

## **Mathematics B (Linear)**

General Certificate of Secondary Education

Component **J567/02**: Mathematics Paper 2 (Foundation)

### **Mark Scheme for June 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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Annotations used in the detailed Mark Scheme.

| Annotation                                                                          | Meaning                                                                                       |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|    | Correct                                                                                       |
|    | Incorrect                                                                                     |
|    | Benefit of doubt                                                                              |
|    | Follow through                                                                                |
|    | Ignore subsequent working (after correct answer obtained), provided method has been completed |
|    | Method mark awarded 0                                                                         |
|    | Method mark awarded 1                                                                         |
|    | Method mark awarded 2                                                                         |
|    | Accuracy mark awarded 1                                                                       |
|    | Independent mark awarded 1                                                                    |
|    | Independent mark awarded 2                                                                    |
|   | Misread                                                                                       |
|  | 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**

1. **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.
2. 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.

3. 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  $180 \times (\text{their '37' } + 16)$ , or FT  $300 - \sqrt{(\text{their '5}^2 + 7^2\text{'})}$ . Answers to part questions which are being followed through are indicated by eg FT  $3 \times \text{their (a)}$ .

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.

4. 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.
5. 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**.

6. 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 by the instruction 'mark final answer'.
7. 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.
8. 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.
  - (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 zero marks for the question unless the candidate has clearly indicated which method is to be marked.
9. 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 zero marks for the question unless the candidate has clearly indicated which response is to be marked.
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) | (i)   | 87540                                     | 1      |                                                                  |                                                                                             |
|          |     | (ii)  | 88000                                     | 1      |                                                                  |                                                                                             |
|          | (b) |       | 6.0399, 6.3, 6.309, 6.903, 6.93           | 2      | <b>M1</b> for first or last correct<br><b>SC1</b> order reversed |                                                                                             |
| 2        | (a) |       | D                                         | 1      |                                                                  | condone lower case letters                                                                  |
|          | (b) |       | B                                         | 1      |                                                                  |                                                                                             |
|          | (c) |       | A                                         | 1      |                                                                  | condone 0 (from diagram)                                                                    |
| 3        | (a) |       | Obtuse angle drawn and labelled           | 1      |                                                                  | if angle drawn in the middle the intended angle must be indicated. accept arc as indication |
|          | (b) |       | 33 - 37°                                  | 1      |                                                                  |                                                                                             |
|          | (c) |       | 142<br>(Angles in a) quadrilateral = 360° | 2<br>1 | <b>M1</b> 360 – (109 + 63 + 46)                                  | allow 4 sided shape                                                                         |
| 4        | (a) | (i)   | C on circumference of circle              | 1      |                                                                  | must be clear intention to identify circumference only                                      |
|          |     | (ii)  | D on diameter of circle                   | 1      |                                                                  | must be clear intention to identify diameter only                                           |
|          |     | (iii) | Radius drawn                              | 1      |                                                                  | must be drawn but need not be labelled if only 1 line                                       |
|          | (b) |       | Equilateral                               | 1      |                                                                  |                                                                                             |
| 5        |     |       | Correct reflection                        | 2      | <b>B1</b> correct reflection, incorrect position                 | correct by eye ±2mm                                                                         |

