OCR
RECOGNISING ACHIEVEMENT

GCSE

Mathematics B (Linear)

General Certificate of Secondary Education

Component **J567/04:** Mathematics Paper 4 (Higher)

Mark Scheme for June 2013

Oxford Cambridge and RSA Examinations

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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
	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

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 × (*their* '37' + 16), or FT 300 – √(*their* '$5^2 + 7^{2}$'). Answers to part questions which are being followed through are indicated by eg FT 3 × *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 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)		ruled line AC = 6cm and ruled line CB = 9cm joined to form the correct triangle	2	allow ± 2mm for lines **M1** for one correct line **SC1** 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 6cm from A or 9cm from B Condone reflection in line AB
	(b)		correct pentagon with ruled lines	2	allow angle at centre to be 72°± 3° **M1** for 72 **seen** or any pentagon drawn on or inside the circle, condone freehand lines	for 2 marks, condone lines just missing a point (intention to join)
2			8.5	3	**M1** for 11 284 – 10 400 implied by 884 **M1** for *their* '884' ÷ 10 400 [×100] or 0.085 alternative method **M2** for 11 284 ÷ 10 400 implied by 1.085 or 108.5	allow trial and improvement with **M1** for each of two trials, correct answer scores 3 marks even without trials.
3	(a)		$^-2.5$, $-\frac{5}{2}$ **oe**	3	**M1** for $7x - 3x + 6 = ^-4$ (dealing with x, condone = 4) or better **M1** for $7x = 3x - 4 - 6$ (dealing with numbers) or better **M1** for $x = b/a$ after $ax = b$, $a \neq 1$ (maximum of **M2** awarded)	these must be equations and accept embedded answer unless contradicted
	(b)		$[W=] \frac{T+8}{5}$ **oe**	2	**M1** for as answer $\frac{T-8}{5}$ or $\frac{T}{5} + 8$ or $\frac{-T-8}{5}$ or $T + 8/5$ or first step correct eg $T + 8 = 5W$ **oe**	

Question			Answer	Marks	Part Marks and Guidance	
4			64	3	**M2** for 288 ÷ 4.5 **oe** **or M1** for 288 ÷ *their* time (eg 4.3(0), 30 or 270)	Implied by 1.06…, 1.07, 66.9[...], 67.0
5			A and correct comparison eg A : 480 ÷ 7.5 = 64 (p per 100g) B : 390 ÷ 6 = 65 (p per 100g)	3	allow any correct comparison with at least 2sf **rot**, providing the numbers are different **M2** for two correct comparisons but wrong or no conclusion or **M1** for attempt to compare similar quantities but involving arithmetic errors	ignore all units, just look at the numbers and mark to the candidate's advantage see additional guidance for other methods
6			angle ADE = 58 or angle ACB = 48 angles in a triangle [add to 180] [parallel due to] corresponding /F angles	1 1 1dep	values need to be identified eg the angle must be named or the value written in the correct place in the diagram can be implied by correct working eg 180 – 74 – 48 **dep** on the mark for the angle being awarded accept similar triangles, enlargement	condone [angle] D or [angle] C condone three points identifying a triangle eg ADE
7			4 with full and correct working	4	**M1** for 3.3 × 20 ([=66]) **M1** for (1×4 + 2×2 + 3×4 + 4×3 + 5×6) or 62 **M1** for *their* '66' – *their* '62' **B1** for answer of 4 allow valid alternative methods see additional guidance	if the 4 comes from completely wrong working award **0** marks

