrt{10}}{5}$<br>If an answer within the given range is seen in working and rounded incorrectly award full marks.<br>Award 0 marks for the answer without supportive working. |

| Paper: 1MA1/3H |        |      |                                                                                                                                           |                                                                                                                                                                                                              |
|----------------|--------|------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question       | Answer | Mark | Mark scheme                                                                                                                               | Additional guidance                                                                                                                                                                                          |
| 23             | 098.6  | P1   | for using bearings to determine $ABC$ as $67^\circ$                                                                                       | Accept 67 written on the diagram.                                                                                                                                                                            |
|                |        | P1   | for using the cosine rule to find $AC$<br>eg $(AC^2 =) 9^2 + 8^2 - 2 \times 9 \times 8 \times \cos[67]$ oe or $AC = 9.4199\dots$          | Accept correct substitution into RHS of equation<br>Accept $AC$ in the range 9.41 to 9.42                                                                                                                    |
|                |        | P1   | (dep P1) for using the sine rule to find angle $BAC$<br>eg $\frac{9}{\sin BAC} = \frac{"9.42"}{\sin[67]}$ oe                              |                                                                                                                                                                                                              |
|                |        |      | <b>OR</b><br><br>for using the cosine rule to find angle $BAC$<br>eg $9^2 = "9.42^2" + 8^2 - 2 \times "9.42" \times 8 \times \cos BAC$ oe |                                                                                                                                                                                                              |
|                |        | P1   | for rearranging<br>eg $\sin BAC = 9 \times \frac{\sin[67]}{"9.42"}$ oe                                                                    | Accept any equivalent form with values substituted                                                                                                                                                           |
|                |        |      | <b>OR</b><br>eg $\cos BAC = ("9.42^2" + 8^2 - 9^2) \div (2 \times "9.42" \times 8)$ oe                                                    |                                                                                                                                                                                                              |
|                |        |      | <b>OR</b><br>for angle $BAC = 61.57\dots$                                                                                                 |                                                                                                                                                                                                              |
|                |        | A1   | for angle in the range 98.5 to 98.6                                                                                                       | If the correct answer is given without supportive evidence award 0 marks.<br>Condone missing "0" at the front.<br>If an answer within the range is seen in working and rounded incorrectly award full marks. |



### Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 3H

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:

Angles:  $\pm 5^\circ$

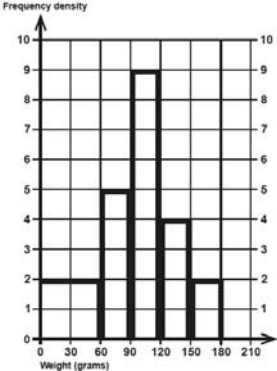
Measurements of length:  $\pm 5$  mm

| PAPER: 1MA1/3H |                                                                                                                                                                                                                                               |                                                                                              |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Question       | Modification                                                                                                                                                                                                                                  | Mark scheme notes                                                                            |
| 1              | Diagram enlarged. Wording added 'It shows an incomplete Venn diagram.'<br>Ovals made circular. Regions labelled 'Set A' and 'Set B' on the diagram.<br>Braille only – spaces labelled (i) to (iv).                                            | Standard mark scheme                                                                         |
| 3              | Frequency column widened.<br>The first two numbers in the table changed to 8 and 12<br>In part (b) diagram enlarged. Right axis labelled. Scale changed.<br>Axes labels moved to the left of the horizontal axis and above the vertical axis. | Standard mark scheme but the first two points plotted in (b) should be at (15,8) and (25,12) |
| 4              | Diagram enlarged. Crosses changed to solid dots.<br>Axes labels moved to the left of the horizontal axis and above the vertical axis.                                                                                                         | Standard mark scheme                                                                         |
| 5              | Wording added ' <i>ABCDEF</i> '. Diagram enlarged.<br>Angle moved outside of the angle arc and the angle arc made smaller.                                                                                                                    | Standard mark scheme                                                                         |

