

## **Methods in Mathematics (Pilot)**

General Certificate of Secondary Education

Unit **B391/02**: Higher Tier

# **Mark Scheme for November 2013**

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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

| 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 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.
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  $3 \times \textit{their} (a)$ .
- 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.
- **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 and applies as a default.
  - **nfw** 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. In questions with no final answer line, make no deductions for wrong work after an acceptable answer (ie **isw**) unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.
8. In questions with a final answer line following working space,
  - (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. Use the M0, M1, M2 annotations as appropriate and place the annotation ✗ next to the wrong answer.
9. 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).
10. 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.
11. 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.
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) |      | 0.6<br>0.125<br>0.417                     | 1<br>1<br>2            | <b>B1</b> for 0.41 ..... or 0.42   |
|          | (b) |      | Two of 60, 7 and 0.5<br>840 or 812 or 864 | <b>M1</b><br><b>A2</b> | For 60 and 7 condone 58 and/or 7.2<br><b>A1</b> for 420 or 406 or 432 or 120 or 116 or 14 or 14.4                  |
| 2        | (a) |      | 64  | 2                      | <b>B1</b> for 136 or for correctly taking <i>their</i> total from 200<br>Eg 64/200 implies <b>B1</b>               |
|          | (b) |      | $\frac{11}{40}$                           | 2                      | <b>B1</b> for $\frac{55}{200}$ oe seen or <b>SC1</b> for 11:40 etc   |
|          | (c) |      | Not fair<br>Not equal frequencies oe      | 1                      | eg $\frac{11}{40}$ not = $\frac{1}{6}$ etc   |
| 3        | (a) |      | Rectangle, Parallelogram, Kite            | 2                      | <b>B1</b> for any 2<br>Allow arrowhead for kite  |
|          | (b) |      | Rectangle,<br>Rhombus                     | 1<br>1                 |  |
| 4        | (a) |      | 125                                       | 1                      |  |
|          | (b) |      | -6  | 2                      | <b>M1</b> for -3 or <i>their</i> (numerical) $(a + 2b) \times 2$<br><b>soi</b>                                     |
| 5        | (a) | (i)  | (6, 2)                                    | 2                      | <b>B1</b> for point (6, 2) or (-6, 2) shown or correct parallelogram drawn<br>Condone (-6, 2 ) (-2, 8) for 2 marks |
|          |     | (ii) | 18  | 2                      | <b>M1</b> for $6 \times 3$ oe  |

| Question |     | Answer   | Marks                  | Part marks and guidance   |   |
|----------|-----|--|------------------------|---|---|
|          | (b) | $y = \frac{3}{2}x + 2$ oe                          | 2                      | <b>B1</b> for gradient = $\frac{3}{2}$ or $y = mx + 2$ ( $m \neq 0$ )<br>or $\frac{3}{2}x + 2$ (no $y =$ )          | <b>isw</b> for attempts to rearrange.<br><br>But allow if $y = \frac{3}{2}x + 2$ seen in working  |
| 6        | (a) | x terms summing to 3x<br>number terms summing to 5 | 1<br>1                 |   |   |
|          | (b) | -- --  | 2                      | <b>B1</b> for – in front of bracket   |   |
| 7        | (a) | $\frac{1}{16}$                                     | 1                      |   |   |
|          | (b) | $\frac{1}{7}$                                      | 1                      |   |   |
| 8        | (a) | $x + 15$   | 1                      | Allow $xp + 15$   | Condone eg $x = x + 15$   |
|          | (b) | $5x + 6(x + 15) = 640$ oe<br>50                    | <b>M1</b><br><b>A3</b> | <b>OR B1</b> FT for $5x + 6x + 90 = 640$<br><br><b>B1</b> FT for $5x + 6x = 640 - 90$<br><br><b>B1</b> for $x = 50$ | multiply brackets dep on there being brackets, <b>soi</b> by eg $6x + 90$ in an equation<br>isolating terms dep on terms needing isolating<br>Both these <b>B1</b> s can be scored with mixed units<br><br>For simultaneous equations can get <b>M1</b> for correct elimination to $11x = 550$ oe or $11y = 715$ oe and then <b>A3</b> for ans 50 |

| Question |     | Answer  | Marks               | Part marks and guidance  |   |
|----------|-----|---|---------------------|--|---|
| 9        | (a) | 1, 2, 4, 5, 8, 10, 20, 40<br>$4 \times 2 = 8$   | 2<br>1              | B1 for 7 correct and one incorrect or<br>6 correct and no incorrect  |   |
|          | (b) | $540 = 2^2 \times 3^3 \times 5$<br>$(2 + 1) \times (3 + 1) \times (1 + 1)$<br><br>24  | 2<br>M1FT<br><br>A1 | M1 for two steps in a factor tree or ladder<br>FT dep on factors being prime<br>If 0 scored <b>SC1</b> for answer 24   | FT must be from at least 2 different<br>prime factors<br>eg $2^2 + 3^3 + 5$ can score <b>M1, M1, A1</b> |
| 10       |     | B and C not grouped with any others<br>All squares similar or sides<br>proportional<br>A and D and no others<br>Ratio of sides same <b>oe</b> | 1<br>1<br>1<br>1    | Dep on B and C<br><br>Dep on A and D only  | Allow 'because they are squares'  |
| 11       |     | $14 - 3\sqrt{3}$  | 4                   | M3 for $20 - 8\sqrt{3} + 5\sqrt{3} - 2 \times 3$<br>or<br>M2 for 3 terms correct<br>or<br>M1 for 2 terms correct   |   |
| 12       |     | 38° with all correct reasons and<br>working   | 4                   | To include perpendicular from centre to<br>chord bisects the chord or equal chords<br>are equidistant from centre,<br>And base angles of <u>isosceles</u> triangle<br>And 104 soi<br>or B3 for 38 and above with 1 criterion<br>missing or for all criteria but with an<br>arithmetic error<br>or B2 for answer 38 <b>nfw</b> otherwise or 2<br>criteria with an arithmetic error<br>or B1 for 104 or named triangle is<br>isosceles |   |

| Question |     |  | Answer  | Marks | Part marks and guidance  |
|----------|-----|--|---------|-------|--|
| 13       | (a) |  | 0.45 oe | 2     | <b>M1</b> for $1 - (0.4 + 0.15)$ <b>soi</b> by 0.81  |
|          | (b) |  | 0.48 oe | 3     | eg $\frac{12}{25}$<br><b>M2FT</b> for $0.4 \times 0.15 + 0.4 \times 0.45 + 0.15 \times 0.4 + 0.45 \times 0.4$ <b>oe</b><br><br><b>M1FT</b> for two of above products <b>oe</b> |

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