

# Foundation

**GCSE**

**Mathematics - Paper 3**

**J560/03: Paper 3 (Foundation tier)**

General Certificate of Secondary Education

**Mark Scheme for June 2022**

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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## MARKING INSTRUCTIONS

### PREPARATION FOR MARKING RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor.
3. Log-in to RM Assessor then mark and annotate the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

### MARKING

4. Mark strictly to the mark scheme.
5. Marks awarded must relate directly to the marking criteria.
6. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
7. If you are in any doubt about applying the mark scheme, consult your Team Leader via the RM Assessor messaging system.
8. Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners should give candidates the benefit of the doubt and mark the crossed out response where legible.
9. When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.
10. On each blank page the annotation **BP** must be inserted to confirm that the page has been checked. For additional objects (if present), a tick must be inserted on each page to confirm that it has been checked.

11. There is a NR (No Response) option. Award NR (No Response)
- if there is nothing written at all in the answer space
  - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
  - OR if there is a mark (e.g. a dash, a question mark) which is not an attempt at the question.

The hash key (#) on your keyboard will enter NR.

Note: Award 0 marks for an attempt that earns no credit (including copying out the question).

12. The RM Assessor **comments box** is used by the Principal Examiner or your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

If you have any questions or comments for your Team Leader, use the RM Assessor messaging system.

13. Assistant Examiners should send a brief report on the performance of candidates to their Team Leader (Supervisor) by the end of the marking period. Please follow the direction of your Team Leader about which questions you should report on and how to submit your report. Your report should contain notes on particular strengths displayed as well as common errors or weaknesses.
14. Annotations available in RM Assessor. These **must** be used whenever appropriate during your marking.

| Annotation                                                                         | Meaning                                                                                       |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|   | Correct                                                                                       |
|  | Incorrect                                                                                     |
| <b>BOD</b>                                                                         | Benefit of doubt                                                                              |
| <b>FT</b>                                                                          | Follow through                                                                                |
| <b>ISW</b>                                                                         | Ignore subsequent working (after correct answer obtained), provided method has been completed |
| <b>M0</b>                                                                          | Method mark awarded 0                                                                         |
| <b>M1</b>                                                                          | Method mark awarded 1                                                                         |

|             |                            |
|-------------|----------------------------|
| <b>M2</b>   | Method mark awarded 2      |
| <b>A1</b>   | Accuracy mark awarded 1    |
| <b>B1</b>   | Independent mark awarded 1 |
| <b>B2</b>   | Independent mark awarded 2 |
| <b>MR</b>   | Misread                    |
| <b>SC</b>   | Special case               |
| <b>^</b>    | Omission sign              |
| <b>BP</b>   | Blank page                 |
| <b>SEEN</b> | Seen                       |

For a response awarded zero (or full) marks a single appropriate annotation (cross, tick, M0 or ^) is sufficient, but not required.

For responses that are not awarded either 0 or full marks, you must make it clear how you have arrived at the mark you have awarded and all responses must have enough annotation for a reviewer to decide if the mark awarded is correct without having to mark it independently.

**It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.**

**Subject-Specific Marking Instructions**

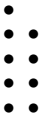
15. **M** marks are for using a correct method and are not lost for purely numerical errors.  
**A** marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.  
**B** marks are independent of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.  
**SC** marks are for special cases that are worthy of some credit.
16. The following abbreviations are commonly found in GCSE Mathematics mark schemes.
- **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point e.g. 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
  - **isw** means **ignore subsequent working** after correct answer obtained and applies as a default.
  - **nfw** means **not from wrong working**.
  - **oe** means **or equivalent**.
  - **rot** means **rounded or truncated**.
  - **soi** means **seen or implied**.
  - **dep** means that the marks are **dependent** on the marks indicated. You must check that the candidate has met all the criteria specified for the mark to be awarded.
  - **with correct working** means that full marks **must not** be awarded without some working. The required minimum amount of working will be defined in the guidance column and **SC** marks given for unsupported answers.
17. Anything in the mark scheme which is in square brackets [...] is not required for the mark to be earned, but if present it must be correct.
18. Unless the command word requires that working is shown and the working required is stated in the mark scheme, then if the correct answer is clearly given and is not from wrong working **full marks** should be awarded.
- Do not award the marks if the answer was obtained from an incorrect method, i.e. incorrect working is seen and the correct answer clearly follows from it.
19. Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct. For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, e.g. FT  $180 \times (\text{their '37'} + 16)$ , or FT  $300 - \sqrt{(\text{their '52'} + 72)}$ . Answers to part questions which are being followed through are indicated by e.g. FT  $3 \times \text{their (a)}$ .