**PAPER: 1MA1/3H**

| <b>Question</b> |            | <b>Modification</b>                                                                                                                                                                                                                                                                                                                                                             | <b>Mark scheme notes</b> |
|-----------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| 6               |            | Diagram enlarged and labelled as Diagram 1. Inside the cylinder labelled as 'Tank'.<br>Diagram of the circular face added and labelled as Diagram 2.<br>Wording added 'Diagram 1 shows a tank.'<br>Wording changed to 'Each tank is in the shape of a cylinder with both a top and a bottom as shown in Diagram 2'.<br>Model of Diagram 1 provided for Braille candidates only. | Standard mark scheme     |
| 8               | (a)<br>(b) | Diagram enlarged and straightened.<br>Diagram enlarged. Solid dot added at C. Excess grid removed.<br>Wording added 'It shows triangles PQR and XYZ on a grid.'                                                                                                                                                                                                                 | Standard mark scheme     |
| 9               |            | Table turned vertical.                                                                                                                                                                                                                                                                                                                                                          | Standard mark scheme     |
| 14              |            | Diagram enlarged. Wording added:<br>'AF = BC = 24 cm. Angle FAE = Angle CBD = 30°'<br>Angles moved outside of angle arcs and angle arcs made smaller.                                                                                                                                                                                                                           | Standard mark scheme     |
| 17              |            | Diagrams enlarged. Graph column widened.<br>Braille only – descriptions labelled from (i) to (iv).                                                                                                                                                                                                                                                                              | Standard mark scheme     |

**PAPER: 1MA1/3H**

| Question | Modification                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Mark scheme notes                                                                                                                                                                                                                                                                                                                                                                    |        |    |   |      |   |     |       |   |     |        |   |     |         |   |     |         |   |    |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----|---|------|---|-----|-------|---|-----|--------|---|-----|---------|---|-----|---------|---|----|
| 21       | <p>Diagrams enlarged.</p> <p>120 to 135 group changed to a 120 to 150 group with height 4.</p> <p>135 to 180 group changed to a 150 to 180 group with height 2.</p>  <p>Axes labels moved above the vertical axis and to the left of the horizontal axis.</p> <p>Right axis labelled. Shading removed.</p> <p>Wording changed to 'Work out the value of the angle marked <math>x^\circ</math>'</p> | <p>Standard mark scheme</p> <p>Note (does not change mark scheme):</p> <table> <tr> <td>Weight</td><td>FD</td><td>f</td></tr> <tr> <td>0-60</td><td>2</td><td>120</td></tr> <tr> <td>60-90</td><td>5</td><td>150</td></tr> <tr> <td>90-120</td><td>9</td><td>270</td></tr> <tr> <td>120-150</td><td>4</td><td>120</td></tr> <tr> <td>150-180</td><td>2</td><td>60</td></tr> </table> | Weight | FD | f | 0-60 | 2 | 120 | 60-90 | 5 | 150 | 90-120 | 9 | 270 | 120-150 | 4 | 120 | 150-180 | 2 | 60 |
| Weight   | FD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | f                                                                                                                                                                                                                                                                                                                                                                                    |        |    |   |      |   |     |       |   |     |        |   |     |         |   |     |         |   |    |
| 0-60     | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 120                                                                                                                                                                                                                                                                                                                                                                                  |        |    |   |      |   |     |       |   |     |        |   |     |         |   |     |         |   |    |
| 60-90    | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 150                                                                                                                                                                                                                                                                                                                                                                                  |        |    |   |      |   |     |       |   |     |        |   |     |         |   |     |         |   |    |
| 90-120   | 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 270                                                                                                                                                                                                                                                                                                                                                                                  |        |    |   |      |   |     |       |   |     |        |   |     |         |   |     |         |   |    |
| 120-150  | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 120                                                                                                                                                                                                                                                                                                                                                                                  |        |    |   |      |   |     |       |   |     |        |   |     |         |   |     |         |   |    |
| 150-180  | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 60                                                                                                                                                                                                                                                                                                                                                                                   |        |    |   |      |   |     |       |   |     |        |   |     |         |   |     |         |   |    |
| 22       | <p>Diagram enlarged. Cross changed to solid dot. Solid dot added at B.</p> <p>Line OA shown on the diagram. Wording added 'OA is shown on the diagram.'</p> <p>Angle moved outside of the angle arc and the angle arc made smaller.</p>                                                                                                                                                                                                                                             | Standard mark scheme                                                                                                                                                                                                                                                                                                                                                                 |        |    |   |      |   |     |       |   |     |        |   |     |         |   |     |         |   |    |
| 23       | <p>Diagram enlarged. A and C connected with a dashed line.</p> <p>Angles moved outside of angle arcs and angle arcs made smaller.</p>                                                                                                                                                                                                                                                                                                                                               | Standard mark scheme                                                                                                                                                                                                                                                                                                                                                                 |        |    |   |      |   |     |       |   |     |        |   |     |         |   |     |         |   |    |





