RECOGNISING ACHIEVEMENT

## GCSE

## Mathematics B (Linear)

General Certificate of Secondary Education

## Mark Scheme for March 2013

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.

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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.

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

Annotations used in the detailed Mark Scheme.

| Annotation | Meaning |
| :---: | :---: |
| $\checkmark$ | Correct |
| 3 | Incorrect |
| [IP] | Benefit of doubt |
| $\square$ | Follow through |
| [1: $1:$ | Ignore subsequent working (after correct answer obtained), provided method has been completed |
|  | Method mark awarded 0 |
| WIL | Method mark awarded 1 |
| [7\% | Method mark awarded 2 |
| $\square .7$ | Accuracy mark awarded 1 |
| - | Independent mark awarded 1 |
| [:F] | Independent mark awarded 2 |
| Wich | Misread |
| - I- | 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 $\mathbf{M}$ (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 $\mathbf{M}$ and $\mathbf{A}$ 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 $180 \times\left(\right.$ their ' 37 ' +16 ), or FT $300-\sqrt{ }\left(\right.$ their ' $5^{2}+7^{2 \prime}$ ). 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.
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.
- 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.

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 for example 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 $\checkmark$ 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 $\checkmark$ 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 $\times$ next to the wrong 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 $\mathbf{A}$ and $\mathbf{B}$ marks. Deduct 1 mark from any $\mathbf{A}$ or $\mathbf{B}$ marks earned and record this by using the MR annotation. $\mathbf{M}$ 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. Ranges of answers given in the mark scheme are always inclusive.
12. 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.
13. 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) | 4630 | 1 | Mark final answer |  |
|  |  | (ii) | 4600 | 1 | Mark final answer |  |
|  | (b) | (i) | 360 | 1 | Mark final answer |  |
|  |  | (ii) | 14.63 | 1 | Mark final answer | condone 14,63 |
|  | (c) |  | 13 | 2 | M1 for $52 \div 4$ oe or showing $10 \%$ is 5.2 and $5 \%$ is $5.2 \div 2$ and finding $5.2+5.2+$ their ' $5.2 \div 2$ ' <br> if M0, SC1 for an answer of $13 \%$ | their ' $5.2 \div 2$ ' can be implied by $5 \%=2 .(\ldots)$ after $10 \%=5.2$ seen |
| 2 | (a) |  | E3 | 1 |  | Accept e3 etc but do not accept 3E |
|  | (b) | (i) | E(ast) | 1 |  | Ignore other comments |
|  |  | (ii) | S W or South West | 1 |  | Ignore other comments |
|  | (c) |  | 80 (accept 76 to 84 inclusive) | 2 | M1 for 4 (3.8 to 4.2) seen or answer 60 to 100 (inclusive) |  |
|  | (d) |  | right, left, second, left, right | 2 | B1 for 3 or 4 correct |  |
| 3 | (a) |  | 0.18 or 18cm clearly indicated | 2 | Mark final answer M1 for attempt at 1.13-0.95 oe <br> if M0, SC1 for answer 18 (metres) |  |
|  | (b) |  | 0.27 or 27 cm clearly indicated | 2 | Mark final answer M1 for attempt at 1.4[0]-1.13 oe <br> if M0, SC1 for answer 27 (metres) |  |



| Question |  |  | Answer | Marks | Part Marks and Guidance |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 7 | (a) | (i) | C and D | 1 |  |  |
|  |  | (ii) | B and D | 1 |  |  |
|  |  | (iii) | A and E | 1 |  |  |
|  | (b) | (i) | Square | 1 |  |  |
|  |  | (ii) | Rhombus | 1 |  |  |
|  |  | (iii) | Kite | 1 |  |  |
| 8 | (a) | (i) | 19 | 1 |  | not embedded |
|  |  | (ii) | 7 | 1 |  | not embedded; not $\times 7$ |
|  | (b) | (i) | $9 p$ oe | 1 |  | condone $p 9$ but not $p^{9}$ |
|  |  | (i) | $11 x-2 y$ oe | 2 | Mark final answer B1 for $11 x$ or ( $\pm$ )2y | Accept $11 x+-2 y$ <br> $11 x 2 y$ gains one mark condone $x 11$ etc |
| 9 | (a) | (i) | $9\left[{ }^{\circ} \mathrm{C}\right]$ | 1 |  | accept ${ }^{-9}$ |
|  |  | (ii) | -2 | 1 |  |  |
|  | (b) | (i) | -7 and 3 | 2 | Mark final answer <br> M1 for two numbers that multiply to give ${ }^{-21}$ or add to give ${ }^{-4} 4$ as final answer or evidence of a pair of numbers that are correctly multiplied to give ${ }^{-21}$ or correctly added to give ${ }^{-4}$ in working space | Numbers do not need to be integers |
|  |  | (ii) | -2 and ${ }^{-5}$ | 1 | Mark final answer |  |