20. In questions **with no final answer line**, make no deductions for wrong work after an acceptable answer (i.e. **isw**) unless the mark scheme says otherwise, indicated by the instruction 'mark final answer'.
21. In questions **with a final answer line and incorrect answer given**:
- (i) If the correct answer is seen in the body of working and the answer given on the answer line is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.
  - (ii) If the correct answer is seen in the body of working but the answer line is blank, allow full marks. Place the annotation ✓ next to the correct answer.
  - (iii) If the correct answer is seen in the body of working but a completely different answer is seen on the answer line, then accuracy marks for the answer are lost. Method marks could still be awarded if there is no other method leading to the incorrect answer. Use the **M0**, **M1**, **M2** annotations as appropriate and place the annotation ✕ next to the wrong answer.
22. In questions **with a final answer line**:
- (i) If one answer is provided on the answer line, mark the method that leads to that answer. A correct step, value or statement that is not part of the method that leads to the given answer should be awarded **M0** and/or **B0**.
  - (ii) If more than one answer is provided on the answer line and there is a single method provided, award method marks only.
  - (iii) If more than one answer is provided on the answer line and there is more than one method provided, award marks for the poorer response unless the candidate has clearly indicated which method is to be marked.
23. In questions with **no final answer line**:
- (i) If a single response is provided, mark as usual.
  - (ii) If more than one response is provided, award marks for the poorer response unless the candidate has clearly indicated which response is to be marked.
24. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the **MR** annotation. **M** marks are not deducted for misreads. If a candidate corrects the misread in a later part, do not continue to follow through, but award **A** and **B** marks for the correct answer only.

25. Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.
26. Ranges of answers given in the mark scheme are always inclusive.
27. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.
28. If in any case the mark scheme operates with considerable unfairness consult your Team Leader.

| Question |     |  | Answer                           | Marks | Part marks and guidance                                                                          |                                                                                                                                                                                                                                                   |
|----------|-----|--|----------------------------------|-------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | (a) |  | One of, 1, 2, 3, 6, 9, 18        | 1     |                                                                                                  | Accept more than one correct but no errors<br>May be a product e.g. $2 \times 9$ but not $2 \times 3^2$ or an incorrect product e.g. $2 \times 6$                                                                                                 |
|          | (b) |  | 16                               | 1     |                                                                                                  | Mark the answer line<br>Accept $4^2 = 16$ as answer but not $4^2$                                                                                                                                                                                 |
|          | (c) |  | [0].25                           | 1     |                                                                                                  | Ignore additional zeros after 5                                                                                                                                                                                                                   |
|          | (d) |  | 5 and 8                          | 2     | Mark final answer<br><b>M1</b> for a pair seen that either multiply to give 40 or add to give 13 | For <b>M1</b> , accept non-integers and negatives<br>Accept answers<br>$8 \times 5$ and $8 + 5$                                                                                                                                                   |
| 2        | (a) |  | 2 correct lines of symmetry only | 1     |                                                                                                  | Mark intention condoning freehand use BOD<br>Lines should be approx half diameter or longer by eye and intersect within the crossbar and one be within the crossbar.<br>If more than one drawing and no clear choice, mark the worst (2a and 2ci) |
|          | (b) |  | 4                                | 1     |                                                                                                  |                                                                                                                                                                                                                                                   |

| Question |     |      | Answer                                                                                                                                                                                                                                         | Marks      | Part marks and guidance                          |                                                                                                                                                                                                                                 |
|----------|-----|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | (c) | (i)  | Sketch of a quadrilateral with exactly one line of symmetry                                                                                                                                                                                    | 1          |                                                  | Mark intention and condone freehand kite or isosceles trapezium or arrowhead. If kite, must not appear to have two pairs of parallel sides e.g. look square<br>L of S need not be seen                                          |
|          | (c) | (ii) | Name consistent with sketch                                                                                                                                                                                                                    | 1dep       | Dep on (c)(i) being a recognisable quadrilateral | Condone poor spelling<br>Mark name based on your decision for shape in (i)                                                                                                                                                      |
| 3        | (a) |      |                                                                                                                                                               | 1          |                                                  | May be at the end of the sequence                                                                                                                                                                                               |
|          | (b) |      | 15<br><br>Add 2 [each time] or goes up in 2s oe<br>or $2n - 1$ oe<br>or correct calculation leading to 15 using 7, 8, or values from given terms e.g. $7 + 8$ or $2 \times 7 + 1$<br>or 8 [dots] and 7 [dots]<br>or [1, 3, 5, 7, 9] 11, 13, 15 | 1<br><br>1 |                                                  | Ignore a drawing<br><br>Do not accept “odd numbers” but accept “the eighth odd number” oe<br>Mark the best part if no contradiction<br>$8 + 7$ may be 8 on left, one less on right<br>2 times previous pattern<br>number + 1 oe |
| 4        | (a) |      | Diameter drawn                                                                                                                                                                                                                                 | 1          |                                                  | Allow freehand intended straight. No white paper seen between line and centre and line and circumference.<br>Ends no more than 2mm by eye beyond circumference<br>If two lines mark the worst                                   |
|          | (b) |      | Chord                                                                                                                                                                                                                                          | 1          |                                                  | Condone poor spelling                                                                                                                                                                                                           |

