

GCSE

Methods in Mathematics (Pilot)

Unit **B391/02**: Higher Tier

General Certificate of Secondary Education

Mark Scheme for June 2014

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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. These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning
BP	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
✓	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

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 awarded for a correct final 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).
 - **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**.

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)	(i)	Ruled correct line over whole range – 2 to 4	3	± 1 small square at (–2, –7) and (4, 5). B2 for 3 or more correct points plotted with no wrong ones Or short ruled correct line B1 for two correct points plotted	Condone wrong points for B3 or B2, if correct line May be wrong ones as well
	(b)		0.4 to 0.6	1	Not eg (0.5, –2)	
2	(a)		–6	1		
	(b)		10	1		
	(c)		40 000 000	1	ISW attempt to change to standard form	
	(d)		900	1	ISW attempt to change to standard form	
3	(a)		$12f - 10g$ Final answer	2	B1 for one term seen	$12f + -10g$ scores B1 only
	(b)		y^7	1		
	(c)		m^6	1		
4	(a)		10 in $C \cap S'$ and 7 in $(C \cup S)'$	2	B1 for each SC1 for pair of numbers adding to 17	
	(b)	(i)	$\frac{3}{25}$ oe	1		–1 once for bad notation eg 3 in 25, 3 out of 25 etc In all parts ISW attempts to cancel or turn into decimals or %
		(ii)	$\frac{7}{25}$ oe	1	FT <i>their 7</i> and <i>their 25</i> from (i)	
		(iii)	$\frac{5}{25}$ oe	1	FT <i>their 25</i> from (i)	

Question		Answer	Marks	Part marks and guidance	
5	(a)	Should end in 2 or too many decimal places oe	1		Mark best if not contradictory E.g. there should only be 5 dp
	(b)	Should be more than 2 Or rough estimate eg 5 2.0344532 is bigger than 0.382 so the answer should be bigger than 1	1		Mark best if not contradictory Decimal can imply number less than one
	(c)	(i)	58368000	1	
		(ii)	0.00567	1	Not eg 0.005670
6	(a)	Correct translation (2, 0), (3, 0), (2, -2)	2	B1 for x or y movement correct or translation through $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$	
	(b)	(i)	3	1	Condone 3x or x3 as '3 times'
		(ii)	$y = x$	2	B1 for correct enlargement (3, 3), (3, 9), (6, 9)

Question		Answer	Marks	Part marks and guidance	
7	(a)	$2 \times 2 \times 3 \times 5$ or $2^2 \times 3 \times 5$	2	M1 for two steps in a factor ladder or two correct factor pairs in a factor tree	Soi by 2, 3, 5 clearly identified as prime factors Or $(10 \times 3 \times 2)$, $(2 \times 2 \times 15)$ $(5 \times 6 \times 2)$, $(5 \times 3 \times 4)$
	(b)*	5 by 3 by 4 and 94 as answer with 3 other shapes and all correct SAs with no extras	6	<p>$[10 \times 3 \times 2]$ 112; $2 \times 2 \times 15$ 128 $5 \times 6 \times 2$ 104; $5 \times 3 \times 4$ 94</p> <p>B5 for all correct but with extras Or for 5 by 3 by 4 and 94 as answer with 3 other correct shapes and 3 SAs Or all correct but answer not clear</p> <p>B4 for 3 other correct shapes and 2 or 3SAs Or 2 other correct shapes and 3 SAs</p> <p>B3 for answer of 5 by 3 by 4 and 94 Or 3 other correct shapes and 1SA Or 2 other correct shapes and 1 or 2 SAs Or 1 other correct shape and 2 SAs</p> <p>B2 for 3 or 2 other correct shapes and 0 SAs Or 1 SA</p> <p>B1 for 1 other correct shape Or correct full method for SA seen</p>	<p>For extra shapes allow drawing or dimensions. For 6 marks, allow repeats only if no wrong SAs with them. Ignore extras that are deleted or have X next to them.</p> <p>For 5 or fewer marks condone extras just mark correct ones.</p>

Question			Answer	Marks	Part marks and guidance	
8	(a)	(i)	$3(2x + 3)$ Final answer	1		Condone missing final bracket
		(ii)	$a(2x + 3)$ Final answer	1		Condone missing final bracket
	(b)		$(3 + a)(2x + 3)$ Final answer	2	B1 for $(2x + 3)(A + B)$ or $A(2x + 3) + B(2x + 3)$ or Eg $3 + a(2x + 3)$	A, B any single number or term ie one factor bracketed or $3 + a(2x + 3)$
9	(a)		$\frac{5}{6}$ oe Final answer	2	B1 for $\frac{3}{6} + \frac{2}{6}$ oe	Accept 0.8 $\dot{3}$ or with a bar or 'r'
	(b)		1.2 h or $1\frac{1}{5}$ h or 1h 12 min	2	M1 for $1 \div$ their (a) or for 1 hour = <i>their</i> $\frac{5}{6}$ trench	
10	(a)		7.2×10^{11}	2	B1 for $a \times 10^{11}$ or figs 72	$1 < a < 10$
	(b)		8×10^{-4}	2	B1 for 0.8×10^{-3} or 0.0008	
11			$4\sqrt{3}$ Final answer	2	B1 for $x \frac{\sqrt{3}}{\sqrt{3}}$ soi by $\frac{12\sqrt{3}}{3}$ or $\frac{4\sqrt{3}}{1}$	
12	(a)		4	1		
	(b)	(i)	$\frac{6}{8}, \frac{1}{7}, \frac{6}{7}, \frac{2}{7}, \frac{5}{7}$ positioned correctly	2	B1 for any 3 of these correct	
		(ii)	$\frac{24}{56}$ oe nfw	3	M2 FT for $\frac{2}{8} \times \frac{6}{7} + \frac{6}{8} \times \frac{2}{7}$ oe M1 FT for one of above products oe	ISW attempt to cancel or turn into decimals or %

Question		Answer	Marks	Part marks and guidance	
13	(a)	$\frac{1}{2}(180 - x)$ and isos triangle Tangents are equal or tangents from a point	1 1	Alternative method B1 for angle between <u>radius</u> and <u>tangent</u> B1 for \square POQ = $180 - x$ and $\frac{1}{2}[180 - (180 - x)]$ and isos triangle OR for \square POT = $90 - \frac{1}{2}x$ and symmetry and \square OPQ = $90 - (90 - \frac{1}{2}x)$	May have angle sum of triangle as well
	(b)	\square OPQ = $\frac{1}{2}x$ Angle between <u>radius</u> and <u>tangent</u> \square POQ = $180 - x$ and isos triangle or \square POT = $90 - \frac{1}{2}x$ and TO is line of symmetry for TPOQ and \square POQ = $180 - x$ \square PRQ = $90 - \frac{1}{2}x$ and angle at circumference = $\frac{1}{2}$ angle at centre	1 1 1 1	Alternative method 1 B2 for \square POQ = $180 - x$ and opposite angles of cyclic quad or angle sum of quad'l B1 for Angle between <u>radius</u> and <u>tangent</u> B1 for \square PRQ = $90 - \frac{1}{2}x$ and angle at circumference = $\frac{1}{2}$ angle at centre Alternative method 2 B2 for \square PTO = $\frac{1}{2}x$ \square POT = $90 - \frac{1}{2}x$ and TO is line of symmetry for TPOQ and \square POQ = $180 - x$ B1 for Angle between <u>radius</u> and <u>tangent</u> B1 for \square PRQ = $90 - \frac{1}{2}x$ and angle at circumference = $\frac{1}{2}$ angle at centre	All must be seen in (b)

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