| Question |     |       | Answer                                             | Marks  | Part Marks and Guidance                                                                            |                                                                  |
|----------|-----|-------|----------------------------------------------------|--------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| 6        |     |       | Vertical scale not linear<br>Bars different widths | 1<br>1 |                                                                                                    | see Appendix 1                                                   |
| 7        | (a) |       | 10 05 oe                                           | 1      |                                                                                                    | ignore “am”. Do not accept “pm”<br>ignore punctuation            |
|          | (b) |       | 9.9[0]                                             | 2      | <b>M1</b> $3 \times 2.85 + 1.35$                                                                   |                                                                  |
| 8        | (a) |       | 37                                                 | 1      |                                                                                                    |                                                                  |
|          | (b) |       | 13                                                 | 1      |                                                                                                    |                                                                  |
| 9        | (a) | (i)   | multiple                                           | 1      |                                                                                                    |                                                                  |
|          |     | (ii)  | square                                             | 1      |                                                                                                    |                                                                  |
|          |     | (iii) | cube                                               | 1      |                                                                                                    |                                                                  |
|          |     | (iv)  | factor                                             | 1      |                                                                                                    |                                                                  |
|          | (b) |       | $6^5$                                              | 1      |                                                                                                    |                                                                  |
| 10       | (a) |       | (-3, 2)                                            | 1      |                                                                                                    |                                                                  |
|          | (b) |       | Point plotted at (5, -3)                           | 1      |                                                                                                    |                                                                  |
| 11       | (a) |       | REH, HER, HRE, ERH, EHR                            | 2      | <b>B1</b> 3 further correct responses, ignore repeats                                              | no repeats for 2 marks                                           |
|          | (b) |       | 0.19 oe                                            | 2      | <b>M1</b> $1 - (0.3 + 0.25 + 0.18 + 0.08)$ or<br><b>SC1</b> 0.46                                   | not $0.81 - 1$ or $0.81 + \dots$<br>answer could be in the table |
|          | (c) |       | 60                                                 | 2      | <b>M1</b> $150 \div 2.5$ or $150 \div 150 \times 60$<br><b>SC1</b> 65.2[....] or 1 mile per minute |                                                                  |

| Question |     |       | Answer                                                     | Marks | Part Marks and Guidance                                                                                   |                                                                         |
|----------|-----|-------|------------------------------------------------------------|-------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 12       | (a) |       | E[ast]                                                     | 1     |                                                                                                           |                                                                         |
|          | (b) |       | N[orth] W[est]                                             | 1     |                                                                                                           | do not accept WN                                                        |
|          | (c) | (i)   | L[eft], Victoria Street, R[ight]                           | 2     | <b>B1</b> any 2 correct                                                                                   | condone e[ast] for left<br>accept Victoria                              |
|          |     | (ii)  | 32                                                         | 1     |                                                                                                           |                                                                         |
|          | (d) | (i)   | 2.5 hours <b>oe</b>                                        | 1     |                                                                                                           | do not accept 2.3 or 2.30                                               |
|          |     | (ii)  | 28                                                         | 1     |                                                                                                           |                                                                         |
|          |     | (iii) | (1400, 28) to (1430, 0) joined with line[s]<br>or curve[s] | 1     |                                                                                                           | must be continuous, do not allow<br>any vertical lines, accept freehand |
| 13       | (a) | (i)   | Any fraction equivalent to half                            | 1     |                                                                                                           | must be a fraction                                                      |
|          |     | (ii)  | $6\frac{1}{3}$                                             | 1     |                                                                                                           | must be a fraction                                                      |
|          |     | (iii) | 60                                                         | 1     |                                                                                                           |                                                                         |
|          |     | (iv)  | $\frac{23}{25}$ final answer                               | 2     | <b>B1</b> for other equivalent fraction, eg $\frac{46}{50}$<br>or $\frac{23}{25}$ not as final answer     | allow $\frac{92}{100}$                                                  |
|          | (b) |       | 22%, $\frac{9}{40}$ , $\frac{13}{50}$ final answer         | 3     | <b>B2</b> all three marks correctly expressed in<br>the same form<br><b>B1</b> two marks in the same form | eg 0.26, 0.225 and 0.22 <b>oe</b><br>eg 22% and 26%                     |

