

**GCSE**

**Methods in Mathematics (Pilot)**

Unit **B391/01**: Foundation Tier

General Certificate of Secondary Education

**Mark Scheme for June 2016**

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

© OCR 2016

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 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.
- **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).
  - **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. 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) | 158 929, 159 450, 159 700  | 1           |  |   |
|          | (b) | 0.358, 0.36, 0.4   | 1           |  |   |
|          | (c) | $\frac{1}{4}, \frac{2}{3}, \frac{8}{9}$                          | 1           |  | Condone equivalents (rounded or truncated if in decimal format) |
| 2        | (a) | unlikely   | 1           |  |   |
|          | (b) | impossible   | 1           |  |   |
|          | (c) | likely or certain  | 1           |  |   |
| 3        | (a) | 576  | 1           |  |   |
|          | (b) | 23   | 1           |  |   |
| 4        | (a) | 2  | 1           |  |   |
|          | (b) | 21   | 1           |  |   |
|          | (c) | 8  | 2           | M1 for $4x=37-5$ or $4 \times 8+5 = 37$<br>SC1 for answer 10.5 |   |
| 5        |     | $\frac{1}{2}$ oe fraction<br>0.1<br>$\frac{15}{100}$ oe fraction | 1<br>1<br>1 |  | $\frac{3}{20}$  |

| Question |     |       | Answer                                  | Marks | Part marks and guidance   |                                     |
|----------|-----|-------|---|-------|---|-------------------------------------|
| 6        | (a) |       | (1, 2)                                  | 1     |   |                                     |
|          | (b) |       | (4, -1)                                 | 1     |   |                                     |
|          | (c) |       | (3, 0)                                  | 1     |   |                                     |
|          | (d) |       | Point (-2, 4) plotted                   | 1     |   |                                     |
| 7        | (a) | (i)   | 4.5                                     | 1     |   | Accept 4500m as long as units clear |
|          |     | (ii)  | 1.8                                     | 1     |   | Accept 1800m as long as units clear |
|          |     | (iii) | 4                                       | 1     |   |                                     |
|          | (b) |       | 22                                      | 2     | <b>B1</b> for indication of Mr Evans 16 eg statement or within equation | Eg $8 + 16 + \text{Faruk} = 46$     |
| 8        | (a) |       | Correct reflection                      | 2     | <b>B1</b> for 1 correct vertex  |                                     |
|          | (b) | (i)   | 4                                       | 1     |   |                                     |
|          |     | (ii)  | 8 triangles shaded to preserve symmetry | 1     |   | May have order 2 symmetry           |

| Question | Answer   | Marks | Part marks and guidance   |
|----------|--|-------|---|
| 9*       | Shows (£)35 and (£)33 with some working for each and concludes that the family ticket or B is the cheapest way | 4     | <p><b>3</b> shows (£)35 and (£)33 with some working for each, but makes incorrect or no conclusion<br/> <b>Or</b> shows working for (£)35 and (£)33 making 1 numerical error but makes correct ft conclusion<br/> <b>Or</b> Shows 35 and 33 with no working and concludes B<br/> <b>Or</b> uses four pairs of skates throughout showing (£)38 and (£)36 with some working for each and concludes that the Special Offer or C is the cheapest way</p> <p><b>2</b> shows either (£)35 with some working or (£)33 with some working<br/> <b>Or</b> Shows 35 and 33 with no working and incorrect or no conclusion<br/> <b>Or</b> uses four pairs of skates throughout showing (£)38 and (£)36 with some working for each and incorrect or no conclusion</p> <p><b>1</b> attempts to show either (£)35 or (£)33 with clear working with 1 numerical error<br/> <b>Or</b> shows (£)3 or (£)33 or (£)35<br/> <b>Or</b> uses four pairs of skates and shows (£)38 or (£)36</p> <p>May show (£)32 and discard this as greater than (£)30 as an alternative to showing (£)35 throughout these mark allocations</p> <p>The same error in (£)3 in both calculations will only count as 1 error as long as working clear</p> <p>Minimum working for A is 32+3</p> <p>And minimum working for B is 30+3 or 1.50 + 1.50 = 3 linked to B</p> |

| Question |     | Answer   | Marks                              | Part marks and guidance   |  |
|----------|-----|--|------------------------------------|---|--|
| 10       | (a) | B A D C  | 3                                  | <b>B2</b> for 2 correct connections<br><b>B1</b> for 1 correct connection | See appendix for explanation and examples  |
|          | (b) | 3 of square<br>rectangle<br>parallelogram<br>rhombus | 3                                  | <b>B2</b> for 2 correct<br><b>B1</b> for 1 correct                        | If more than three answers given, mark as choice   |
| 11       | (a) | $\frac{7}{25}$ oe                                    | 1                                  |   | Penalise first time only for bad notation eg 7 in 25, 7 out of 25 etc<br>Do not accept ratio<br>In all parts isw attempts to cancel or turn into decimals or % |
|          | (b) | $\frac{4}{25}$ oe                                    | 1                                  |   |  |
|          | (c) | $\frac{14}{25}$ oe                                   | 1                                  |   |  |
|          | (d) | $\frac{2}{25}$ oe                                    | 2                                  | <b>B1</b> for 2 on own or as numerator                                    |  |
| 12       | (a) | (i)  | 16 highlighted                     | 2   | <b>B1</b> for 8 seen clearly linked to $2^3$ or $\sqrt{64}$  |
|          |     | (ii)   | $2^5$ highlighted                  | 2   | <b>B1</b> for 64 seen clearly linked to $8^2$ or $4^3$ or for 32 seen clearly linked to $2^5$  |
|          | (b) |  | x in numerator, x-3 in denominator | 1   |  |

