RECOGNISING ACHIEVEMENT

GCSE

Mathematics B (Linear)

General Certificate of Secondary Education

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

Mark Scheme for June 2012

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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
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).
   - **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. 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'.

7. 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).

8. 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.

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.

9. 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'. 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.

10. Ranges of answers given in the mark scheme are always inclusive.

11. 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.

12. 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)		[Regular] Octagon	1		Ignore spellings if clear in all parts
	(b)		Isosceles	1		
	(c)		Cylinder	1		Accept circular prism, but not prism
2	(a)		3	1		Condone embedded in all parts
	(b)		6	1		
	(c)		18	1		
	(d)		7	1		
3	(a)		1, 2, 3 or 6	1		Accept 1 x 6 or 2 x 3 (=6)
	(b)		Any 2 multiples of 50	1	ie two of 50,100,150,200 etc	
	(c)		23 or 29	1		If two answers both must be correct
4	(a)		Likely	1		
	(b)		Impossible	1		
	(c)		Evens	1		
5			Correct enlargement	3	**B2** for 2 or 3 correct lines Or **B1** for 1 correct line	Accept correct enlargement not using given line. Vertices to be within half a square.
6	(a)		30	1		

Question			Answer	Marks	Part Marks and Guidance	
	(b)		16000	1		
	(c)		41.75	2	**M1** for 41.748 or 41.74	
7	(a)	(i)	29	1		
		(ii)	Added 7	1		+ 7 may be seen on the diagram see appendix
	(b)		16	2	**M1** for 12 (from 6 × 2)	
8			Appropriate numbers on frequency axis	1	Scale on axis by grid lines not in gaps	Must be a linear scale, from zero to at least 23 (zero need not be labelled)
			Correct height bars [23, 18, 14, 11, 7, 4]	1	**FT** *their* scale if linear; tolerance less than half a unit - mark the intent; condone unruled if in tolerance	If scale is linear but does not start at zero, or is linear after the first square, **FT** heights [they will lose the mark for the scale] If no scale allow heights as shown by overlay
			Bars consistent width [and consistent gaps]	1		Condone no gaps between bars
9	(a)		0.4[0]	1		
	(b)	(i)	18	2	**M1** for 48 ÷ 8 implied by 6 or 144 ÷ 8	
		(ii)	35	1		
		(iii)	343	1		

Question			Answer	Marks	Part Marks and Guidance	
		(iv)	29.6	2	**M1** for [0].37 × 80 or figs 296	Non calculator methods: **M1** for a complete method leading to 37% Condone 1 arithmetic error
	(c)		77.08	3	**B2** for 16.92 Or **M2** for [0].82 × 94 Or **M1** for [0].18 × 94	Condone 77.08p Non calculator methods: **M2** for a complete method leading to 82%. Condone 1 arithmetic error Or **M1** for a complete method leading to 18%. Condone 1 arithmetic error
10	(a)		75	1		
	(b)		60	2	**M1** for 37.5 × 1.6	
11	(a)		¯3	1		
	(b)		3	1		
12	(a)		Correct reflection (2, 0) (4, 0) (2, ¯3)	1		In both parts accept unlabelled if clear
	(b)		Correct translation (¯3, 3) (¯3, 0) (¯1, 0)	2	**B1** for 5 left or 2 down	
13	(a)		8.5	2	**M1** for 16.5 or 8	**0** for 5.5 + 3
	(b)		$2y^2 - 5y$	1		
	(c)		5.2	2	**M1** for $20x = 100 + 4$ or better or complete correct inverse flow chart showing + 4 and ÷ 20	

Question	Answer	Marks	Guidance
14*	The correct final answer of` £147.96 is obtained with clearly expressed method showing all correct calculations: £1.37 × 4.5 =£6.165 [cost per gallon] 360 ÷ 15 = 24 [gallons needed] 24 × 6.165 Or 360 ÷ 15 = 24 [gallons needed]. 24 × 4.5 = 108 [litres needed]. 108 × 1.37 = 147.96 Or or 15 ÷ 4.5 = 3.333(…) [miles per litre] 360 × £1.37 = 493.2 493.2 ÷ 3.333 = 147.96 Or $\frac{360 \times 4.5 \times 1.37}{15}$ = 147.96 oe	5	If more than one method shown, mark to the candidates advantage. Some calculations may be done in parts. Method must be consistent
	Answer of £147.96 with incomplete working (soi). At least one relevant calculation must be shown. Or All calculations for their method attempted (soi) with one arithmetical error or premature rounding or truncating. Allow **FT** from calculation error.	4-3	Answer of £147.96 without working. (No relevant calculations shown)
	At least 2 relevant calculations attempted at least one correct from above or any 2 operations from the following string $\frac{360 \times 4.5 \times 1.37}{15}$	2-1	One correct relevant calculation attempted e.g. Finding the number of gallons needed or cost per gallon etc or any 1 operation from the following string $\frac{360 \times 4.5 \times 1.37}{15}$
	No worthwhile work attempted.	0	

