

**GCSE**

**Methods in Mathematics (Pilot)**

Unit **B391/02**: Methods in Mathematics 1 (Higher Tier)

General Certificate of Secondary Education

**Mark Scheme for November 2014**

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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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1. Annotations used in the detailed Mark Scheme.

| Annotation | Meaning   |
|------------|---|
| ✓          | Correct   |
| ✗          | Incorrect   |
| BOD        | Benefit of doubt  |
| FT         | Follow through  |
| ISW        | Ignore subsequent working (after correct answer obtained), provided method has been completed |
| M0         | Method mark awarded 0   |
| M1         | Method mark awarded 1   |
| M2         | Method mark awarded 2   |
| A1         | Accuracy mark awarded 1   |
| B1         | Independent mark awarded 1  |
| B2         | Independent mark awarded 2  |
| MR         | Misread   |
| SC         | Special case  |
| ^          | Omission sign   |

These should be used whenever appropriate during your marking.

The **M**, **A**, **B** etc annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks.

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

It is not mandatory to use annotations for any other marking, though you may wish to use them in some circumstances.

### Subject-Specific Marking Instructions

2. **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 awarded for a correct final answer or a correct intermediate stage.  
**SC** marks are for special cases that are worthy of some credit.
3. Unless the answer and marks columns of the mark scheme specify **M** and **A** marks etc, or the mark scheme is 'banded', 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, ie incorrect working is seen and the correct answer clearly follows from it.

4. 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.

Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, eg FT  $180 \times (\textit{their} '37' + 16)$ , or FT  $300 - \sqrt{(\textit{their} '5^2 + 7^2)}$ . Answers to part questions which are being followed through are indicated by eg FT 3  $\times$  *their* (a).

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.

5. Where dependent (**dep**) marks are indicated in the mark scheme, you must check that the candidate has met all the criteria specified for the mark to be awarded.
6. The following abbreviations are commonly found in GCSE Mathematics mark schemes.
- **cao** means **correct answer only**.
  - **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point eg 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).
  - **nfww** means **not from wrong working**.
  - **oe** means **or equivalent**.
  - **rot** means **rounded or truncated**.
  - **seen** means that you should award the mark if that number/expression is seen anywhere in the answer space, including the answer line, even if it is not in the method leading to the final answer.
  - **soi** means **seen or implied**.
7. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.
8. As a general principle, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered, mark the poorer (poorest).
9. 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.

10. 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.
11. If the correct answer is seen in the body and the answer given in the answer space is a clear transcription error allow full marks unless the mark scheme says 'mark final answer' or 'cao'. Place the annotation ✓ next to the correct answer.  
  
If the answer space is blank but the correct answer is seen in the body allow full marks. Place the annotation ✓ next to the correct answer.  
  
If the correct answer is seen in the working but a completely different answer is seen in the answer space, then accuracy marks for the answer are lost. Method marks would still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation ✗ next to the wrong answer.
12. Ranges of answers given in the mark scheme are always inclusive.
13. 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.
14. 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.

| Question |     | Answer | Marks   | Part marks and guidance |   |  |
|----------|-----|--------|---|-------------------------|---|--|
| 1        | (a) |        | 2   | B1 for up to 3 errors   | One error is<br>1 omitted<br>Or 1 misplaced (an element in twice or more counts as misplaced)<br>Or extras (however many counts as one error) |  |
|          | (b) | (i)    | 3, 6, 12  | 1FT                     | FT from their diagram   | Do not FT if repeated element makes it 'choice', but correct answer scores.  |
|          |     | (ii)   | 2, 4, 5, 7, 8, 10, 11,                                | 1FT                     | FT from their diagram   | Do not FT if repeated element makes it 'choice', but correct answer scores.  |
| 2        | (a) |        | 9, 5, 1, -3   | 2                       | B1 for 2 correct  |  |
|          | (b) |        | Correct line across whole range<br>$-2 \leq x \leq 4$ | 2                       | B1FT for 3 points plotted $\pm \frac{1}{2}$ small square  |  |
|          | (c) |        | 0.8   | 1FT                     | FT from their graph $\pm \frac{1}{2}$ small square  | Not e.g. (0.8, 3.4)  |
|          | (d) |        | -2 cao  | 1                       |   |  |
| 3        | (a) |        | Correct triangle (5, 0), (6, 0), (6, -2)              | 2                       | SC1 for triangle with same orientation<br>Or triangle (4, 4), (5, 4), (4, 6).   |  |
|          | (b) |        | Translation $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$   | 2                       | B1 for each   | Clear Indication of second transformation scores zero.<br>Mark vector first. If no vector accept 5 to the left (or back) and 3 up or (-5, 3) |

| Question |     |     | Answer  | Marks | Part marks and guidance  |   |
|----------|-----|-----|---|-------|--|---|
| 4        |     |     | Fully correct algebra including all 4 steps with no incorrect statements, leading to answer $-12$ | 4     | <p><b>B3</b> for answer <math>-12</math> with algebra missing or for wrong answer with full algebra but with at most one error.</p> <p><b>B2</b> for wrong answer with 2 correct algebraic steps</p> <p><b>B1</b> for 1 correct algebraic step</p>   | <p>NB both brackets multiplied incorrectly or errors in isolating <math>x</math>s <u>and</u> numbers count as two errors</p> <p>4 Algebraic steps are:<br/>           Multiplying out brackets<br/>           Collecting terms (evidence could be in next step)<br/>           Isolating terms<br/>           Completion from <math>ax = b</math></p> |
| 5        |     |     | Formula<br>Equation<br>Expression<br>Equation   | 3     | <p><b>B2</b> for 3 correct</p> <p><b>B1</b> for 2 correct</p>  |   |
| 6        |     |     | 4.8 (cm)  | 3     | <p><b>M1</b> for area of triangle = <math>\frac{1}{2} \times 8 \times 6</math> so by 24<br/>           And <b>M1</b> for <math>\frac{1}{2} \times 10 \times h = \text{their Area}</math></p> <p>OR</p> <p><b>M1</b> for correct equation(s) from similar triangles<br/>           And <b>M1</b> for correct elimination of 1 variable from their equations or 1 step in solving correct single equation.</p> | Or <b>B1</b> for $6 \times 8 = 10 \times h$ and <b>M1</b> for <i>their</i> $(6 \times 8) \div 10$   |
| 7        | (a) | (i) | (2,5),(3, 1),(3, 3),(3,5), (6, 1),(6, 3), (6, 5)  | 2     | <b>B1</b> for 5 correct  | Ignore duplicates   |