| Question |     | Answer                                                                                                                                                                                                    | Marks | Part marks and guidance                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                    |
|----------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5        | (a) | H5 H6 H8<br>T5 T6 T7 T8                                                                                                                                                                                   | 2     | <b>B1</b> for 5 correct in correct place                                                                                                                                                                                                                                                                                                                       | Accept 5H etc                                                                                                                                                                                                                      |
|          | (b) | $\frac{1}{4}$                                                                                                                                                                                             | 2     | <b>B1</b> for $\frac{\text{their } 2}{8}$ isw<br>If 0 scored, <b>SC1</b> for 0.25 or 25%                                                                                                                                                                                                                                                                       | Follow through <i>their</i> number of “T and even number” from table in (a)                                                                                                                                                        |
| 6        |     | Kai and correct value(s) used/referred to in reason<br><br>7<br>or<br>14 and 13 [# right]<br>Accept $\frac{13}{20}$ and $\frac{14}{20}$<br><br>or<br><br>35% and 30% [% wrong]<br><br>or<br>70% [% right] | 3     | <b>B2</b> for 7 or <b>M1</b> for $\frac{35}{100} \times 20$ oe<br>or<br><b>B2</b> for 13 and 14 or <b>M1</b> for $\frac{65}{100} \times 20$ oe<br>or <b>B1</b> for 13<br>or<br><b>B2</b> for 30% and 35% or <b>M1</b> for $\frac{6}{20} [\times 100]$ oe<br>or <b>B1</b> for 30%<br>or<br><b>B2</b> for 70[%] or <b>M1</b> for $\frac{14}{20} [\times 100]$ oe | Value(s) may be in working space.<br>Reference may be e.g. He got more right oe with 7 or 70% seen.<br>Ignore extra statements if no contradiction<br><br>Accept [0].35 and [0].3[0] for %<br><br>Accept [0].65 and [0].7[0] for % |
| 7        | (a) | He has not used [masses in] the same units<br>or correct example of amounts e.g.<br>[4kg and] 1kg [of butter]<br>or 4g [of flour] [and 1g]                                                                | 1     |                                                                                                                                                                                                                                                                                                                                                                | See appendix<br>Accept amounts for masses<br>The units are mixed/not the same<br>Do not accept “measurements” for “units” but may be clarified later<br>Mark the best part if no contradiction                                     |

| Question |     |  | Answer                                                       | Marks | Part marks and guidance                                                                                                                                               |                                                                                                                                                                                        |
|----------|-----|--|--------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | (b) |  | 1 : 9                                                        | 2     | <b>B1</b> for $\frac{1}{10} : \frac{9}{10}$ or 10 : 90 or 2 : 18<br>or 0.1 : 0.9<br>If 0 scored <b>SC1</b> for answer 9 : 1                                           | Must be a ratio to earn marks                                                                                                                                                          |
| 8        | (a) |  | 6a final answer                                              | 1     |                                                                                                                                                                       | Condone poor algebra e.g. $6 \times a$ and $a \times 6$ but not $a^6$                                                                                                                  |
|          | (b) |  | $\frac{1}{2}x^4$ or $\frac{x^4}{2}$ or $0.5x^4$ final answer | 2     | <b>B1</b> for $0.5x^k$ $k \neq 0$<br>or $gx^4$ $g \neq 0$ as answer                                                                                                   | Condone 1 before term in x<br>Allow $\frac{x^5}{2x}$ and $\frac{2x^4}{4}$ for B1                                                                                                       |
| 9        |     |  | 249.6[0]                                                     | 3     | <b>M2</b> for $\frac{4}{3} \times 23.4[0] \times 8$ oe<br>or<br><b>M1</b> for $\frac{4}{3} \times 23.4[0]$ oe soi by 31.2[0]<br>or $23.4[0] \times 8$ soi by 187.2[0] | Accept only 249.6[0] for 3 marks<br>Accept $1\frac{1}{3}$ or 1.3[33...] for $\frac{4}{3}$<br>oe $=23.4 \div 3 = a$ , $a \times 4 \times 8$<br><br>oe $=23.4 \div 3 = a$ , $a \times 4$ |
| 10       | (a) |  | $\frac{2}{8}$                                                | 1     |                                                                                                                                                                       | Accept equivalent fractions<br>eg $\frac{1}{4}$ or $\frac{4}{16}$                                                                                                                      |