Question			Answer	Marks	Part Marks and Guidance	
15	(a)	(i)	Radius	1		
		(ii)	X marked on circumference	1		Accept any letter if clear
	(b)		7.216 – 7.224 or 7.2	4	**B3** for 721600 – 722400 seen or 14.432 – 14.448 or 3.608 – 3.612 as answer Or **B2** for 205.67 – 205.86 or figs 72[…] OR **M1** for 65.5 × π oe implied by 206 **M1** for (*their* '65.5 × π' or 65.5) × 3509 **M1** for *their* '722062' ÷ 100 000 soi	Allow full marks for 7 with supporting working Take π as 3.14[2] or $\frac{22}{7}$ The **M**'s can be done in any order eg 65.5 × 3509 or 229839.5 scores **M1**
16	(a)		$^{-}4$ 2	1		
	(b)		Correct straight line (± 2mm of the points)	2	**M1** for four points correctly plotted **FT** *their* table (± 2mm)	Ignore additional parallel lines
	(c)		✖ where their straight line crosses the *x*-axis	1	If there is no line crossing the *x*-axis then accept a cross between *x* = 1 and *x* = 1.5 but not on the ends of this range	If they have drawn a 'curve' treat this as 'no line' so award the mark if there is a cross between *x* = 1 and *x* = 1.5

Question			Answer	Marks	Part Marks and Guidance	
17	(a)		[BT], BB, BW, TB, TT, TW, WT, WW, WB with no incorrect combinations	2	**B1** for 6 or more new combinations	Ignore further incorrect combinations or repeats for **B1**
	(b)		$\frac{15}{500}$ oe	2	Ignore incorrect cancelling or conversion **M1** for 15 out of 500 in words or incorrect form	If 'unlikely' or an incorrect form is given as well as $\frac{15}{500}$ then ignore. If 'word' contradicts max **M1**
	(c)	(i)	$\frac{1}{4}$ oe	1		Must be a fraction
		(ii)	13 380	1FT		
		(iii)	29 436 to 30031	3	Answer must be a whole number **B2** for non integer value in range 29 436 to 30031 OR **B1** for 198 – 202[°] or 55 – 56.1[%] **M1** for *their* $\frac{200}{360}$ × 53 520 oe	May be on diagram or implied Calculation may be in parts, eg 180 + 20
18	(a)		Fully correct net (5 more faces correctly placed), correct size	3	**B2** for 3 or 4 correct faces correctly placed, isw extra wrong pieces Or **B1** for 2 more correct faces correctly placed, isw extra wrong pieces If **0** scored, **SC1** for a net of a cuboid of incorrect size	Ignore extra flaps Tolerance 2mm by eye

Question			Answer	Marks	Part Marks and Guidance	
	(b)		9	4	**M3** for $\frac{12 \times 5 \times 3}{20}$ OR **B2** for 180 **M1** for 180 ÷ 20 OR **M1** for 12 × 5 × 3 **M1** for *their* '180' ÷ 20	9 must not be from wrong working **M3** for 4 × 5 × 9 = 180 as an embedded answer
19	(a)		2 × 2 × 2 × 3 × 5 × 5 oe	3	**M2** for 2, 2, 2, 3, 5, 5 or one factor missing or one replaced by another prime (ignore 1 in the list) Or **M1** for at least one of 2, 3, 5 identified as a factor of 600 nfww	These factors could be on a factor tree or with '+' or ',' instead of '×' for **M2** Allow full marks for correct answer seen in working unless contradicted
	(b)		16 20 or 4 20	3	**M2** for 80 OR **M1** for any multiple of 80 **M1dep** for *their* '80' added correctly to 1500 to give acceptable time OR **M1** for a list of 3 consecutive times with the correct gap(16 or 20) for one train **M1** for similar list for other train	15 80 or 3 80 as answer or 1620 in both lists imply **M2** Ignore any time embellishments eg am/pm, o'clock, h and min and preceding zeros
20	(a)		There is no "0" or no "16+" boxes/options	1	Allow any correct answer	Mark the best comment Do not accept 'other' See appendix

