



GCSE

Mathematics B (Linear)

Component **J567/01**: Mathematics Paper 1 (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.

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

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

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.

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Question		Answer	Marks	Part marks and guidance	
1	(a)	right angle	1		
	(b) (i)	57	1	Accept 55 to 59	If answer space blank check diagram
	(ii)	6 or 60mm	1	Accept 5.8 to 6.2 Or 58mm to 62mm	If answer space blank check diagram
	(c)	Jake is correct as circumference is [distance] around the circle and perimeter [of triangle] is [distance] around the triangle	1	Or Statement referring to the triangle being inside the circle	See exemplars
2	(a)	30.60 or 3060 p(ence) clearly identified	2	Mark final answer M1 for $8.25 + 3 \times 7.45$ oe or 22.35 seen or figs 306	Accept [£]30.60p
	(b)	7.65	2	Mark final answer B1 for answer between 7.01 and 7.99 OR SC1 for answer of £8.65	Accept [£]7.65p
	(c)	16:05 (Screen 2 - finish) 1 hour 57 min (Screen 3 -length)	2	Both values correct Or B1 for each correct value	Accept 16.05 Accept 1h[our] 57[m]
3	(a) (i)	35	1		
	(ii)	145	1		
	(b) (i)	73	1		
	(ii)	34	2	M1 for $180 - (73+73)$ or '[angles in] triangle = 180' soi	

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Question			Answer	Marks	Part marks and guidance	
4	(a)	(i)	14	1		Allow 13
		(ii)	10	1		Allow 9 – 11
		(iii)	74	2	M1 for 37/50 soi	Allow 72 – 78 for 2 marks Allow 36/50 or 38/50 or 39/50 for M1 soi
		(iv)	Any correct statement Data used to support their statement	1 1	such as 'more men got higher wages than women' such as '52% of men earned more than £40 000 compared with 26% of women'	See exemplars Mark to candidates advantage, ignore incorrect statements unless contradictory.
	(b)	(i)	23 [000] nfw	2	M1 for putting at least 9 of the wages in order	15,16,16,16,22,23,23,25,27,34,61 Cover errors and check remaining wages for 9 in order
		(ii)	46 [000]	1		
		(iii)	16 [000]	1		
5	(a)		20	1		In all parts ignore any additional correct/incorrect terms
	(b)		96	1		
	(c)		19	1		

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Question		Answer	Marks	Part marks and guidance	
6	(a)	50	1		
	(b)	75	1		Allow 74 - 76
	(c)	9	1		Allow 8.5 – 9.5
	(d)	6	1		Allow 5 - 7
7	(a)	scalene	1		
	(b)	correct reflection	1		See overlay Condone freehand, mark clear intent
	(c)	correct reflection	2	B1 for one correct line or a translation of correct reflection	See overlay Condone freehand, mark clear intent
8	(a)	21	1		
	(b) (i)	0 or none or zero	1		
	(ii)	4	1		
	(iii)	56	3	B1 for identifying length 4 [cm] and M1 for $(7 + 3 + \textit{their 4}) \times 4$ oe	May be seen on diagram <i>Their 4</i> must be between 3 and 7

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Question			Answer	Marks	Part marks and guidance	
9	(a)	(i)	[0].75 final answer	1		
		(ii)	[0].21 final answer	1		
	(b)		[0].125	2	M1 for $0.625 \div 5$ soi or $0.625 - 0.5$ or answer x such that $0.1 < x < 0.15$	
10	(a)		51	2	M1 for 21 [from 3×7] seen or 30 [from 5×6] seen	Do not accept eg $21x$ for M1
		(b)	270	3	M1 for [£]60 [from 3×20] seen and B1 for [£]210 or 21000p seen Or M1 for $420 \times [0].5[0]$ oe soi	Accept equivalent answer in pence (clearly identified) Working in pounds
11	(a)	(i)	E[ast] or 090 (only)	1		Do not accept W[est] to E[ast]
		(ii)	860	2	Accept 820 to 900 M1 for 4.1[cm] to 4.5[cm] or 41[mm] to 45[mm] seen	May be on the diagram
	(b)		125	1	Accept 121 to 129	Condone 125 with S[outh] E[ast]

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Question		Answer	Marks	Part marks and guidance	
12	(a)	$\frac{2}{5}$ final answer	1		
	(b)	$3\frac{5}{6}$ final answer	1		
	(c)	$\frac{3}{4}$ $\frac{9}{10}$ $\frac{37}{40}$ $\frac{19}{20}$	2	<p>B1 for three of the given fractions in correct order (relative to one another) OR</p> <p>M1 for any correct conversion to get a common denominator for 2 fractions or 2 correctly converted decimals or percentages. OR</p> <p>SC1 for correct order reversed</p>	<p>Cover up the 1st error, the remaining 3 fractions must be in the correct order.</p> <p>Condone omission of % sign</p>
	(d)	$\frac{13}{14}$ oe	2	<p>M1 for $\frac{3}{7} = \frac{6}{14}$ or $\frac{1}{2} = \frac{7}{14}$ or two equivalent fractions with a common denominator where one numerator is correct</p>	<p>May be seen in the form eg $\frac{6+5}{14}$ scores M1</p>
13	(a)	30	1		Allow ± 30 but not -30 alone
	(b)	196	2	M1 for 14×14 oe	
	(c)	8	1		