| Question |     | Answer                                                                                                                                                                                                                                                       | Marks                                                               | Part marks and guidance                                                                                                               |                                                                                                                                                                                                               |
|----------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | (b) | <p>15 ÷ 4 oe or 15 ÷ 8 × [2 or 6] oe</p> <p>3.75 oe or 1.875 or 11.25 and recognise not integer</p> <p>OR</p> $\frac{R}{R+B} = \frac{3}{12} \text{ and } \frac{4}{16}$ <p>or</p> <p>R:B = 3:9 and 12 sides and 4:12 and 16 sides</p> <p>15 is missing oe</p> | <p><b>M1</b></p> <p><b>A1</b></p> <p><b>M1</b></p> <p><b>A1</b></p> | <p>If 0 scored, <b>SC1</b> for 15 is not a multiple of 4 or 8 oe</p>                                                                  | <p>No FT as the scale can be used but allow 15 × (0.25 or 0.75) for <b>M1</b></p> <p>May be fractions</p> $\frac{R}{B} = \frac{3}{9} \text{ and 12 sides etc}$ <p>oe e.g. 4, 8, 12, 16 and 15 is not here</p> |
| 11       |     | 60                                                                                                                                                                                                                                                           | 2                                                                   | <p><b>M1</b> for <math>\frac{400 \times 3 \times 5}{100}</math> oe</p> <p>If 0 scored, <b>SC1</b> for answer 460</p>                  | <p>Any attempt at compound interest scores 0</p> <p>M1 May be in stages</p> <p>eg <math>400 \times \frac{3}{100} = 12</math></p> <p>and 12 × 5</p> <p>M1 Allow 4 × 3 × 5 or 12 × 5</p>                        |
| 12       |     | 167                                                                                                                                                                                                                                                          | 4                                                                   | <p><b>M1</b> for 375 × 1.15 soi by 431.25</p> <p><b>M1</b> for (their euros) – 217.49</p> <p><b>M1</b> for their 213.76 ÷ 1.28 oe</p> | <p>213.76 implies <b>M1M1</b></p> <p>Must be linked to 375 but do not accept 375 as euros</p> <p>May be their 213.76 × 0.781[...]</p>                                                                         |

| Question |     |  | Answer                   | Marks | Part marks and guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|-----|--|--------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13       |     |  | 120 with correct working | 5     | <p><b>M2</b> for <math>1 - (\frac{2}{5} + \frac{5}{12})</math> oe soi <math>\frac{11}{60}</math><br/>or<br/><b>M1</b> for <math>\frac{2}{5} + \frac{5}{12}</math> oe soi <math>\frac{49}{60}</math></p> <p>AND</p> <p><b>M2</b> for <math>22 \div \text{their } \frac{11}{60}</math> oe<br/>or<br/><b>M1</b> <math>\text{their } \frac{11}{60}</math> equated to 22</p> <p>If 0 or M1 scored, instead award <b>SC2</b> for 120 as final answer with no or insufficient working.</p> | <p>Correct working requires evidence of at least <b>M1M1</b> or <b>M2</b></p> <p>Equivalent fraction or [0].183 to [0].184</p> <p>Equivalent fraction or [0].816 to [0].817</p> <p>Accept in decimals but <math>\text{their } \frac{11}{60}</math> must come from some working<br/>May be <math>22 \div 11 \times 60</math></p> <p>May be <math>22 \div \text{their } 11</math> or <math>\text{their } \frac{11}{60} = \frac{22}{k}</math></p> |
| 14       | (a) |  | 30                       | 3     | <p><b>B1</b> for [median =] 3.5<br/><b>M1</b> for <math>\text{their median} \times 10 - 5</math></p>                                                                                                                                                                                                                                                                                                                                                                                | <p>Accept only 30 for 3 marks<br/>If 4 (mode) or 3 (mean) or other wrong value from 1 to 4 used <b>M1</b> still available.</p>                                                                                                                                                                                                                                                                                                                 |

| Question |     | Answer                                                                                                                                    | Marks | Part marks and guidance                                                                                                                                                                                                          |                                                                                                                                                                                                            |
|----------|-----|-------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | (b) | At least one from<br>1, 4, 5, 5<br>2, 4, 5, 5<br>3, 4, 5, 5<br><br>or<br><br>one judge awards 1, 2 or 3 oe<br>and 4, 5, 5 [stay the same] | 2     | <b>B1</b> for four values in order with median 4.5<br>with one not from 1 to 5<br><br>or<br><br>for one judge awards 1, 2 or 3 without<br>mentioning 4, 5, 5                                                                     | Condone inclusion of 4, 4,<br>5, 5, with another correct<br>list.<br><br><br><br>Accept 1 to 3 for 1, 2 or 3<br>and condone 4 included e.g.<br>1 to 4<br>Accept “the rest stay the<br>same” oe for 4, 5, 5 |
| 15       |     | 5 nfww                                                                                                                                    | 4     | <b>B2</b> for $[a =] 4$<br>or<br><b>M1</b> for $9a = 36$ or better<br><br>and<br><b>M1</b> for showing substitution/use of their $a$<br>e.g. $4 \times \text{their } 4 + 4b = 36$ oe or better<br>or $[b =] 9 - \text{their } 4$ | If another value for $a$ is used<br>to find $b$ do not award B2<br>T&I only scores if ending at<br>4<br><br>or better may be<br>e.g. $a + b = 9$<br>or $\frac{36 - 4 \times \text{their } 4}{4}$           |
| 16       | (a) | 6                                                                                                                                         | 1     |                                                                                                                                                                                                                                  |                                                                                                                                                                                                            |
|          | (b) | -3                                                                                                                                        | 1     |                                                                                                                                                                                                                                  |                                                                                                                                                                                                            |