| Question |     |      | Answer                                                        | Marks      | Part Marks and Guidance                                                                                |                                                                                  |
|----------|-----|------|---------------------------------------------------------------|------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
|          | (c) |      | 31.5[0]                                                       | 2          | <b>M1</b> $0.18 \times 175$ <b>soi</b> by 31.5[0] not as final answer<br><b>SC1</b> answer of 206.5[0] | allow non calculator method with no more than 1 numerical error                  |
| 14       | (a) |      | $2p + 10r$ final answer                                       | 2          | <b>B1</b> $[+]2p$ or $[+]10r$                                                                          | 12pr as answer scores B1                                                         |
|          | (b) | (i)  | 3                                                             | 2          | <b>M1</b> $6x = 18$                                                                                    | in (bi) and (bii) penalise embedded answer 1 mark the first time                 |
|          |     | (ii) | 104                                                           | 2          | <b>M1</b> $\frac{x}{4} = 26$ <b>oe</b>                                                                 |                                                                                  |
| 15       | (a) |      | 126, 46, 15, 27                                               | 3          | <b>B2</b> 3 correct<br><b>B1</b> 1 correct<br>1 person is 3[°] or a correct method to find this        | may be seen in part (a) or (b)                                                   |
|          | (b) |      | 3 correct and labelled sectors pie chart angles $\pm 3^\circ$ | 2          | <b>B1</b> 2 correct sectors labelled or 3 correct with incorrect/no labels                             | If pie chart incorrect <b>FT</b> if <i>their</i> '126' + <i>their</i> '15' = 141 |
| 16       | (a) |      | Fully correct cuboid with ruled lines                         | 2          | <b>B1</b> cuboid with 2 dimensions correct or all 3 correct but lines not ruled                        | condone internal lines                                                           |
|          | (b) |      | 48<br><br>$\text{cm}^3$ <b>oe</b>                             | 2<br><br>1 | <b>FT</b> <i>their</i> cuboid<br><b>M1</b> <i>their</i> ' $6 \times 4 \times 2$ '                      | must be a cuboid                                                                 |

| Question |     |  | Answer                                                                                                                     | Marks                  | Part Marks and Guidance                                                                                                                                                                                                                                                 |                                                                                                                                                                       |
|----------|-----|--|----------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17       | (a) |  | ruled line AC = 6cm and ruled line CB = 9cm joined to form the correct triangle                                            | 2                      | allow $\pm 2\text{mm}$ for lines<br><b>M1</b> for one correct line<br><b>SC1</b> for correct triangle AC 9cm and BC 6cm                                                                                                                                                 | lines must meet, allow 2mm gap and take this point as C, use the ruler centred on C to check the lengths<br>6cm from A or 9cm from B<br>Condone reflection in line AB |
|          | (b) |  | correct pentagon with ruled lines                                                                                          | 2                      | allow angle at centre to be $72^\circ \pm 3^\circ$<br><b>M1</b> for 72 <b>seen</b> or any pentagon drawn on or inside the circle, condone freehand lines                                                                                                                | for 2 marks, condone lines just missing a point (intention to join)                                                                                                   |
| 18       |     |  | A and correct comparison eg<br>A : $480 \div 7.5 = 64$ (p per 100g)<br>B : $390 \div 6 = 65$ (p per 100g)                  | 3                      | allow any correct comparison with at least 2sf <b>rot</b> providing the numbers are different<br><b>M2</b> for two correct comparisons but wrong or no conclusion<br>or<br><b>M1</b> for attempt to compare similar quantities but involving arithmetic errors          | <u>ignore all units</u> , just look at the numbers and mark to the candidate's advantage<br><br>see additional guidance for other methods                             |
| 19       |     |  | angle ADE = 58 or angle ACB = 48<br><br>angles in a triangle [add to 180]<br><br>[parallel due to] corresponding /F angles | 1<br><br>1<br><br>1dep | values need to be identified eg the angle must be named or the value written in the correct place in the diagram<br>can be implied by correct working eg $180 - 74 - 48$<br><b>dep</b> on the mark for the angle being awarded<br>accept similar triangles, enlargement | condone [angle] D or [angle] C<br><br>condone 3 points identifying a triangle eg ADE                                                                                  |

| Question |     |  | Answer                                                                                      | Marks  | Part Marks and Guidance                                                                                                                                                                                                                                                            |                                                                                                                                                       |
|----------|-----|--|---------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20       |     |  | 4 with full and correct working                                                             | 4      | <b>M1</b> for $3.3 \times 20$ ( $[=66]$ )<br><b>M1</b> for $(1 \times 4 + 2 \times 2 + 3 \times 4 + 4 \times 3 + 5 \times 6)$ or 62<br><b>M1</b> for <i>their</i> '66' – <i>their</i> '62'<br><b>B1</b> for answer of 4<br>allow valid alternative methods see additional guidance | if the 4 comes from completely wrong working award <b>0</b> marks                                                                                     |
| 21       | (a) |  | 10   -2                                                                                     | 2      | <b>B1</b> for each                                                                                                                                                                                                                                                                 |                                                                                                                                                       |
|          | (b) |  | seven correct points correctly plotted and joined with a curve which must go below $y = -2$ | 2      | <b>B1</b> for 6 points correctly plotted ( <b>FT</b> <i>their</i> table)                                                                                                                                                                                                           | points should lie on or inside the circles on the overlay and the curve should be within 2mm of each point (by eye), be generous towards 'tram lines' |
|          | (c) |  | -0.7 to -0.4<br>3.4 to 3.7                                                                  | 1<br>1 | If 0 scored <b>B1</b> for any correct point <b>FT</b> <i>their</i> graph ( $\pm 1\text{mm}$ )<br>accept answers in the form (x, 2)                                                                                                                                                 | for <b>FT</b> the points must be joined<br>If more than 2 values given -1 each error                                                                  |