| Question |     |      | Answer  | Marks | Part marks and guidance   |  |
|----------|-----|------|---|-------|---|--|
|          | (c) |      | Shows a number between 0 and 1 inclusive and correctly shows this value squared | 2     | <b>B1</b> for showing a number between 0 and 1 inclusive [being squared] but the answer to their calculation is incorrect but positive and less than or equal to the number or omitted<br><b>Or</b> makes a general statement that a number between 0 and 1 squared will result in a smaller number | If multiple examples are given, where some are incorrect, a correct example must be highlighted or be the last example |
| 13       | (a) | (i)  | 0.06  | 1     |   |  |
|          |     | (ii) | 20  | 1     |   |  |
|          | (b) | (i)  | $1\frac{7}{15}$   | 2     | <b>M1</b> for $\frac{10}{15}$ and $\frac{12}{15}$ oe soi by $\frac{22}{15}$ oe  | Condone error in one numerator   |
|          |     | (ii) | $1\frac{1}{8}$  | 2     | <b>M1</b> for $\frac{3}{2} \times \frac{3}{4}$ oe soi by $\frac{9}{8}$ oe   |  |
| 14       |     |      | Circles clearly indicated   | 1     |   |  |
| 15       |     |      | 4   | 3     | <b>M2</b> for $\frac{1}{2}(6 + 5 + 6) \times h = 34$ oe<br>Or <b>M1</b> for $6 \times h$ or $\frac{1}{2} \times 5 \times h$ soi   |  |

APPENDIX

Exemplar responses

**Q10a** There are 5 “connections” to be made by the dominoes but the nature of the question means that if you get 3 connections you must get the other 2. So the correct answer gets 3 marks, 2 correct connections gets 2 marks and 1 correct connection gets 1 mark. This may look rather generous in places but it gets over the issue that they could be working in either direction (or both). Below are all the combinations of dominoes showing each correct connection (^) and the mark.

|      |  |                |   |
|------|--|----------------|---|
| Kite | $\wedge B \wedge A \wedge D \wedge C \wedge$ | Sector         | 3 |
|      | $\wedge B \wedge A$                          | C D            | 2 |
|      | $\wedge B$                                   | D A C $\wedge$ | 2 |
|      | $\wedge B$                                   | D $\wedge C$ A | 2 |
|      | $\wedge B$                                   | C A $\wedge D$ | 2 |
|      | $\wedge B$                                   | C D A          | 1 |

|      |   |                       |              |   |        |   |
|------|---|-----------------------|--------------|---|--------|---|
| Kite | C | A                     | B            | D | Sector | 0 |
|      | C | A $\wedge D$          | B            |   |        | 1 |
|      | C | B $\wedge A \wedge D$ |              |   |        | 2 |
|      | C | B                     | D            | A |        | 0 |
|      | C | D                     | A            | B |        | 0 |
|      | C | D                     | B $\wedge A$ |   |        | 1 |

|      |                       |   |                     |   |        |   |
|------|-----------------------|---|---------------------|---|--------|---|
| Kite | A                     | B | C                   | D | Sector | 0 |
|      | A                     | B | D $\wedge C \wedge$ |   |        | 2 |
|      | A                     | C | B                   | D |        | 0 |
|      | A                     | C | D                   | B |        | 0 |
|      | A $\wedge D$          | B | C $\wedge$          |   |        | 2 |
|      | A $\wedge D \wedge C$ | B |                     |   |        | 2 |

|      |              |              |            |            |        |   |
|------|--------------|--------------|------------|------------|--------|---|
| Kite | D            | A            | B          | C $\wedge$ | Sector | 1 |
|      | D            | A            | C          | B          |        | 0 |
|      | D            | B $\wedge A$ | C $\wedge$ |            |        | 2 |
|      | D            | B            | C          | A          |        | 0 |
|      | D $\wedge C$ | A            | B          |            |        | 1 |
|      | D $\wedge C$ | B $\wedge A$ |            |            |        | 2 |

**OCR (Oxford Cambridge and RSA Examinations)**  
**1 Hills Road**  
**Cambridge**  
**CB1 2EU**

**OCR Customer Contact Centre**

**Education and Learning**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

**[www.ocr.org.uk](http://www.ocr.org.uk)**

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

**Oxford Cambridge and RSA Examinations**  
**is a Company Limited by Guarantee**  
**Registered in England**  
**Registered Office; 1 Hills Road, Cambridge, CB1 2EU**  
**Registered Company Number: 3484466**  
**OCR is an exempt Charity**

**OCR (Oxford Cambridge and RSA Examinations)**  
**Head office**  
**Telephone: 01223 552552**  
**Facsimile: 01223 552553**

© OCR 2016