| Question |  |  | Answer | Marks | Part Marks and Guidance |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 10 | (a) | (i) | 271.8 | 1 | Mark final answer |  |
|  |  | (ii) | 32 | 2 | Mark final answer <br> M1 for an answer of 30 to 40 (exclusive) or attempt at 14 times table (up to 3 ) listed or $3 \times 14=42$ soi or figs 32 |  |
|  | (b) |  | 6732 | 3 | Mark final answer <br> M2 for attempting $132 \times 50+132$ oe soi with at most 2 arithmetic errors or answer 6700 to 6864 (inclusive) <br> or 'Napier's bones' diagram correct <br> Or M1 for $132 \times 10 \times 5$ or 6600 seen or answer 6600 to 7000 (inclusive) |  $\mathbf{1 0 0}$ $\mathbf{3 0}$ $\mathbf{2}$ <br> $\mathbf{5 0}$ 5000 1500 100 <br> $\mathbf{1}$ 100 30 2 <br> Award M2 for above table with at least 4 entries correct |
| 11 | (a) | (i) | $\frac{1}{5} \text { oe or } 0.2 \text { or } 20 \%$ | 1 | Mark final answer | Do not accept ratios in (a) except for SC1 in part (ii) <br> Accept $\frac{1}{5}$ with 'unlikely' on answer line, but $\frac{1}{5}$ and 'impossible' does not score <br> Accept $\frac{1}{5}$ with 1 in 5 etc on answer line |


| Question |  |  | Answer | Marks | Part Marks and Guidance |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | (ii) | $\frac{3}{5} \text { oe or } 0.6 \text { or } 60 \%$ | 1 | Mark final answer After $\mathbf{0}$ marks in (i), SC1 for 1 and 5 in (i) and 3 and 5 in (ii) seen | Accept $\frac{3}{5}$ with 'likely' on answer line Accept $\frac{3}{5}$ with 3 in 5 etc on answer line |
|  |  | (iii) | $\frac{1}{5} \text { oe or } 0.2 \text { or } 20 \%$ | 1 | FT from their (a)(i), providing it is an answer between 0 and 1 (exclusive) or 1 in 5 etc |  |
|  | (b) |  | 8 | 2 | M1 for $\frac{2}{3}$ of 12 or for fraction equivalent to $\frac{2}{3}$ seen |  |
| 12 | (a) | (i) | 19 | 1 | ignore further terms |  |
|  |  | (ii) | 18 | 1 | ignore further terms |  |
|  | (b) | (i) | $\begin{array}{\|l\|} \hline 5 \\ 16 \\ 8 \end{array}$ | 3 | Mark final answer <br> B1 for each term <br> FT from their ' 5 ', providing it is odd FT from their ' 16 ' |  |
|  |  | (ii) | 44, 7 | 2 | B1 for either correct |  |