| Question |         |       | Answer                                                      | Marks | Part marks and guidance                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |     |      |     |       |       |         |         |       |
|----------|---------|-------|-------------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----|------|-----|-------|-------|---------|---------|-------|
| 17       |         |       | 315                                                         | 4     | <b>B3</b> for answer 630 or 945 or 1260<br>or<br><b>M3</b> for $3 \times 3 \times 5 \times 7$ or $5 \times 7 \times 9$<br><br>OR<br><br><b>M1</b> for [35 =] 5 and 7<br><b>M1</b> for [45 =] 3 and 3 and 5<br><br>OR<br><br><b>M1</b> for 35, 70, 105, 140, (... 280, 315)<br><b>M1</b> for 45, 90, 135, 180, (... 270, 315) | Accept final answer 3.15 m for 4 marks. Ideally “cm” would be crossed out but BOD if not<br><br><br><br>May be in factor tree<br>Allow 9 and 5<br><br><br>Must have first 4 correct in each list                                                                                                                                                                                                                                           |  |     |      |     |       |       |         |         |       |
| 18       | (a)     |       | 425                                                         | 2     | <b>M1</b> for $680 \div 1.6[0]$ oe                                                                                                                                                                                                                                                                                           | e.g. $[0].68[0] \div [0].0016$                                                                                                                                                                                                                                                                                                                                                                                                             |  |     |      |     |       |       |         |         |       |
|          | (b)     |       | $1600$ or $1.6 \times 10^3$                                 | 1     |                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |     |      |     |       |       |         |         |       |
| 19       | (a)     |       | $x^2 + [1]x - 20$ final answer                              | 2     | <b>M1</b> for at least three of<br>$x^2$ , $[+]5x$ , $-4x$ , $-20$                                                                                                                                                                                                                                                           | M1 may be seen in a table<br>e.g. <table><tr><td></td><td><math>x</math></td><td><math>-4</math></td></tr><tr><td><math>x</math></td><td><math>x^2</math></td><td><math>-4x</math></td></tr><tr><td><math>[+] 5</math></td><td><math>[+]5x</math></td><td><math>-20</math></td></tr></table><br><br>[1]x counts as two terms<br>M1 for $x^2 + [1]x + -20$<br><br>Do not accept poor algebra<br>e.g $x5$ for $5x$ or $x \times x$ for $x^2$ |  | $x$ | $-4$ | $x$ | $x^2$ | $-4x$ | $[+] 5$ | $[+]5x$ | $-20$ |
|          | $x$     | $-4$  |                                                             |       |                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |     |      |     |       |       |         |         |       |
| $x$      | $x^2$   | $-4x$ |                                                             |       |                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |     |      |     |       |       |         |         |       |
| $[+] 5$  | $[+]5x$ | $-20$ |                                                             |       |                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |     |      |     |       |       |         |         |       |
|          | (b)     |       | $(x - 5)(x + 5)$ final answer                               | 1     |                                                                                                                                                                                                                                                                                                                              | Condone missing final bracket.                                                                                                                                                                                                                                                                                                                                                                                                             |  |     |      |     |       |       |         |         |       |
| 20       | (a)     |       | All branches completed with 0.55 and 0.05 in correct places | 3     | <b>B1</b> for 0.55 correctly placed at least once<br><b>B1</b> for 0.05 correctly placed at least once                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |     |      |     |       |       |         |         |       |

| Question |     | Answer                                                                    | Marks | Part marks and guidance                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|-----|---------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | (b) | $0.4 \times 0.4$<br>$+ 0.55 \times 0.55$<br>$+ 0.05 \times 0.05 [=0.465]$ | 3     | <p><b>M2</b> for <math>0.4 \times 0.4</math>, <math>0.55 \times 0.55</math> and <math>0.05 \times 0.05</math> may be 0.16 0.3025 0.0025 or</p> <p><b>M1</b> for <math>0.4 \times 0.4</math> or <math>0.55 \times 0.55</math> or <math>0.05 \times 0.05</math> may be 0.16, 0.3025, 0.0025</p> | <p>Answer given: for 3 marks products and additions must be explicitly seen</p> <p>Accept e.g. <math>(0.4)^2</math> for <math>0.4 \times 0.4</math></p> <p>Values may be seen on diagram in (a)</p> <p><u>If all values</u> shown on ends of tree, must select 3 values to use for <b>M2</b> and 1 value for <b>M1</b></p> <p>Equivalent fractions are OK but, for 3 marks must convert to the decimal</p> |
| 21       |     | $[x =] 4$<br>$[y =] -1$                                                   | 3     | <p><b>M1</b> for correct method to eliminate one variable</p> <p><b>B1</b> for <math>x = 4</math></p> <p><b>B1</b> for <math>y = -1</math></p> <p>If 0 scored <b>SC1</b> for a pair of values that satisfy one of the original equations</p>                                                  | <p>Allow one arithmetic error in subtraction of terms or in rearrangement</p> <p>If previously rearranged must be correct rearrangement</p>                                                                                                                                                                                                                                                                |

