



GCSE

Mathematics B (Linear)

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

General Certificate of Secondary Education

Mark Scheme for June 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 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 $180 \times (\textit{their} \text{'37'} + 16)$, or FT $300 - \sqrt{(\textit{their} \text{'5}^2 + 7^2)}$. 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.

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| Question | | | Answer | Marks | Part marks and guidance | |
|----------|-----|------|--------------------------|-------|--|---|
| 1 | (a) | | Pentagon | 1 | | |
| | (b) | (i) | Cone | 1 | | |
| | | (ii) | Cuboid | 1 | | |
| 2 | (a) | | (1, 3) | 1 | | |
| | (b) | | Point plotted at (5, -2) | 1 | | |
| | (c) | | Isosceles | 1 | | |
| 3 | (a) | | 400g | 1 | | May be indicated in the question in all parts |
| | (b) | | 60l | 1 | | |
| | (c) | | 300 ml | 1 | | |
| 4 | (a) | | Diagonals are equal | 1 | | See exemplars |
| | (b) | | Rhombus | 1 | | |
| 5 | (a) | | 1 2 3 6 9 and 18 | 2 | M1 At least 4 correct and at most 1 incorrect in answer | |
| | (b) | | Any 2 multiples of 7 | 1 | | Ignore extra if correct |
| | (c) | | 7 11 or 13 | 1 | | |
| 6 | | | 32 nfw | 3 | M2 for 60 – their 12 – their 16 Or M1 for their $48 \div 3$ Or B1 for 12 | Their 16 cannot be 20 Beware if 20 seen (20 + 12) is ww Their 48 cannot be 60 |

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| Question | | Answer | Marks | Part marks and guidance | |
|----------|---------|-----------------------------------|-------|---|---|
| 7 | (a) | 7.037 7.30 7.307 7.37 7.737 | 2 | B1 for 4 in correct order SC1 for correct but reversed | |
| | (b) (i) | 27 | 1 | | |
| | (ii) | 4078 | 2 | M1 for 4096 or 18 | |
| | (c) | 6 ⁵ | 1 | | |
| | (d) | 490 | 3 | M2 for 486.71 M1 for 0.17 × 2863 oe If zero scored SC1 for answer figs 49 or for correctly rounding “ <i>their</i> ” answer to 2sf | Non calculator must be a fully correct method, including addition of the values. Condone error in addition Must see the “unrounded” answer |
| 8 | (a) | Arrow at $\frac{1}{8}$ labelled B | 1 | | Tolerance ± 2mm by eye If no arrow accept B in correct position |
| | (b) | Arrow at $\frac{5}{8}$ labelled P | 1 | | Tolerance ± 2mm by eye If no arrow accept P in correct position |
| 9 | (a) | -3 | 1 | | |
| | (b) | 7 | 1 | | |
| 10 | | Correct enlargement | 3 | M2 for 3 correct sides M1 for 2 correct sides | Condone good freehand/intention |

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| Question | | | Answer | Marks | Part marks and guidance | |
|----------|-----|-------|--|-------|--|--|
| 11 | (a) | (i) | 413 | 1 | | |
| | | (ii) | 262 | 2 | M1 for 100 or 162 | For M1 Maximum of 2 distances identified |
| | (b) | | 65 | 2 | M1 for $74.75 \div 1.15$ | |
| | (c) | | 20 | 2 | M1 for $36 \div 180$ Or B1 for 0.2 oe | |
| | (d) | (i) | 160 | 1 | | |
| | | (ii) | 320 | 2 | M1 for $200 \div 5$ | |
| 12 | (a) | (i) | $10j$ | 1 | | |
| | | (ii) | $-2r + 4s$ | 2 | M1 for $-2r$ or $4s$ in answer | $4s + -2r$ scores M1 |
| | (b) | (i) | 5 | 1 | | |
| | | (ii) | 4.5 or $4\frac{1}{2}$ or $\frac{9}{2}$ | 2 | M1 for $8x = 36$ or $k/8$ after $8x = k$ | $36/8$ scores M1 |
| | | (iii) | $x > 2$ | 1 | | |
| | (c) | | $5x + 20$ | 1 | | |
| 13 | (a) | | $\frac{90}{360}$ oe | 1 | | Must be a fraction |
| | (b) | | 60 | 3 | M2 for $(150 \div 360) \times 144$ M1 for $(150 \div 360)$ or 2.5 | Accept equivalent methods |