Question			Answer	Marks	Part Marks and Guidance	
8	(a)		0.22 **oe**	2	**M1** for 1 – 0.42 – 0.25 – 0.11 **oe**	in (a), (b) and (c) accept percentages providing % seen eg 22% but not 22 and also **BOD** 0.22/1 etc
	(b)		0.67 **oe**	1		
	(c)		0.58 or 0.36 + *their* '*p*' **oe**	2FT	**M1** for 1 – 0.42 or **FT** with *their* '*p*' **oe** If **0** scored **SC1** for 0.55 **oe**	
	(d)		353 or 354 or 350	2	**M1** for 842 × 0.42 or 353.64 or a rounding such as 800 × 0.4 or better	
9	(a)		10 $^{-2}$	2	**B1** for each	
	(b)		seven correct points correctly plotted and joined with a curve which must go below $y = {}^{-}2$	2	**B1** for 6 points correctly plotted (**FT** *their* 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 $^{-}0.4$ 3.4 to 3.7	1 1	If 0 scored **B1** for any correct point **FT** *their* graph (± 1mm) accept answers in the form (*x*, 2)	for **FT** the points must be joined If more than 2 values given -1 each error

Question			Answer	Marks	Guidance
10	(a)*		The response "No" supported by a fully correct calculation of the cost of the holiday. The figure 1895.2[0] is obtained from 980×2 + 50×2 [=2060]. The 8% reduction is made. Clear annotation and explanation of reasoning. Correct spelling, punctuation and grammar.	5	
			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 (**FT** incorrect reading from table).	4–3	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.
			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	One correct line from the method such as the figure 980 selected, *their* '980' doubled or the 8% discount correctly applied to *their* 'total'.
			No worthwhile work attempted.	0	

Example method;
980
980 + 50 (=1030)
1030 x 0.92 **oe** (=947.6[0])
947.6 x 2 (=1895.2[0])
No [since 1895.2 > 1850]

Question			Answer	Marks	Part Marks and Guidance	
10	(b)		1550	3	**M2** for 1643 ÷ 1.06 **oe** could be implied by **figs** 155 **or** **B1** for 106 or 1.06 **seen**	allow trial and improvement with **M1** for each of two correct trials
11			(x =) 6 (y =) $^-$2 with supporting algebraic working	4	this is one example: **M2** for × eq 1 by 4 and for × eq 2 by 3,or any pair of numbers which will eliminate a variable, allowing 1 error in each **or M1** for one equation multiplied with at most one error **M1FT** for adding or subtracting as appropriate to eliminate one variable, allow 1 error **A1** (x =) 6 (y =) $^-$2 if **0** scored allow **SC1** for the correct answers **seen**	accept any correct method eg × eq 1 by 3 and × eq 2 by 5 and subtract or use of substitution: **M1** for rearranging one equation eg $y = (24 – 5x) \div 3$ allow one error **M1FT** for correct substitution into the other equation eg $3x – 4\{(24 – 5x) \div 3\} = 26$ **M1FT** for rearranging to separating the variable and numbers eg $29x = 174$
12			Indicates AEC or 302.[11...] as the shortest distance with both correctly calculated	5	**B2** for AEC = $\sqrt{160^2 + 175^2}$ + 65 or 302.[11…] **or M1** for AE = $\sqrt{160^2 + 175^2}$ implied by 237.[11...] **and B2** for AFC = $\sqrt{240^2 + 110^2}$ + 50 or 314.[00...] **or M1** for AF = $\sqrt{240^2 + 110^2}$ or 264.[00...] if **0** scored then **SC1** for any 2D Pythagorean statement eg $x^2 = 240^2 \pm 160^2$	accept any correct method

Question			Answer	Marks	Part Marks and Guidance	
13	(a)		288	3	**B2** for 288 000 or **M1** for 60 × 60 × 80 implied by **figs** 288 **and** **M1** *their* '60 × 60 × 80' ÷ 1000	
	(b)		960	2	**B1** for 2^3 or 8 **seen**	
	(c)		86 or 87 or 86.5[34...]	3	**B1** for $\sqrt[3]{3}$ or 1.44[22...] **soi** **M1** for attempt to multiply any side by $\sqrt[3]{3}$ **or** **SC2** for 64.901... or 79.323... as the answer **rot** to at least 3 sf	
14	(a)	(i)	336.5	2	**M1** for (928 + 286 + 4 + 128) ÷ 4 or 344 + (128 – 158) ÷ 4 **or** **B1** for 336 or 337 as answer	
		(ii)	(a)(i) correctly plotted	1	correct or **FT** *their* (a)(i) tolerance: it must be in or on the boundary of the correct square	