Question			Answer	Marks	Part Marks and Guidance	
	(b)		Suitable question and at least **four** boxes/table covering all possibilities (integers 0 – 12) with no overlap	2	eg "How many hours do you(the athletes) train at the week[end]?"with boxes for 0 - 3, 4 – 6, 7 – 9, over 9 **B1** for a suitable question <u>with</u> 3 boxes which cover all possibilities (integers 0 - 12) and have no overlapping numbers Or **B1** for a suitable question <u>and</u> at least 4 boxes which have one error, either they do not cover all possibilities up to 12 or they contain at least one overlap Or **B1** for no question/unsuitable question with at least **four** boxes/table covering all possibilities (integers 0 – 12) and have no overlapping numbers	We accept 12 as a sufficient maximum (can go over 12) The 'boxes' must include 0 and at the end have 'over *t*', '*t*+' or go to at least 12 Mark at least the first four boxes and ignore any further boxes if over 12 hours Accept 10 + or 'more than 10' as including 10 or not (we BOD it) whichever is in the candidate's interest and be generous in accepting inequality signs; <u>'other'</u> is insufficient but <u>'more'</u> is acceptable
	(c)		52.75 or 52.7 or 52.8 or 53	4	nfww **B1** for 3 midpoints seen from 43, 49, 55, 61 (condone 42.5, 48.5, 54.5, 60.5) or implied by 3 seen from 172, 588, 1045, 305 **M1** for attempting to multiply '*their* midpoint' by the frequency and adding them up or 2110 if seen (if their midpoints are wrong then check just two of their products) **M1 dep** for *their* '2110' ÷ *their* '40'	If they score **B0** then you can award both **M** marks if at least 3 of their "midpoints" used are from within the groups (including the ends eg 46)

Question			Answer	Marks	Part Marks and Guidance	
21			[t =] $\frac{v-u}{5}$ oe	2	**M1** for one correct step eg $v - u = 5t$ or $\frac{v}{5}=\frac{u}{5}+t$ oe or as answer: $\frac{v+u}{5}, v-\frac{u}{5}, \frac{u-v}{5}$, $\frac{v}{5}-u$, $v - u - 5$, $v - u \div 5$ or $(u - v)\div 5$	
22			6.87	4	**B3** for 6.86 [9…] or 6.9 nfww Or **M1** for [BC^2] = $18.8^{2\,-}17.5^2$ soi by 353.44 − 306.25 or 47.19 **M1 FT** for $\sqrt{47.19}$	**FT** *their* '$18.8^{2'}$ − *their* '17.5^{2}'

APPENDIX 1

Exemplar responses for Question 7aii

Response	**Mark awarded**
7n-6,	1
Add 7	1
+ 7	1
I added 7 to 22	1
Goes up 7	1
22 + 7 =29	1
Each term add 7	1
Because each term in the sequence increases by seven from the one before it	1
Worked out the difference between each of the numbers in the sequence **(Diagram has +7 between each pair)**	1
Because the rule of the sequence is plus seven	1
Because adds up 7	1 - this is the minimum
I found out it went up in 7s **so I added 7 to 29**	1 - mark best part if not contradictory
The sequence adds on 7 each time so with the 7 times table it subtracts 6 so 34 subtract 6 is 28	0 - contradictory
Gap of 7	0
Between each number there is a space of 7	0
Because the difference between all the numbers in the first 4 had 7 in between	0
Because if you work out the pattern in the sequence which is 7 you will find it	0
The sequence goes up in 7 times table	0
I counted how many numbers had been added between each number	0
Missed out 6	0
1**+7**=8 8+7=15 15+7=22 So 22+7 gives you the answer	1
1 **+ 7** = 8 8 + 7 = 15	1
X **+ 7** e.g.15 + 7 = 22, 22 + 7 = 29	1
8-1=7 15-8=7 22-15=7 **22+7=29**	1
First I took 1 from 8 = 7, **add 7** to 8 = 15 + another seven = 22	1
8-1=7 15-8=7 22-15=7 …**you must add 7**	1
8 -1 =7 22 – 15 = 7	0

Exemplar responses for Question 20a

Response	Mark awarded
Might have competed more than 16 times.	1
It only shows a maximum of 16	1
They should start from 0 and go past 16	1
There is only enough for 4 people to tick a box, **someone may have been in more than 16 competitions**	1 - mark best comment
She doesn't have a box saying 'more'	1
It doesn't have a plus sign at the end because someone might have entered more competitions	1
There isn't a more or less option	1
A person might not have entered any competitions	1
There isn't one saying non	1
There is no 0 option	1
There isn't competition every single month	0
The numbers on the box start going up in 4s then change to 3s	0
Her survey has got a box for entering more than 16	0
There is no 'other' box	0
Ticking one of the boxes if you for example had done 14 competitions, Jenny would Know actually how many had been done	0
It does have a none box	0
Needs more variety of options	0
There are not enough ticky boxes	0
By using the answers 1-4, 5-8 you don't know if it is 1,2,3,4 so the results are not accurate	0
It is not telling her the exact amount of competitions entered	0
The groups are too big the options should be in smaller groups	0
It is hard to judge how many competitions she has entered	0
Somebody could have done 4 to 5 competitions, but you can only tick one box	0
Not telling you what different athletes there is	0
People might not know…12 month range too long, should be 6 months	0
The question is biased	0
The ranges are too big	0
The last box 13-16 (it says 12 months)	0
It does not state what sport the competition is in	0

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