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| Question | | Answer | Marks | Part marks and guidance | |
|----------|-----|--|-------|---|--|
| 14 | (a) | 200 | 1 | | |
| | (b) | (i) | 1.8 | 2 | M1 for 400×4.5 oe soi by 1800 |
| | | (ii) | 4.25 | 3 FT | <p>B2 for 15.75</p> <p>Or</p> <p>M1 for $8.75 \times \text{their } 1.8$ [= their 15.75] and</p> <p>M1 for $20 - \text{their } 15.75$</p> |
| | | | | | <p>Ft <i>their</i> 1800 in kg</p> <p>0 if <i>their</i> 15.75 is more than £20 and</p> <p><i>Their</i> 15.75 must come from $8.75 \times \text{"their"} 1.8$</p> |
| 15 | (a) | Two correct vertices marked | 1 | | Any clear indication of correct vertices if more than 2 scores 0 |
| | (b) | Fully correct drawing with ruled lines | 3 | B2 for correct diagram lines not ruled B1 for 1 correct face of a cuboid | Ignore internal lines |
| 16 | (a) | 1 5 9 | 2 | B1 for 2 correct | |
| | (b) | Ruled line between (0, 1) and (4, 9) | 2 | B1 for 3 points plotted correctly ft their table with no more than 2 incorrect points | Mark intent for plotted points |
| 17 | | 1.4 or $\frac{7}{5}$ or $1\frac{2}{5}$ | 2 | M1 for 1.96 or 9.5 | |
| 18 | | $[0].15$ or $\frac{15}{100}$ oe | 2 | M1 for $1 - 0.38 - 0.47$ oe | Do not accept just 15 |

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| Question | | Answer | Marks | Part marks and guidance | |
|----------|--|---------------------|-------|--|--|
| 19 | | 21.02 to 21.03[...] | 4 | <p>M3 for $\frac{14^2 - 49\pi}{2}$ soi by 21 to 21.07</p> <p>Or</p> <p>M2 for $14^2 - 7^2 \times \pi$ soi by 42 to 42.14..</p> <p>Or</p> <p>M1 for $7^2 \times \pi$</p> <p>SC0 for 21 as answer without working</p> | Allow value of 49π as 153.86 to 154 49 can be 7^2 |

| Question | Answer | Marks | Part marks and guidance |
|----------|--|---|---|
| 20(a)* | <p>Two correct comparative comments of different aspects with four pieces of correct supporting evidence, this is communicated in a clear, correct and coherent way.</p> <p>A fully correct response except that it has only one correct comparative statement and four pieces of correct evidence or two correct comparative statements of different aspects and only three pieces of correct evidence.</p> <p>Two correct comparative statements of different aspects and one piece of correct evidence or one correct comparative statement and two correct pieces of evidence or three pieces of correct evidence.</p> <p>One correct comparative statement or one correct piece of evidence</p> | <p>6</p> <p>5 – 4</p> <p>3 – 2</p> <p>1 - 0</p> | <p><i>There can be one piece of evidence for A and one piece of evidence for B but they must be from the same statistical measure, e.g. the median for A must be compared to the median for B.</i></p> <p>Two correct comparative statements of different aspects and two pieces of correct evidence or one correct comparative statement and three correct pieces of evidence or four pieces of correct evidence.</p> <p>Two correct comparative statements of different aspects or two correct pieces of evidence of different aspects or one correct comparative statement and one piece of correct evidence.</p> <p>No worthwhile work attempted.</p> |