Question			Answer	Marks	Part Marks and Guidance	
	(b)	**(i)**	Two relevant comments eg the greatest rainfall is in the first quarter, the least rainfall is in the third quarter	1 1	Mark the best comment and accept any correct statements for the variation amongst the quarters/seasons	condone winter for quarter 1, spring for quarter 2, summer for quarter 3, etc and mark best comment
		(ii)	the rainfall falls steadily/slightly over the three years	1	accept any correct statement for the general pattern in the moving averages	mark best comment
	(c)		902	2	**M1** for $330 \times 4 - 286 - 4 - 128$ or $\frac{x + 286 + 4 + 128}{4} = 330$ **oe**	
15			3.49[05...] or 3.5 or 3.491	3	**M2** for $5.8 \times \sin 37$ or any complete correct method **or** **M1** for $\sin 37 = \frac{AB}{5.8}$ or $\cos 53 = \frac{AB}{5.8}$ or $\frac{AB}{\sin 37} = \frac{5.8}{\sin 90}$ etc	accept explicit use of sine rule or 53° etc
16	**(a)**		4.705	1	condone 4.70499…	
	(b)		11.49[0]	2	**B1** for 6.785 or 6.78499… **seen**	condone 11.4899... for 2 marks
	(c)		2.07[00...]	2	**B1** for 4.705 or 4.70499… or 6.775 **seen** in this part	**nfww**
17	**(a)**		1 – 0.05 **oe**	1	accept any correct explanation which involves, or implies, subtraction from 1 or 100%	
	(b)		12349[.54…] or 12349.6 or 12350	1		

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th colspan="2">Part Marks and Guidance</th></tr>
<tr><td></td><td>(c)</td><td></td><td>Two correct attempts

2024 or 2025</td><td>M2

B1</td><td>M1 for one correct attempt beyond 2010 rot to at least 2sf

if 0 then SC1 for correct answer and no correct working

rot to at least 2sf means eg 7783.293 accept 7700, 7800, 7780, 7783, 7783.2, 7783.3 and condone 7790, 7784, etc</td><td>
<table>
<tr><td>10(0)</td><td>16800</td><td>18</td><td>11145.46</td></tr>
<tr><td>11(1)</td><td>15960</td><td>19</td><td>10588.19</td></tr>
<tr><td>12(2)</td><td>15162</td><td>20</td><td>10058.78</td></tr>
<tr><td>13(3)</td><td>14403.9</td><td>21</td><td>9555.842</td></tr>
<tr><td>14(4)</td><td>13683.71</td><td>22</td><td>9078.049</td></tr>
<tr><td>15(5)</td><td>12999.52</td><td>23</td><td>8624.147</td></tr>
<tr><td>16</td><td>12349.54</td><td>24</td><td>8192.94</td></tr>
<tr><td>17</td><td>11732.07</td><td>25</td><td>7783.293</td></tr>
</table>
</td></tr>
<tr><td>18</td><td></td><td></td><td>$^-1.85$, 0.18</td><td>3</td><td>M2 for $\frac{^-5 \pm \sqrt{5^2 - 4 \times 3 \times ^-1}}{2 \times 3}$ or
$\frac{-5 \pm \sqrt{37}}{2 \times 3}$ (allow one error) or one correct solution or both solutions to more than 2 dp
or
M1 for the formula with two errors or $^-1.8$ and 0.2 as answers with no working</td><td>Eg fuller solutions are $^-1.847127…$, 0.1804604…</td></tr>
<tr><td>19</td><td>(a)</td><td></td><td>$y = x^2 - 1$ oe</td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>$y = (x - 4)^2$ oe</td><td>1</td><td></td><td></td></tr>
<tr><td>20</td><td>(a)</td><td></td><td>B
F</td><td>1
1</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>32
148</td><td>1
1</td><td>if 0 scored SC1 for both angles adding to 180 or 32,148 together with any other angle(s) within range</td><td>ignore units and ignore angles outside the given range
condone an embedded answer or condone 32 seen</td></tr>
</table>