| Question |  |  | Answer | Marks | Part Marks and Guidance |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 14 | (a) | (i) | 0.7(0) | 1 | Mark final answer |  |
|  |  | (ii) | 0.75 | 1 | Mark final answer |  |
|  | (b) |  | $\frac{1}{3}$ and either $\frac{10 k}{30 k}$ and $\frac{9 k}{30 k}$ seen, for some integer $k$ or $\frac{1}{3}=\frac{3}{9}$ (ignore other fractions) or $0.33(3 \ldots)$ and 0.3 seen or $\frac{1}{3}=\frac{33}{100}(33 \%)$ and $\frac{3}{10}=\frac{30}{100}(30 \%)$ or for example $\frac{1}{3}$ of $30=10$ and $\frac{3}{10}$ of $30=9$ etc | 2 | M1 $\frac{10 k}{30 k}$ or $\frac{9 k}{30 k}$ seen, for some integer $k$ <br> or $\left[\frac{1}{3}=\right] 0.33(\ldots)$ or $\left[\frac{3}{10}=\right] 0.3$ seen or $33(\ldots) \%$ or $30 \%$ seen <br> or answer $\frac{3}{10}$ with $\frac{1}{3}$ of $30=10$ and $\frac{3}{10}$ of $30=9$ etc | Do not accept diagrams unless they are accurate |
|  | (c) |  | $4 \frac{1}{15} \text { oe }$ | 3 | Mark final answer M2 for $\frac{16}{15}$ oe seen or $\frac{51}{15}+\frac{10}{15}$ or $\frac{61}{15}$ or $3 \frac{16}{15}$ oe Or M1 for $\frac{6}{15}$ or $\frac{10}{15}$ or $\frac{17}{5}$ or $\frac{51}{15}$ seen or $\frac{12}{30}+\frac{20}{30}$ etc |  |


| Question |  | Answer | Marks | Part Marks and Guidance |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 15 | (a) | $3 a+a^{2}$ final answer | 1 |  | Condone $a \times 3$ and $a 3$ for $3 a$ [not $a^{3}$ ] |
|  | (b) | 4(b-3) final answer | 1 | Accept 2(2b-6) as final answer | Condone missing final bracket |
|  | (c) | $x<5$ final answer | 3 | nfww <br> M1 for collecting $x$ terms or constants on one side $3 x-x-6<4 \text { or } 3 x<x+4+6$ <br> AND <br> M1 dep for collecting constants or $x$ terms on the other side $3 x-x<4+6$ <br> AND <br> M1 for $x<\frac{b}{a}$ after $a x<b$ seen max 2 marks if answer incorrect <br> Or SC2 for answer 5 or $x \ldots 5$ with any incorrect equality or inequality symbol or answer $3 \times 5-6<5+4$ | eg $3 x-x<-2$ implies M1 <br> $3 x-6-4<x$ implies M1 <br> Dependent on first M1 <br> $2 x<10$ implies M2 <br> $a \neq 1, b \neq 0$ <br> Condone use of = or incorrect inequality symbol for < for method marks |


| Question |  | Answer | Marks | Part Marks and Guidance |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 16 | (a) | Linear scale on vertical axis <br> Six heights correct $[3,4,6,8,7,2]$ <br> Plots at midpoints and joined with straight lines | 1 <br> 1 <br> 1 | FT their linear scale or implied linear scale if no scale indicated <br> Condone one missing plot | Condone zero not marked, but scale must start from 0 <br> Bar chart scores max 2 for scale and heights If frequency polygon and bar chart shown, mark best <br> Ignore lines joining to origin or first point to last |
|  | (b) | $9000 \leq s<10000$ | 1 |  | Condone incorrect notation eg $9000<s<10000$, $9000-10000$ etc Condone slip in number of zeros eg 9000 < s < 1000 <br> Do not accept answer $9000 \leq s$ < 10000 and 8 (choice) |
|  | (c) | 30 | 2 | B1 for 9 and 30 seen SC1 for answer 70 | For B1 condone 28, 29, or 31 in place of 30 |
|  | (d) | 7.5 or $7.499(99 \ldots)$ or 7.49 | 1 |  | 7.49 scores 0 |


