

GCSE

Methods in Mathematics (Pilot)

Unit **B391/01**: Foundation Tier

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 $180 \times (\textit{their} '37' + 16)$, 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.

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.

Question		Answer	Marks	Part marks and guidance	
1	(a)	158 929, 159 450, 159 700	1		
	(b)	0.358, 0.36, 0.4	1		
	(c)	$\frac{1}{4}, \frac{2}{3}, \frac{8}{9}$	1		Condone equivalents (rounded or truncated if in decimal format)
2	(a)	unlikely	1		
	(b)	impossible	1		
	(c)	likely or certain	1		
3	(a)	576	1		
	(b)	23	1		
4	(a)	2	1		
	(b)	21	1		
	(c)	8	2	M1 for $4x=37-5$ or $4 \times 8+5 = 37$ SC1 for answer 10.5	
5		$\frac{1}{2}$ oe fraction 0.1 $\frac{15}{100}$ oe fraction	1 1 1		$\frac{3}{20}$

Question			Answer	Marks	Part marks and guidance	
6	(a)		(1, 2)	1		
	(b)		(4, -1)	1		
	(c)		(3, 0)	1		
	(d)		Point (-2, 4) plotted	1		
7	(a)	(i)	4.5	1		Accept 4500m as long as units clear
		(ii)	1.8	1		Accept 1800m as long as units clear
		(iii)	4	1		
	(b)		22	2	B1 for indication of Mr Evans 16 eg statement or within equation	Eg $8 + 16 + \text{Faruk} = 46$
8	(a)		Correct reflection	2	B1 for 1 correct vertex	
	(b)	(i)	4	1		
		(ii)	8 triangles shaded to preserve symmetry	1		May have order 2 symmetry

Question	Answer	Marks	Part marks and guidance
9*	Shows (£)35 and (£)33 with some working for each and concludes that the family ticket or B is the cheapest way	4	<p>3 shows (£)35 and (£)33 with some working for each, but makes incorrect or no conclusion Or shows working for (£)35 and (£)33 making 1 numerical error but makes correct ft conclusion Or Shows 35 and 33 with no working and concludes B Or uses four pairs of skates throughout showing (£)38 and (£)36 with some working for each and concludes that the Special Offer or C is the cheapest way</p> <p>2 shows either (£)35 with some working or (£)33 with some working Or Shows 35 and 33 with no working and incorrect or no conclusion Or uses four pairs of skates throughout showing (£)38 and (£)36 with some working for each and incorrect or no conclusion</p> <p>1 attempts to show either (£)35 or (£)33 with clear working with 1 numerical error Or shows (£)3 or (£)33 or (£)35 Or uses four pairs of skates and shows (£)38 or (£)36</p> <p>May show (£)32 and discard this as greater than (£)30 as an alternative to showing (£)35 throughout these mark allocations</p> <p>The same error in (£)3 in both calculations will only count as 1 error as long as working clear</p> <p>Minimum working for A is 32+3</p> <p>And minimum working for B is 30+3 or 1.50 + 1.50 = 3 linked to B</p>

Question			Answer	Marks	Part marks and guidance	
10	(a)		B A D C	3	B2 for 2 correct connections B1 for 1 correct connection	See appendix for explanation and examples
	(b)		3 of square rectangle parallelogram rhombus	3	B2 for 2 correct B1 for 1 correct	If more than three answers given, mark as choice
11	(a)		$\frac{7}{25}$ oe	1		Penalise first time only for bad notation eg 7 in 25, 7 out of 25 etc Do not accept ratio In all parts isw attempts to cancel or turn into decimals or %
	(b)		$\frac{4}{25}$ oe	1		
	(c)		$\frac{14}{25}$ oe	1		
	(d)		$\frac{2}{25}$ oe	2	B1 for 2 on own or as numerator	
12	(a)	(i)	16 highlighted	2	B1 for 8 seen clearly linked to 2^3 or $\sqrt{64}$	
		(ii)	2^5 highlighted	2	B1 for 64 seen clearly linked to 8^2 or 4^3 or for 32 seen clearly linked to 2^5	
	(b)		x in numerator, x-3 in denominator	1		

Question			Answer	Marks	Part marks and guidance	
	(c)		Shows a number between 0 and 1 inclusive and correctly shows this value squared	2	B1 for showing a number between 0 and 1 inclusive [being squared] but the answer to their calculation is incorrect but positive and less than or equal to the number or omitted Or makes a general statement that a number between 0 and 1 squared will result in a smaller number	If multiple examples are given, where some are incorrect, a correct example must be highlighted or be the last example
13	(a)	(i)	0.06	1		
		(ii)	20	1		
	(b)	(i)	$1\frac{7}{15}$	2	M1 for $\frac{10}{15}$ and $\frac{12}{15}$ oe soi by $\frac{22}{15}$ oe	Condone error in one numerator
		(ii)	$1\frac{1}{8}$	2	M1 for $\frac{3}{2} \times \frac{3}{4}$ oe soi by $\frac{9}{8}$ oe	
14			Circles clearly indicated	1		
15			4	3	M2 for $\frac{1}{2}(6 + 5 + 6) \times h = 34$ oe Or M1 for $6 \times h$ or $\frac{1}{2} \times 5 \times h$ soi	

APPENDIX

Exemplar responses

Q10a There are 5 “connections” to be made by the dominoes but the nature of the question means that if you get 3 connections you must get the other 2. So the correct answer gets 3 marks, 2 correct connections gets 2 marks and 1 correct connection gets 1 mark. This may look rather generous in places but it gets over the issue that they could be working in either direction (or both). Below are all the combinations of dominoes showing each correct connection (^) and the mark.

Kite	$\wedge B \wedge A \wedge D \wedge C \wedge$	Sector	3	Kite	C	A	B	D	Sector	0
	$\wedge B \wedge A$	C	D		C	$A \wedge D$	B			1
	$\wedge B$	D	A	$C \wedge$		$B \wedge A \wedge D$				2
	$\wedge B$	D	$\wedge C$	A		C	B	D	A	0
	$\wedge B$	C	A	$\wedge D$		C	D	A	B	0
	$\wedge B$	C	D	A		C	D	$B \wedge A$		1

Kite	A	B	C	D	Sector	0	Kite	D	A	B	$C \wedge$	Sector	1
	A	B	$D \wedge$	$C \wedge$		2		D	A	C	B		0
	A	C	B	D		0		D	$B \wedge A$	$C \wedge$			2
	A	C	D	B		0		D	B	C	A		0
	$A \wedge D$	B	$C \wedge$			2		$D \wedge C$	A	B			1
	$A \wedge D \wedge C$	B				2		$D \wedge C$	$B \wedge A$				2

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