| Question |  |  | Answer                                                                                                                                                                                                                                                                                                            | Marks | Guidance                                                                                                                                                                           |
|----------|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22       |  |  | The response “No” supported by a fully correct calculation of the cost of the holiday. The figure 1895.2[0] is obtained from $980 \times 2 + 50 \times 2$ [=2060]. The 8% reduction is made. Clear annotation and explanation of reasoning. Correct spelling, punctuation and grammar.                            | 5     | Three correct lines of working from the method such as the figure 980 selected, doubled and the 8% discount applied correctly to it or the correct answer with incomplete working. |
|          |  |  | Alternatives include fully correct numerical solution but no summary or no clear reasoning. It could be one error in working out the total cost followed by a correct response (yes or no) from their answer or evidence of correct working of four of the lines below ( <b>FT</b> incorrect reading from table). | 4–3   |                                                                                                                                                                                    |
|          |  |  | Two correct lines of working from the method such as the figure 980 selected and 980 doubled or 980 selected and the 8% discount applied correctly to it.                                                                                                                                                         | 2–1   |                                                                                                                                                                                    |
|          |  |  | No worthwhile work attempted.                                                                                                                                                                                                                                                                                     | 0     |                                                                                                                                                                                    |

Example method;

980

$980 + 50$  (=1030)

$1030 \times 0.92$  **oe** (=947.6[0])

$947.6 \times 2$  (=1895.2[0])

No [since  $1895.2 > 1850$ ]

|    |  |  | Answer                  | Marks | Part Marks and Guidance                                                                                                                                                                                                                                                                                              |                                                                        |
|----|--|--|-------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 23 |  |  | $-2.5, -\frac{5}{2}$ oe | 3     | <p><b>M1</b> for <math>7x - 3x + 6 = -4</math> (dealing with <math>x</math>, condone = 4) or better</p> <p><b>M1</b> for <math>7x = 3x - 4 - 6</math> (dealing with numbers) or better</p> <p><b>M1</b> for <math>x = b/a</math> after <math>ax = b</math>, <math>a \neq 1</math> (maximum of <b>M2</b> awarded)</p> | these must be equations and accept embedded answer unless contradicted |

**APPENDIX**

Exemplar responses for question 6

| <b>Response</b>                                                  | <b>Mark awarded</b> |
|------------------------------------------------------------------|---------------------|
| The blocks are not the same                                      | 0                   |
| The bars are different sizes                                     | 0                   |
| The bars aren't equal                                            | 0                   |
| The bars aren't the same width apart                             | 0                   |
| because one has more bars                                        | 0                   |
| Because the 'maths is fun' bar is 4 squares wide (no comparison) | 0                   |
| One bar is bigger/larger                                         | 0                   |
| One bar is wider/thicker/fatter/thinner                          | 1                   |
| width of the bars are different                                  | 1                   |
| the numbers aren't equal                                         | 0                   |
| the units are not stated correctly                               | 0                   |
| doesn't give right units                                         | 0                   |
| the scale changes                                                | 1                   |
| Scale goes up in 2's then jumps to 5's                           | 1                   |
| Scale doesn't always go up in 2's                                | 1                   |
| Scale isn't equal                                                | 1 bod               |
|                                                                  |                     |

Mark scheme for question 16a Braille transcript

| <b>Response</b>             | <b>Mark awarded</b> |
|-----------------------------|---------------------|
| Fully correct net of cuboid | 2                   |
| 4 correct faces             | M1                  |
|                             |                     |
|                             |                     |
|                             |                     |

**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)

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