| Question |  | Answer | Marks | Part Marks and Guidance |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 17 |  | $\begin{array}{\|l\|} \hline 11 \\ 36 \end{array}$ | 4 | B3 for 11 or 36 in correct position <br> or 11 and 36 positioned incorrectly <br> OR <br> M1 for $3 n+3$ oe seen <br> AND <br> M1 for $6(n-5)$ oe seen <br> AND <br> M1 for their ' $3 n+3$ ' = their ' $6(n-5$ )' <br> correctly simplified to $a x=b$ <br> Alternative method <br> M1 for trial with same start number correctly evaluating end number for both Leo and Kate <br> AND <br> M1 for another trial with same start number and correctly evaluating end number for both Leo and Kate <br> After M0, award M1 for two starting numbers substituted correctly evaluating end number for Kate and/or Leo | Accept any letter used for $n$ |  |  |  |  |  |
|  |  |  |  |  | $n$ | K | L | $n$ | K | L |
|  |  |  |  |  | 1 | 6 | -24 | 11 | 36 | 36 |
|  |  |  |  |  | 2 | 9 | -18 | 12 | 39 | 42 |
|  |  |  |  |  | 3 | 12 | -12 | 13 | 42 | 48 |
|  |  |  |  |  | 4 | 15 | -6 | 14 | 45 | 54 |
|  |  |  |  |  | 5 | 18 | 0 | 15 | 48 | 60 |
|  |  |  |  |  | 6 | 21 | 6 | 16 | 51 | 66 |
|  |  |  |  |  | 7 | 24 | 12 | 17 | 54 | 72 |
|  |  |  |  |  | 8 | 27 | 18 | 18 | 57 | 78 |
|  |  |  |  |  | 9 | 30 | 24 | 19 | 60 | 84 |
|  |  |  |  |  | 10 | 33 | 30 | 20 | 63 | 90 |
|  |  |  |  |  | Allo neg |  |  |  |  |  |
| 18 |  | Correct enlargement (all points within 2mm) | 3 | M2 for two or three correct points or correct enlargement not centre C or a 'spider's web' enlargement (sf 3) but inaccurate <br> M1 for a line of correct length in any position parallel to original or one correct point or correct enlargement centre C with a different Scale Factor |  |  |  |  |  |  |


| Question |  |  | Answer | Marks | Part Marks and Guidance |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 19 | (a) | (i) | C | 1 |  |  |
|  |  | (ii) | Correct net of a cube (not congruent to C if C given as answer in (i)) | 1 | Must be 6 squares (of any size) |  |
|  | (b) | (i) | Four equilateral triangles, correct size and position | 2 | M1 for one correctly sized triangle Or for four triangles correctly placed | Use overlay, triangles should be correct by eye Ignore flaps |
|  |  | (ii) | 96-100.8 | 4 | M1 for [height] $5.0-5.4$ seen or FT measuring their triangle And M1 for $0.5 \times 6 \times$ their height <br> And M1 for area of square base $=36$ soi | Answer nfww <br> This mark is for using area of a triangle formula, may be implied by $3 \times$ their height their height is FT triangle drawn in (a), condone 6 for their height <br> May be implied by $6 \times 6=36$ seen but not by $6 \times 6 \times 6=216$ <br> Condone use of Pythagoras with correct surds eg answer $36(1+\sqrt{3})$ oe scores 4 <br> M1 for height $\sqrt{27}$ oe <br> M1 for $0.5 \times 6 \times \sqrt{27}$ |

## APPENDIX

Exemplar responses for Q6(d)

| Response |  | Mark |
| :--- | :---: | :---: |
| Olivers temperature went up then down | $\mathbf{1}$ |  |
| Oliver's temperature wasn't as high early in the day and late at night as it was during the day | $\mathbf{1}$ |  |
| It raised to a peak of 38.6 at 3pm and then returned to 37.4 at 9pm. | $\mathbf{1}$ |  |
| It rose (in the morning and the evening) and lowered (at night) | $\mathbf{1}$ |  |
| It got higher as the day went on and started dropping after 3pm | $\mathbf{1}$ |  |
| High temperature to 3pm and then started to cool down towards 6 and 9pm | $\mathbf{1}$ |  |
| Olivers temperature began at an average temperature then progressed to its highest at 36.9 and began to go back down | $\mathbf{1}$ | $\mathbf{1}$ |
| In the afternoon his temperature was hot than the mornings or evenings | $\mathbf{0}$ |  |
| Positive and negative correlation | $\mathbf{0}$ |  |
| Olivers temperature went up during the afternoon | $\mathbf{0}$ |  |

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