

**GCSE**

**Methods in Mathematics (Pilot)**

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

General Certificate of Secondary Education

**Mark Scheme for November 2016**

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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) | (i)   | 378 00   | 1     |  |                                      |
|          |     | (ii)  | 0.000 536 7  | 1     |  |                                      |
|          |     | (iii) | 19   | 1     |  |                                      |
|          | (b) |       | $(5 + 3) \times 2 - (6 - 3) = 13$  | 1     | Ignore extra brackets which do not change answer             |                                      |
| 2        | (a) |       | 101  | 2     | B1 for 49  | Not -49                              |
|          | (b) |       | -3   | 2     | B1 for -4  |                                      |
| 3        | (a) |       | 2 1 (0) 1 (2) 3<br>3 2 1 0 1 2<br>4 3 (2) 1 0 1<br>5 4 3 2 1 (0)<br>6 5 4 3 2 1<br>7 6 5 4 3 2 | 2     | B1 for 1, 2 or 3 errors                                      |                                      |
|          | (b) | (i)   | $\frac{8}{36}$ oe  | 2FT   | B1 for proper fraction with correct numerator or denominator | FT their table                       |
|          |     | (ii)  | $\frac{12}{36}$ oe   | 1FT   |  | FT their table and their 36 from (i) |

| Question |     | Answer                              | Marks       | Part marks and guidance  |   |
|----------|-----|-------------------------------------|-------------|--|---|
| 4        | (a) |                                     | 3           | <b>B2</b> for 1 or 2 misplaced or missing<br><b>B1</b> for 3 or 4 misplaced or missing<br>If 0 scored, <b>SC1</b> for P and Q and intersection completely correct but extras in (P U Q)' |   |
|          | (b) | E A R                               | 1FT         | Must be letters  | No FT if intersection letters are repeated elsewhere  |
|          | (c) | 1                                   | 1           |  |   |
| 5        | (a) | Reflection<br>$y = 1$               | 1<br>1      | In all parts give 0 if any indication of second transformation given   | e.g. 'and' followed by vector                         |
|          | (b) | Rotation<br>90° clockwise<br>(0, 3) | 1<br>1<br>1 | Or 270° anti-clockwise<br>Accept column vector   | Condone eg 'from' / 'about' a column vector as centre |
|          | (c) | Enlargement<br>s.f. -2<br>(0, 0)    | 1<br>1<br>1 |  |   |

| Question |     | Answer   | Marks | Part marks and guidance   |  |
|----------|-----|--|-------|---|--|
| 6*       |     | £78 with clear calculation of areas of walls + ceiling – doors/windows | 5     | <p><b>B4</b> for 78 NFWW or incorrect answer with fully correct method seen</p> <p><b>B3</b> for correct area of walls and ceiling – window (63.6 m<sup>2</sup>) or or for correct conversion of their area to cost.</p> <p><b>B2</b> correct method for area of walls + ceiling – windows/doors or for correct conversion of their area to cost except doubling for two coats soi.</p> <p><b>B1</b> for area of two different walls (15 and 11.4) or area of ceiling (19) or attempt to divide their area by 12, ÷ 5 (implied by 1 tin = 60m<sup>2</sup>) and × 20</p> | <p>To include full area calculation, ÷ 12, ÷ 5 (implied by 1 tin = 60m<sup>2</sup>), × 20 +18</p> <p>×2 (two coats), ÷ 12, ÷ 5 (implied by 1 tin = 60m<sup>2</sup>) converting to whole tins, × 20 + 18 (even if their area is a volume)</p> |
| 7        |     | 8.5 , 5.5  | 3     | <p>Accept reversed answers</p> <p><b>M2</b> for correct equation or <math>\frac{28 \pm 6}{4}</math></p> <p>or <b>B1</b> for any pair of values which differ by 3 or give a perimeter of 28</p>  | <p>eg <math>x + 3 + x + x + 3 + x = 28</math></p> <p>These may be included in t &amp; i (or t &amp; e) attempts</p>  |
| 8        |     | $p = 3, q = 2, r = 1$  | 3     | <b>B1</b> for each  |  |
| 9        | (a) | $1\frac{2}{3}$ or $\frac{10}{6}$ oe or 1.67 (or better)                | 3     | <p><b>M1</b> for <math>12 - 4x = 2x + 2</math> oe</p> <p><b>M1FT</b> for <math>12 - 2 = 2x + 4x</math></p> <p><b>M1FT</b> for <math>ax = b \Rightarrow x = \frac{b}{a}, a \neq 1</math></p>   | <p>eg <math>6 - 2x = x + 1</math></p> <p>Isolating x terms</p>   |



| Question |     | Answer  | Marks  | Part marks and guidance   |  |
|----------|-----|---|--------|---|--|
|          | (b) | $2x^2y^2(2y - 3x)$  | 2      | B1 for correctly extracting two of 2, $x^2$ , $y^2$ or $2xy$ or 1 error inside bracket                                    |  |
| 10       | (a) | (i)   | 1      |   |  |
|          |     | (ii)  | 1      |   |  |
|          | (b) | $0.00076$ or $7.6 \times 10^{-4}$   | 1      |   |  |
|          | (c) | $8 \times 10^8$   | 2      | M1 for $2^4 \times 5 \times 10^7$ soi by any equiv or figs 8  | eg $80 \times 10^7$  |
| 11       | (a) | (2,6, -3)   | 1      |   |  |
|          | (b) | (-4, 6, 3)  | 2      | B1 for any two correct  |  |
| 12       | (a) | $31^\circ$  | 2      | B1 for angle OCE = 35   |  |
|          | (b) | $125^\circ$   | 2      | B1 for reflex angle COE = 250 or Angle CPE = 55<br>Or angle <u>CED</u> = their (a) (not 24)                               | Where P is a point on major arc CE<br>Must be clear it's angle CED             |
| 13       | (a) | $1 - p$ on lower branch of first ball<br>Rest correct                       | 1<br>1 |   |  |
|          | (b) | (i)   | 3      | B1FT for $2p(1 - p)$ oe<br>B1FT for $(1 - p)(1 - p)$ oe<br>If 0 scored, SC1 for 'correct' equation with brackets omitted. | FT provided both are functions of $p$<br>FT provided both are functions of $p$ |
|          |     | (ii)  | 1      | or $2p = 1 - p$   |  |
|          |     | or correctly substituting $\frac{1}{3}$ in a correct equation and verifying |        |   |  |

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