

GCSE

Mathematics A

Unit **A502/02**: Mathematics B (Higher Tier) Paper 4

General Certificate of Secondary Education

Mark Scheme for November 2016

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

© OCR 2016

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

- 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.

- 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 $3 \times \textit{their} (a)$.

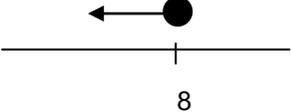
For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

- 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).
- **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 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.
- 9 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.
- 10 If the correct answer is seen in the body of working
- 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.
 - but the answer space is blank, allow full marks. Place the annotation ✓ next to the correct answer.
 - but a completely different answer is seen in the answer space, 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.
- 11 Ranges of answers given in the mark scheme are always inclusive.
- 12 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.
- 13 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 9	(a)	(i)	6 points correctly plotted	2	B1 for 4 or 5 correct	Tolerance 2mm Ignore any joining lines
		(ii)	[Increases], decreases then increases [decreases]	1		Ignore extra detail provided it doesn't contradict
	(b)		9 peaks $100 \div 9$ or $100 \div 10$ 11[.1..] or 10 which is approx 11	B1 M1 A1	soi by correct calculation	10 scores B0 'Each line =5 and there's a peak every 2 lines' B1
2	(a)		$x \leq 8$	2	M1 for $5x \leq 33 + 7$ or better or $[x =] 8$ nfw or $x < 8$ or $x > 8$ or $x \geq 8$	
	(b)			FT2	FT their 8 for 1 or 2 marks Arrow extending at least to 5 Or B1 if hollow (or ambiguous) circle	

Question		Answer	Marks	Part Marks and Guidance	
3 11	(a)	$\frac{1}{2}$ $\frac{5}{8}$ $\frac{3}{4}$ $1\frac{1}{4}$ oe	3	M1 for attempt to change to a common form and A1 for 2 or more fractions correctly converted If 0 scored SC1 for $\frac{1}{2}$ as smallest and $1\frac{1}{4}$ as largest or for 3 in correct order or for correct order reversed	eg common denominator, decimal, percentages
	(b) (i)	3.142 857	1	Allow 'Jewish'	
	(ii)	0.0016	2	B1 for 0.001593 or 0.00159 or figs 16	
	(c)	T R R T	3	B2 for 3 correct B1 for 2 correct	
4	(a) (i)	$\begin{pmatrix} -6 \\ 4 \end{pmatrix}$	2	B1 for one component correct or for correct answer with poor notation or for $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$	eg 'fraction' line
	(ii)	Correct image	2	B1 for correct reflection in $y = 1$	Condone freehand Mark intention
	(b)	[Rotation:] 180° about origin [Enlargement:] SF=-1, (centre) origin Or Rotation: 360° about origin Enlargement: SF=1, (centre) origin	3	B1 for 180 and B1 for sf -1 or B1 for 360 and B1 for sf 1 Could be any other centre used in both descriptions	Must have both centres stated for 3 marks

Question		Answer	Marks	Part Marks and Guidance	
6		eg $6\sqrt{\frac{5}{10}} = 6\sqrt{0.5}$ $= 6\sqrt{0.49}$ $= 6 \times 0.7$ $= 4.2$ with all steps clear	4	B2 for all three numbers rounded to 1 sf or B1 for 1 number rounded to 1 sf and M1 for dealing with the root	These do not have to be part of a single calculation Also eg for 4 marks $\frac{6}{\sqrt{2}} = \frac{6}{1.5}$ $= 4$ Allow full marks for a full valid method leading to an answer between 4 and 6
7		2.4	3	M2 for $\frac{6 \times 0.8}{2}$ or better or M1 for one correct ratio such as $\frac{6}{2}$ or $\frac{2}{0.8}$ etc	
8	(a)	-2	2	M1 for change in y /change in x used Or SC1 for 2 or $-\frac{1}{2}$	
	(b)	$y = (\text{their } -2)x + 3$ oe	2FT	B1 for $y = mx + 3$ or $y = (\text{their } -2)x + c$ or $(\text{their } -2)x + 3$ oe	Any m or c (inc 0)
	(c)	$y = -1/(\text{their } -2)x + 3$ oe	2FT	B1 for $= -1/(\text{their } -2)$ oe	

Question		Answer	Marks	Part Marks and Guidance	
9	(a)	$8x + 6\left(-4x - \frac{1}{2}\right) = 17$ $[8x - 24x - 3 = 17$ $-16x = 20]$ $x = -1\frac{1}{4}$ $y = 4\frac{1}{2}$	<p>M1</p> <p>A1</p> <p>A1</p>	<p>For substitution</p> <p>Or</p> <p>M1 for rearranging to get coeffs of either x or y equal</p> <p>A marks as above</p>	<p>Allow 1 error</p> <p>Allow 1 error eg $24x + 6y = -3$ or $8x + 2y = -1$</p> <p>Ignore further incorrect cancelling and/or sign change after a correct answer seen</p>
	(b)	<p>Correct line</p> <p>Correct conclusion about points of intersection relating to their (a)</p>	<p>2</p> <p>1FT</p>	<p>B1 for 2 correct points in table or on graph</p>	<p>Overlay available</p> <p>Dependent on at least B1</p>
10	(a)	$\frac{1}{2}(\mathbf{c} - \mathbf{a})$	1	oe	
	(b) (i)	$(\mathbf{b} - \mathbf{a})$	1		
	(ii)	$(\mathbf{c} - \mathbf{b})$	1	oe	
	(c)	$\frac{1}{2}(\mathbf{b} - \mathbf{a}) + \frac{1}{2}(\mathbf{c} - \mathbf{b})$	1 4	oe	

Question		Answer	Marks	Part Marks and Guidance	
11	(a)	6	1		Condone ± 6 but not -6
	(b)	$\frac{1}{2}$ or 0.5	3	B2 for 2 or -2 or $\frac{1}{8}$ or $-\frac{1}{8}$ Or B1 for 8 or -8 If 0 scored, SC1 for $\frac{1}{4}$ oe as final answer	
	(c)	$5\sqrt{2}$	2	M1 for $\frac{10}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ or better	

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

OCR Customer Contact Centre

Education and Learning

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2016