| Question | | Answer | Marks | Part marks and guidance | | | | | | | | | | | | | | | | | | | | |
|----------|---------|--|---------------------|-------------------------|--|---|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|
| | (b) (i) | 3.7 | 1 | | | | | | | | | | | | | | | | | | | | | |
| | (ii) | 11 | 1 | | | Condone 11 out of 23, but not $\frac{11}{23}$ | | | | | | | | | | | | | | | | | | |
| | (iii) | positive | 1 | | | Ignore embellishments | | | | | | | | | | | | | | | | | | |
| | (iv) | Correct ruled line of best fit | 1 | | | Line must be from 1 to 3.5 and it must cross through "mass = 1" between and including 126 and 136 and through "mass = 3.5" between and including 155 and 166 | | | | | | | | | | | | | | | | | | |
| | (v) | 2.6 – 3.4 | 1 | | | If not in this range then FT their ruled line of best fit ± 0.05 and the line must go from 1 to 3.5 | | | | | | | | | | | | | | | | | | |
| 21 | | 7.7 first correct result of a trial of a value of x between 7 and 8 second correct result of a trial of a value of x between 7 and 8 | 1 1 1 | | | The result of each trial can be rot to at least 2 sf e.g. for x = 7.2, the result could be 410, 420, 416, 416.4, 416.5 etc Allow trials to more than 1 decimal place e.g. x = 7.65 gives 493.59... so we allow 490, 493, 494 and so on | | | | | | | | | | | | | | | | | | |
| | | | | | | <table border="1"> <tbody> <tr><td>7.1</td><td>400.51</td></tr> <tr><td>7.2</td><td>416.45</td></tr> <tr><td>7.3</td><td>432.82</td></tr> <tr><td>7.4</td><td>449.62</td></tr> <tr><td>7.5</td><td>466.88</td></tr> <tr><td>7.6</td><td>484.58</td></tr> <tr><td>7.7</td><td>502.73</td></tr> <tr><td>7.8</td><td>521.35</td></tr> <tr><td>7.9</td><td>540.44</td></tr> </tbody> </table> | 7.1 | 400.51 | 7.2 | 416.45 | 7.3 | 432.82 | 7.4 | 449.62 | 7.5 | 466.88 | 7.6 | 484.58 | 7.7 | 502.73 | 7.8 | 521.35 | 7.9 | 540.44 |
| 7.1 | 400.51 | | | | | | | | | | | | | | | | | | | | | | | |
| 7.2 | 416.45 | | | | | | | | | | | | | | | | | | | | | | | |
| 7.3 | 432.82 | | | | | | | | | | | | | | | | | | | | | | | |
| 7.4 | 449.62 | | | | | | | | | | | | | | | | | | | | | | | |
| 7.5 | 466.88 | | | | | | | | | | | | | | | | | | | | | | | |
| 7.6 | 484.58 | | | | | | | | | | | | | | | | | | | | | | | |
| 7.7 | 502.73 | | | | | | | | | | | | | | | | | | | | | | | |
| 7.8 | 521.35 | | | | | | | | | | | | | | | | | | | | | | | |
| 7.9 | 540.44 | | | | | | | | | | | | | | | | | | | | | | | |

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| Question | | Answer | Marks | Part marks and guidance | |
|----------|--|--|--------|---|------------------------|
| 22 | | 22.5 23.5 | 1 1 | | Allow 23.499 or better |
| 23 | | 13.4[3] | 3 | M2 for $\sqrt{12.3^2 + 5.4^2}$ M1 for $12.3^2 + 5.4^2$ soi by 180.45 | |
| 24 | | B with three correct figures which can be compared | 3 | M2 for two correct figures which can be compared or M1 for a correct attempt to make at least two figures comparable | |

APPENDIX

Exemplar responses for Qn 4

| Response | Mark |
|---|---------------------|
| Because not all the diagonal bisects are equal | 1 |
| On a square all the diagonals bisect are equal | 1 |
| Because the diagonals are not equal | 1 |
| Diagonals are not equal so it can't be a square | 1 |
| Diagonals are not equal | 1 |
| A square is equal in every way including the diagonals | 1 bod for diagonals |
| Diagonals that bisect at 90° on a square are equal | 1 |
| The diagonals of a square that bisect at 90° should be equal as 4 corners to square = $90 \times 4 = 360^\circ$ | 1 |
| She is wrong because the diagonals are not equal | 1 |
| Because a square would have equal diagonals | 1 |
| Not all quadrilaterals are the same length sides | 0 |
| A square would be bisected at 90 and equal but they aren't | 0 |
| A square would bisect equally | 0 |
| All angles are equal in a square | 0 |
| All sides are equal in a square | 0 |
| Everything should be equal in a square | 0 |
| All the sides aren't the same length | 0 |
| The angles would all bisect at 90 | 0 |
| In a square all the diagonals would bisect at 90 | 0 |
| The diagonals on a square would make them both equal 90 | 0 |
| Angles in a square do not bisect | 0 |
| Because all the diagonals aren't the same angle | 0 |
| Diagonals bisect at 90 | 0 |
| A square has equal bisects | 0 |
| If it was a square, the bisect should be equal | 0 |
| Wrong because a square doesn't have diagonals bisect at 90° | 0 |
| | |
| | |

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