Question			Answer	Marks	Part Marks and Guidance	
21			$\frac{1}{2}$ and $-\frac{11}{10}$ **oe** with supporting algebraic manipulation	7	**B1** for $5(4x – 1) + 3(x + 2)$ **seen** **and** **M1FT** for expanding *their* single brackets (involving $x \pm 2$ and $4x \pm 1$) eg $20x – 5 + 3x + 6$, or better (allow one error) **B1** for $(x + 2)(4x – 1)$ as denominator or on RHS **seen** eg $5(x + 2)(4x – 1)$ **and** **M1FT** for expanding *their* double brackets eg $20x^2 + 40x – 5x – 10$ or $4x^2 + 8x – x – 2$, or better (allow one error) **M1FTdep** for forming *their* correct quadratic equation to equal 0 eg $20x^2 + 12x – 11 = 0$ **FT** their brackets provided that they form a quadratic equation **M1FTdep** for attempting to solve *their* quadratic equation eg $(2x – 1)(10x + 11)$ accept factors which satisfy two coefficients or any correct method, allow one error **A1** $\frac{1}{2}$ and $-\frac{11}{10}$ If **0** scored award **B1** for each correct answer	For the single brackets ignore any denominators The B1s can be implied by the correct expansion seen **Dep** on using both the two single brackets and the double bracket **Dep** on previous **M1**

APPENDIX 1

Exemplar responses for question 14(b)(i)

Response	Mark awarded
the greatest rainfall is in the first quarter	1
the rainfall is high in quarters 1 and 2	1
the first season shows high rainfall	1
The rainfall rises from autumn to winter	1
In the first quarter there is always more than 900mm	1
From quarter 1 to quarter 4 it continues to rain less where there is a small increase on quarter 3	1
Until the 3rd quarter rainfall falls rapidly	1
Rainfall rises from 3rd to 4th quarter or Rainfall rises from 3rd quarter	1
the least rainfall is in the third quarter	1
the rainfall is low in quarters 3 and 4	1
it drops in the third season	1
In the third quarter there is always less than 15mm	1
There is always more rainfall in winter than summer	1
There is less amounts of rainfall each year	1
There is less rain in summer	1
The rainfall decreases in the last two seasons of each year	0
Every season there is a large peak	0
It begins to lower towards the 4th quarter	0
In the spring the rain is heavy and then decreases to autumn	0

Exemplar responses for question 14(b)(ii)

Response	Mark awarded
Rainfall slightly dropping in all quarters in 2012 compared to previous years	1
The trend slightly increases and then decreases	1
the rainfall drops over the three years	1
starts off high before falling twice then increasing again	1
no sudden increases or decreases	1 BOD
Any comment only comparing quarters	0
highest in first quarter …..	0

Exemplar responses for question 17(a)

Response	Mark awarded
subtract 0.05 from 1	**1**
100 – 5	**1**
take 5% away from 1	**1**
As to find 5% less of the population you take 0.05 which is 5% as a decimal away from 1 which is 100% to find the rate of decrease in population	**1**
95% is a decrease of 5% (100% implied)	**1**
Because the population is decreasing by 5% each year so you times 16800 by 0.95 to get 95% of the original value	**1**
5% less than the original amount (not enough for 1 or 100)	**0**
Because 0.95 is the 5%	**0**
Because its 5% less	**0**
Because it represents the number of birds decreasing every year	**0**
is the percentage left after 5%	**0**

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