| Question |  | Answer                             | Marks | Part marks and guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                |
|----------|--|------------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22       |  | Yes, with full supporting evidence | 5     | <p><b>B2</b> for 175<br/>or<br/><b>M1</b> for <math>250 \times 0.7</math> oe</p> <p>AND</p> <p><b>M2</b> for <math>\frac{250 - 10}{11 + 3 + 1} \times 11</math> soi 176<br/>or<br/><b>M1</b> for <math>\frac{250 - 10}{11 + 3 + 1}</math> soi 16</p> <p><u>Alternative Method</u></p> <p><b>M2</b> for <math>\frac{250 - 10}{11 + 3 + 1} \times 11</math> soi 176<br/>or<br/><b>M1</b> for <math>\frac{250 - 10}{11 + 3 + 1}</math> soi 16</p> <p>AND</p> <p><b>M2</b> for <math>\frac{\text{their } 176}{250} \times 100</math> soi 70.4<br/>or 0.7 and 0.704 seen<br/>or<br/><b>M1</b> for <math>\frac{\text{their } 176}{250}</math> soi 0.704</p> | <p>“Full supporting evidence” requires <b>B2M2</b> or <b>M2M2</b><br/>Non-Calculator methods<br/>e.g.<br/><math>250 \div 10 = [ ], [ ] \times 7 = 176</math><br/>M1</p> <p>Allow <math>\frac{240}{15}</math> for <math>\frac{250 - 10}{11 + 3 + 1}</math></p> <p>If using 250 for 240, <i>their</i> 176 will be 183[. ...]</p> |

| Question |     |  | Answer                                            | Marks | Part marks and guidance                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                              |
|----------|-----|--|---------------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23       | (a) |  | 16                                                | 1     |                                                                                                                                                                                                              | Do not accept coordinates<br>Condone $y = 16$                                                                                                                                                                                                                                                                                                |
|          | (b) |  | 5                                                 | 1     |                                                                                                                                                                                                              | Do not accept coordinates<br>Condone $x = 5$                                                                                                                                                                                                                                                                                                 |
| 24       | (a) |  | 1852    1945                                      | 3     | <p><b>B2</b> for 1852 or 1945<br/>or 1852.2 with either 1944.[6] or 1944.8[1]<br/>or<br/><b>M1</b> for <math>1764 \times \frac{5}{100} + 1764</math> or 1852.2</p>                                           | <p>e.g. <math>1764 \times 1.05</math><br/>e.g. <math>1600 \times 1.05^3</math><br/>NC% methods<br/>M1 for e.g. <math>1764 \div 10 = [x]</math>.<br/><math>[x] \div 2 = [y]</math>. <math>[y] + 1764</math></p>                                                                                                                               |
|          | (b) |  | Correct curved graph                              | 3     | <p><b>B2</b> for 5 of <i>their</i> points plotted correctly<br/>or<br/><b>B1</b> for 4 of <i>their</i> points plotted correctly or 5 of <i>their</i> points plotted at correct height but incorrect time</p> | <p><math>\frac{1}{2}</math> square accuracy</p> <p><u>Stick graph</u> mark heights as points max <b>B2</b><br/>If stick graph and curve regard as choice and mark points/heights only<br/><u>Bar chart</u><br/>If points clearly marked, mark the points<br/>If points not clear <b>B0</b><br/>Ruled line or line segments max <b>B2</b></p> |
|          | (c) |  | Increases [to 2000]                               | 1     |                                                                                                                                                                                                              | See Appendix                                                                                                                                                                                                                                                                                                                                 |
|          |     |  | Flattens/levels off/plateaus/horizontal [at 2000] | 1     |                                                                                                                                                                                                              | <p>2000/the maximum must be seen once for 2 marks<br/>Accept approx/about 2000<br/>Condone embellishments such as "slight fall" after correct statement or reference to line of best fit</p>                                                                                                                                                 |