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Question		Answer	Marks	Part marks and guidance													
14		Yes because $2800 > 2500$ or yes because $2.8 > 2.5$	4	B1 for 2.5 litres = 2500 [cm ³] soi or <i>their</i> 2800 [cm ³] = <i>their</i> 2.8 litres soi and B2 for 2800 or M1 for $14 \times 10 \times 20$	See exemplars Must come from attempt at volume												
15	(a)	(i)	1	Accept $\frac{7}{9}$ with ' [very] likely' on the answer line $\frac{7}{9}$ with 7 in (out of) 9 on the answer line	ISW Do not accept a ratio												
		(ii)	1	Do not accept 'impossible' or 'none' alone. Accept 0 with eg 'no chance' on the answer line 0 with 0 in (out of) 9 on the answer line	Do not accept a ratio Condone $\frac{0}{9}$												
	(b)	<table border="1"> <thead> <tr> <th></th> <th>Number of counters</th> <th>Probability</th> </tr> </thead> <tbody> <tr> <td>Red</td> <td>6</td> <td>$\frac{6}{30}$ oe</td> </tr> <tr> <td>Blue</td> <td>15</td> <td></td> </tr> <tr> <td>Yellow</td> <td></td> <td></td> </tr> </tbody> </table>		Number of counters	Probability	Red	6	$\frac{6}{30}$ oe	Blue	15		Yellow			3	All three values correct Or B1 for each correct value	ISW
	Number of counters	Probability															
Red	6	$\frac{6}{30}$ oe															
Blue	15																
Yellow																	

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Question			Answer	Marks	Part marks and guidance				
16	(a)	(i)	38	12	50	100	2	All four values correct B1 for two or three values correct	
			56	49	45	150			
			94	61	95	250			
		(ii)	2 : 3 or 1 : 1.5 or $\frac{2}{3} : 1$	2	M1 for 100 : 150 or better seen OR SC1 for 3 : 2 or 1.5 : 1 or $1 : \frac{2}{3}$	For 2 marks or SC1 do not ISW For M1 accept any equivalent, including fractions and decimals to 3sf or better			
		(iii)	$\frac{9}{50}$ final answer	2	M1 for $\frac{45}{250}$ oe fraction seen OR SC1 for <i>their</i> fraction seen written in simplest form	Accept eg $\frac{4.5}{25}$ as an equivalent Both simplified and unsimplified fractions seen			
	(b)		8 × 90 soi leading to 720 or 85 × 8 soi leading to 680	2	B1 for 8 and 90 used as an estimate Or 10 × 90 = 900 or 10 × 87 = 870 or 8 × 100 = 800 or 7.95 × 100 = 795 or 8 × 87 = 696	Accept rounding of 720 seen to 700 or 680 seen to 700 for 2 marks Condone 8 and 90 seen or 8 and 9 seen with answer 720 for 2 marks, and similarly for part marks 0 marks for calculation of 7.95 × 87			

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Question	Answer	Marks	Guidance
17*	<p>Statement that he should use voucher A (or 20% off deal) and the meal costs £45.50 with fully correct calculations showing correct discounts for both vouchers Calculations are clearly set out and annotated</p> <p>4A Correct conclusion of voucher A and meal cost £45.50 and £9.50 and £8.25 discounts without clear method Or 4B Statement that he should use voucher A without (or incorrect) final meal cost calculated but fully correct calculations showing £9.50 discount with A and £8.25 discount with B Or 4C Statement of voucher selected with total cost for meal with one or two arithmetic slips in calculations. Method is correct and clearly set out and annotated and voucher choice FT their figures 4D Meal cost £45.50 with A and £46.75 with B with fully correct calculations</p> <p>2A Correctly finds 20% of <i>their</i> total or 15% of <i>their</i> total without clear method Or 2B Correctly finds and identifies 10% of <i>their</i> total Or 2C [Total food =] £47.50 or [Total food + drink =] £55.00</p>	<p>5</p> <p>4-3</p> <p>2-1</p>	<p>Total food bill = £47.50 [Total drinks bill = £7.50] Total cost of meal = £55.00</p> <p>Voucher A: 20% of food bill = £9.50 or meal cost = £45.50 Voucher B: 15% of total bill = £8.25 or meal cost = £46.75</p> <p>Bigger discount with voucher A, total paid = £45.50</p> <p>For lower mark 3A Correct conclusion of voucher A without final meal cost calculated and £9.50 discount with A and £8.25 discount with B without clear method Or 3B Correct discount using voucher A or voucher B seen with clear method FT <i>their</i> total Or 3C Correct discounts using voucher A and B seen without clear method FT their totals</p> <p>For lower mark: 1A Attempts to find total for food or drinks or meal without discount Or 1B Correctly finds and identifies 10% of a cost</p>