| Question |         | Answer                     | Marks | Part marks and guidance   |   |
|----------|---------|----------------------------|-------|---|---|
|          | (ii)    | 2 occurs more than once oe | 1     |   | e.g. Not all pairs of numbers are equally likely or there are 12 equally likely outcomes.<br>Not e.g. there could be 2 + 3 or 3 + 2 |
|          | (b)     | $\frac{2}{12}$ oe          | 2     | M1 for $\frac{2}{4} \times \frac{1}{3}$ or list of 12 outcomes  | For M1 accept e.g. There are 12 outcomes and 2 ways of getting 3.   |
| 8        |         | 30 (days)                  | 4     | B2 for $\frac{11}{15}$ seen<br>Or M1 for $\frac{2}{5} + \frac{1}{3}$<br>M1 for 22 ÷ their $\frac{11}{15}$ | Accept 0.73<br>condone decimals   |
| 9        | (a)     | X √ X X √                  | 2     | B1 for 3 correct or 3 correct divisions seen  | For 2 marks condone – √ – – √<br>Divisions must get to recurring stage  |
|          | (b) (i) | $\frac{3}{20}$             | 2     | B1 for $\frac{15}{100}$ seen  |   |
|          | (ii)    | $\frac{1}{3}$              | 1     |   |   |
| 10       | (a)     | 4                          | 1     | Accept $10^4$   |   |
|          | (b)     | 10                         | 1     | Accept $2^{10}$   |   |
|          | (c)     | 2.5 oe                     | 3     | M2 for $5x - 3 = x + 7$<br>or B1 for 5x seen  | Accept 5 × x  |
| 11       | (a)     | 3 × 3 × 5 oe               | 1     |   |   |



| Question  |             |  | Answer   | Marks   | Part marks and guidance   |   |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |
|-----------|-------------|--|--|---|---|---|----------|-----|----|------|-------|---|---|----|-----------|------|----|------|---|------------------|--|
|           |             |  | 2192   | 3   | B2 for LCM = 180<br>Or B1 for $2 \times 2 \times 5$ seen<br>Or M1 for (20), 40, 60... and (45), 90, 135.... | Or (2012), 2032, 2052 ....<br>and (2012), 2057, 2102 ....     |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |
| 12        | (a)         | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>Sailin<br/>g</td> <td>Rock<br/>Climbing</td> <td>Tota<br/>l</td> </tr> <tr> <td>Boy<br/>s</td> <td>(6)</td> <td>12</td> <td>(18)</td> </tr> <tr> <td>Girls</td> <td>8</td> <td>4</td> <td>12</td> </tr> <tr> <td>Tota<br/>l</td> <td>(14)</td> <td>16</td> <td>(30)</td> </tr> </table> |  | Sailin<br>g   | Rock<br>Climbing  | Tota<br>l   | Boy<br>s | (6) | 12 | (18) | Girls | 8 | 4 | 12 | Tota<br>l | (14) | 16 | (30) | 2 | B1 for 3 correct |  |
|           | Sailin<br>g | Rock<br>Climbing   | Tota<br>l  |   |   |   |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |
| Boy<br>s  | (6)         | 12   | (18)   |   |   |   |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |
| Girls     | 8           | 4  | 12   |   |   |   |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |
| Tota<br>l | (14)        | 16   | (30)   |   |   |   |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |
|           | (b)         | $\frac{91}{435}$ oe  | 2  | M1 for $\frac{14}{30} \times \frac{13}{29}$ or $\frac{14}{30} \times \frac{13}{30}$ or $\frac{14}{30} \times \frac{14}{29}$ | oe $\frac{182}{870}$  |   |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |
|           | (c)         | $\frac{2}{5}$ oe   | 3  | M2 FT for $\frac{12}{16} \times \frac{4}{15} + \frac{4}{16} \times \frac{12}{15}$ oe<br>Or M1FT for one of above products   | oe $\frac{96}{240}$   |   |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |
| 13        | (a)         | (i)  | $a + \frac{2}{3}b$                                       | 1   |   |   |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |
|           |             | (ii)   | $\frac{2}{5}(b - a)$                                     | 2   | B1 for $\vec{AB} = b - a$   |   |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |
|           |             | (iii)  | $\frac{3}{5}a + \frac{2}{5}b$                            | 2   | B1 unsimplified<br>Or M1 for a + their (a)(ii) soi  | Their (a)(ii) must be correct vector form in terms of a and b |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |
|           | (b)         |  | Parallel because $\vec{OQ} = \frac{3}{5}\vec{PC}$ oe soi | 1   | Dep on (a)(i) and (iii) correct   |   |          |     |    |      |       |   |   |    |           |      |    |      |   |                  |  |

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