| Question |  |  | Answer                     | Marks | Part marks and guidance                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|--|--|----------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25       |  |  | 25[%] with correct working | 5     | <p><b>B2</b> for 12 600<br/>or<br/><b>M1</b> for <math>18\,000 \times \frac{70}{100}</math> oe or <math>18\,000 \times \frac{30}{100}</math><br/>oe</p> <p>AND<br/><b>M2</b> for <math>\frac{\text{their } 12600 - 9450}{\text{their } 12600} [\times 100]</math> oe<br/>or</p> <p><b>M1</b> for <math>\frac{9450}{\text{their } 12\,600} [\times 100]</math> oe</p> | <p>“correct working” requires at least <b>M2</b> or <b>M1M1</b> the first <b>M1</b> implied by <b>B2</b></p> <p><b>M0</b> for e.g. 70% of 18 000<br/><b>M0</b> for e.g. 70% <math>\times</math> 18 000</p> <p>Accept 3150 for numerator<br/><b>M2</b> may be<br/><math>\left(1 - \frac{\text{their } 9450}{\text{their } 12600}\right) [\times 100]</math></p> <p><b>M1</b> may be seen as<br/><math>\frac{9450}{18000} = 0.525</math> and then<br/>followed by <math>\frac{0.525}{0.7}</math></p> <p><u>Trials for second M marks</u><br/><b>M2</b> for <math>12600 \times 0.25 = 3150</math><br/>or<br/><b>M1</b> for <math>12600 \times 0.75 = 9450</math></p> <p><u>Equation method</u><br/>B2M2 <math>p/100 \times 12600 = 3150</math>; leading to <math>p = 25</math><br/>(scores 5 marks)<br/>B2M1 <math>p/100 \times 12600 = 9450</math>;<br/>leading to <math>p = 75</math><br/>B2M1 <math>18000 \times 0.7 \times m = 9450</math> leading to <math>m = 0.75</math>, as 12600 implied within this</p> |
|          |  |  |                            |       | <p>If 0 or <b>M1</b> scored, instead award <b>SC2</b> for answer 25[%] with no or insufficient working</p> <p>If 0 scored, award <b>SC1</b> for 0.25 or 0.75 or 75[%] with no or insufficient working</p>                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Question |  | Answer                   | Marks | Part marks and guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                     |
|----------|--|--------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 26       |  | 864 with correct working | 6     | <p><b>M1</b> for <math>\frac{12 \times 16}{2} \times 18</math> oe<br/> <b>A1</b> for 1728</p> <p>or</p> <p><b>M1</b> for <math>\frac{12 \times 16}{2}</math> oe</p> <p>AND</p> <p><b>M1</b> for <math>\sqrt[3]{\text{their } 1728}</math><br/> <b>A1</b> for 12</p> <p>AND</p> <p><b>M1</b> for <math>6 \times (\text{their } 12)^2</math></p> <p>If 0, 1 or 2 scored, instead award <b>SC3</b> for 864 as final answer with no working or insufficient working</p> <p>If 0 or <b>M1</b> scored, instead award <b>SC2</b> for 12 seen as dimension of cube or <math>(\sqrt[3]{3456})^2 \times 6</math> soi 1371 to 1372 with no working or insufficient working</p> <p>If 0 scored, award <b>SC1</b> for 1728 or <math>\sqrt[3]{3456}</math> soi 15.1[...]with no working or insufficient working</p> | <p>"correct working" requires at least <b>M1M1</b></p> <p>Accept e.g. <math>12 \times 8 \times 18</math> or <math>96 \times 18</math></p> <p>Allow <math>12^3 = 1728</math> for M1A1<br/> 1728 must be from correct method for volume of triangular prism</p> <p><i>Their</i> 12 must come from use of volume of triangular prism and cube root</p> |

## APPENDIX

Non Calculator methods for percentages.

Labels only

This is when labels such as 10% = are used.

If only labels are used the final answer scores full marks if it is correct.

Condone a numerical slip if the answer is correct.

If there is an error in the values and so the **final answer is incorrect** this cannot score method marks

e.g. Find 65% of 80

Method scoring M1A1

$$10\% = 8$$

$$5\% = 4$$

$$50\% = 40$$

$$65\% = 52 \quad \checkmark \quad \text{M1A1}$$

$$10\% = 8$$

$$5\% = 5 \quad \times \quad \text{condone this slip as answer correct}$$

$$50\% = 40$$

$$65\% = 52 \quad \checkmark \quad \text{M1A1}$$

Method scoring M0A0

$$10\% = 8$$

$$5\% = 6 \quad \times$$

$$50\% = 40$$

$$65\% = 54 \quad \times \quad \text{M0}$$

Do not condone this slip as answer incorrect

Build up method

This is where the candidate finds the percentages to build up to the required value but shows the operations used.

e.g. Find 65% of 80

$$10\% = 80 \div 10 = x$$

$$5\% = x \div 2 = y$$

$$50\% = x \times 5 = z$$

$$65\% = x + z + y$$

Because the operations have been shown and they are correct, if there is an error in one of x, y or z, method marks can still be earned