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Question		Answer	Marks	Part Marks and Guidance	
18	(a)	5, 5	2	B1 for one correct Or M1 for $(-1)^2 - 4 \times (-1)$ or $5^2 - 4 \times 5$ seen	
	(b)	Correct smooth curve through all 7 correct points	2	B1 for at least 6 points plotted correctly FT their table	Use overlay Tolerance for plotting ± 1 mm Intention of correct smooth curve through correct points
	(c)	-0.7 to -0.5 and 4.5 to 4.7	2	B1 for each correct value or each correct value FT <i>their</i> parabola	Tolerance half small square
19	(a)	40° final answer	2	B1 for 140 or 40 seen or M1 for $360 \div 9$ oe	Eg $180 - 180 \times 7 \div 9$
	(b)	140°	1	Or FT 180 – <i>their</i> 40	FT <i>their</i> 40 if < 180

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Question	Answer	Marks	Part Marks and Guidance																								
20	7.5[0] Or 750p	4	<p>B1 for $2x$ and $x + 5$ seen AND M1 for $x + \textit{their } 2x + \textit{their } (x + 5) = 35$ seen AND M1 for $4x = 30$ FT <i>their</i> equation simplified to $ax = b$</p> <p>AND</p> <p>M1 for $x = \frac{b}{a}$ after $ax = b$ seen Max 3 marks if answer incorrect</p> <p>Alternative method B1 for any consistent set of values for A, D, E soi AND M1 for correct trial using Alex <£10, showing values of A, D, E with correct total for trial clearly linked AND M1 for a second correct trial, using Alex <£10, showing values of A, D, E with correct total for trial clearly linked</p> <p>Accept any letter used for x</p> <p>Equation must involve summation of terms for 3 children</p> <p>FT <i>their</i> linear equation = 35 involving summation of terms for at least 2 children</p> <p>$a \neq 1, b \neq 0$</p> <p>If names not linked with values, B1 may be implied by 3 correct values seen added to give correct total for trial. If names seen, total not required for B1</p> <table border="1" data-bbox="1608 847 2101 1054"> <thead> <tr> <th>Alex</th> <th>Dan</th> <th>Eva</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>10</td> <td>10</td> <td>25</td> </tr> <tr> <td>6</td> <td>12</td> <td>11</td> <td>29</td> </tr> <tr> <td>7</td> <td>14</td> <td>12</td> <td>33</td> </tr> <tr> <td>8</td> <td>16</td> <td>13</td> <td>37</td> </tr> <tr> <td>9</td> <td>18</td> <td>14</td> <td>41</td> </tr> </tbody> </table>	Alex	Dan	Eva	Total	5	10	10	25	6	12	11	29	7	14	12	33	8	16	13	37	9	18	14	41
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APPENDIX

Exemplar responses for Q1(c)

Response	Mark
Yes the triangle fits in the circle	1
Yes because the circle holds the triangle inside of its seft, so there for has a bigger circumference.	1
Jake is correct because the circle goes around the triangle.	1
Yes because the circumference is the hole circle and the triangle is in the circle	1
Yes because the triangles is inside the circumference and the perimeter is smaller than the circle	1
Yes because the triangle fits inside part of the circle	1
He's write because circumference have more cm than the perimeter of the triangle	1
He is correct, we know this because one of the sides of the triangle goes through the centre of the circle to form a diameter.	1
Jake is correct because the triangle just touches the circumference of the circle with each point of the triangle.	1
He is correct as the diameter of the circle is almost 7cm and the longest side of the triangle is the same – the circumference will be larger	1
Jake is correct because the circumference would be $\pi \times D = \pi \times 6.1$ but the perimeter of the triangle would be less as the longest side is less than 6.1	1
Yes the circumference of the circle (outside) is bigger the all the trangle side added up. Circle 360 trangle 180 We can ignore the incorrect statement alongside a correct statement	1
Jake is correct because if the perimeter of the triangle was bigger than the circumference it wouldn't be able to fit inside the circle	1
Yes the circumference is bigger than the perimeter	0
Yes because the triangle is smaller than half a circle	0
I agree because angles of a triangle only add up to 180, whereas the circumference of the circle is 360 °.	0
Jake is correct as a circle is 360 ° where the triangle is only 180°.	0
Yes he is correct because the circle has a larger area than the triangle	0
Jake is correct because the circumference is double the length of the diameter and the triangle is showing the diameter. Double the length is incorrect. Triple the length would be ok.	0
Jake is correct because there are more sides on the triangle to add up compared to the circumference.	0

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

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Telephone: 01223 553998

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Facsimile: 01223 552553

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