7a

| Reason                                                            | Judgement                                                                                 | Mark     |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------|
| He should have converted the kg into grams                        | Correct                                                                                   | 1        |
| He only put a gram of butter when it should have been a kilogram  | Correct                                                                                   | 1        |
| He used kg and g and these should be the same                     | Allow these referring to units                                                            | 1        |
| He only used 1 g but it should be 1 kg                            | Correct example                                                                           | 1        |
| He should have used 4 g of flour                                  | Correct example of matching units                                                         | 1        |
| The measurements should be 4000 g and 1000 g                      | Correct example in correct order<br>If order incorrect must tell us which is butter/flour | 1        |
| He should have used 4 kg and 1000 g                               | Correct example even though using mixed units                                             | 1        |
| He added too little butter because he measured in different units | The first part is correct but would, on its own, not get the mark                         | 1        |
| Rowan has used the wrong units as he has used the ratio 4000 : 1  | Allow example of the ratio he has used<br>An alternative would be 4 : 0.001               | 1        |
| He didn't put the ratio back to the original numbers              | Incorrect as "original" undefined                                                         | 0        |
| They are different amounts of measurements                        | Do not accept amounts or measurements for units                                           | 0        |
| They should have made the conversions the same                    | Should be, Should make units the same                                                     | 0        |
| He only used 1 g of butter                                        | No comparison                                                                             | 0        |
| <b>He used 1 g and it's too small</b>                             | <b>No comparison</b>                                                                      | <b>0</b> |
| They got the units wrong                                          | Does not say that the units should be the same                                            | 0        |
| He added too much butter and he measured in different units       | First part is incorrect so award 0                                                        | 0        |

24c

| Reason                                                                                                  | Judgement                                                                                                                 | Mark   |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------|
| It would increase to 2000<br>then stay at 2000                                                          | Correct<br>correct                                                                                                        | 1<br>1 |
| Once it reaches 2000 it will plateau                                                                    | Reaches 2000 implies increasing<br>It will plateau is fine                                                                | 1<br>1 |
| It would increase to approx. 2000<br>and then remain more or less constant around this value.           | approx. is okay. 2000 referenced at least once.                                                                           | 1<br>1 |
| Keep increasing as 2000 is a little way up the scale.                                                   | Increase is fine                                                                                                          | 1<br>0 |
| It will increase and continue past the maximum<br>Then it will fall as fish will die                    | Award for "It will increase"<br>Doesn't say the line will level off                                                       | 1<br>0 |
| After the 5th year the graph would be capped at 2000,<br>only allowing 55 more fish in the lake.        | Implies increase in graph BOD<br>The description is for what is happening in the<br>lake and not the shape of the graph   | 1<br>0 |
| The line continues up<br><br>and then falls                                                             | Continues <b>up</b> is enough but without the up,<br>would not get the mark<br>Falls is incorrect                         | 1<br>0 |
| It would cause it to slow down in the rate of increase<br>and would then cause it to plateau.           | Describes increase<br>True. No mention of 2000. Max 1 mark                                                                | 1<br>0 |
| The line of best fit would hit a peak.                                                                  | Not awarded as the peak could be at the end of<br>the line so "up" not implied.                                           | 0<br>1 |
| It would eventually plateau and level out with no increase.                                             | No mention of increase (to 2000)                                                                                          | 0<br>1 |
| The line will continue to 2000<br><br>Then it will go along the x-axis                                  | Correct as "the line continues" and max/2000<br>imply going up<br>Incorrect as it is parallel to the x-axis, not along it | 1<br>0 |
| It starts to decrease...then not go past 2000<br>Once at 2000 it will stay around the same place        | Incorrect should be increase<br>Staying around the same place BOD for value                                               | 0<br>1 |
| After 4 years the shape would no longer increase.<br>It'll stay at 2000 with a horizontal line on 2000. | Incorrect.<br>Correct                                                                                                     | 0<br>1 |
| It would plateau/level off at 2000 fish                                                                 | No mention of graph increasing<br>2000 then staying there.                                                                | 0<br>1 |
| It would become a horizontal straight line                                                              |                                                                                                                           | 0<br>1 |

|                                                                                                             |                                                                                                                    |   |
|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---|
| The graph would plateau as no fish are being added or taken away                                            | No mention of increase                                                                                             | 0 |
|                                                                                                             | Correct for plateau                                                                                                | 1 |
| 4 years almost 2000 fish(1995) so the graph would plateau as no more fish can live in the pool              | No increase                                                                                                        | 0 |
|                                                                                                             | Plateau                                                                                                            | 1 |
| It would not increase.<br><br>The line of best fit would level off and perhaps sometimes slightly decrease. | Wrong (but It would not increase past 2000 implies curve increasing for 1 mark)                                    | 0 |
|                                                                                                             | Level off okay, condone the rest as not contradicting                                                              | 1 |
| It will exceed the maximum amount of fish                                                                   | Describing what is going on in the lake not the shape of the graph                                                 | 0 |
|                                                                                                             |                                                                                                                    | 0 |
| Would start plateauing downward becoming more and more flat as less fish were present year by year.         | No mention of increase (or 2000)                                                                                   | 0 |
|                                                                                                             | Spoilt for second mark as suggests going down so is contradictory                                                  | 0 |
| The graph curves as the max capacity is exceeded                                                            | Ruled out as a possible interpretation is that it has already reached maximum and it then curves in some direction | 0 |
|                                                                                                             |                                                                                                                    |   |

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