

Mathematics B (MEI)

General Certificate of Secondary Education

Unit **B293**: Paper 3 (Higher – Modular)

Mark Scheme for January 2012

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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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Annotations

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.

M (method) marks are not lost for purely numerical errors.

A (accuracy) marks 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.

- 1 The following abbreviations are commonly found in GCSE Mathematics mark schemes.
 - i. Where you see **oe** in the mark scheme it means **or equivalent**.
 - ii. Where you see **cao** in the mark scheme it means **correct answer only**.
 - iii. Where you see **soi** in the mark scheme it means **seen or implied**.
 - iv. Where you see **nfw** in the mark scheme it means **not from wrong working**.
 - v. Where you see **rot** in the mark scheme it means **rounded or truncated**.
 - vi. Where you see **seen** in the mark scheme it 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.

- vii. Where you see **figs 237**, for example, this means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point e.g. 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
- 2 Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
 - 3 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).
 - 4 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.
 - 5 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.
 - 6 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'. If the answer is missing, but the correct answer is seen in the body allow full marks. If the correct answer is seen in 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.
 - 7 Ranges of answers given in the mark scheme are always inclusive.
 - 8 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.
 - 9 Where a follow through mark is indicated on the mark scheme for a particular part question, you must ensure that you refer back to the answer of the previous part question if this is not shown within the image zone. You may find it easier to mark follow through questions candidate by candidate rather than question by question by question.
 - 10 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.

Section A

Question		Answer	Marks	Part Marks and Guidance	
1	(a)	120 or 130	2	M1 for sight of two of 60, 100 (or 110) or 50 Allow $\frac{60 \times 110}{50} = 12 \times 11 = 132$	This means 0 for no approximations shown even if answer is correct
	(b)	5	2	M1 for $\frac{35}{8} > 4$	
2		£150 and £350	3	M1 for evidence of dividing by 10 A1 for one answer	
3	(a)	Correct shape	2	B1 one vertex or one length wrong	
	(b)	160	3	M1 split into rectangle and triangle M1 mult by 10	
4	(a)	Because of the regular peaks and troughs	1	Must have something indicating consistency of peaks and troughs year on year - ie mention of seasons	
	(b)	A slight increase in sales for each quarter	1	A comment comparing year by year	
5	(a)	1	3	M1 for collecting terms A1 for $5x$ or 5	
	(b)	$3x - 15$ ($= 3(x - 5)$)	3	M1 for removing brackets B1 for $3x$ or 15	
6		$3\sqrt{2}$	3	M1 for sight of Pythagoras A1 for $d^2 = 72$ or $r^2 = 18$	Alt: B1 for centre (2, 3) M1 for Pythagoras

Question		Answer	Marks	Part Marks and Guidance
7	(a)	$x = 4, y = 3$	3	M1 for substituting or multiplying to get one coefficient the same A1 for correct equation in one variable SC1 Correct answer but no algebra
	(b)	Correct lines through (4, 3)	3	B1 for one line correct B1 for one line with +ve gradient and one with -ve gradient
8	(a)	<p>Add with common denominator:</p> $= \frac{n \times n}{n(n-1)} - \frac{(n+1)(n-1)}{n(n-1)}$ $= \frac{n^2 - (n^2 - 1)}{n(n-1)} \quad \text{or} \quad \frac{n^2 - (n-1)(n+1)}{n(n-1)}$ <p>Collect terms in numerator:</p> $= \frac{1}{n(n-1)}$	4	M1 A1 M1 A1
	(b)	<p>Multiply out: $n(n-1) = 2$</p> $\Rightarrow n^2 - n - 2 = 0$ $\Rightarrow n = -1, 2$	3	M1 M1 Solve by any means A1 Both values

Section B

Question		Answer	Marks	Part Marks and Guidance	
9		£4257	3	M2 for 7095×0.6 oe M1 for 7095×0.4 oe OR B1 for 0.6 or 0.4 used	oe means also mult by 0.4 and subtracting
10		0.31	2	M1 for sight of adding and subtracting from 1.	
11		27.9	4	B2 for 14.1 nfw OR B1 for 28.3 nfw OR M1 Area of semicircle $= \frac{1}{2} \pi \times 3^2$ soi And M1 for subtracting <i>their</i> area of semicircle from 42 SC3 for $42 - 28.3 = 13.7$	Accept anything that rounds to 27.9
12	(a)	(215984) anything that corrects to 216 000	2	M1 for sight of correct formula	
	(b)	Anything that corrects to 216	1		ft
	(c)	Depth of water = 0.771 cm Time = 51 mins	2 2	M1 for dividing <i>their</i> (a) by (700×400) M1 for dividing <i>their</i> depth by 0.9	Alt: $700 \times 400 \times 0.9 = 252\,000$ M1 A1 <i>Their</i> (a) / this ans and mult by 60 M1 A1

Question		Answer	Marks	Part Marks and Guidance	
13	(a)	3.14085 and 3.14286 3.14	M1 A1	For both fractions as decimals correct to at least 4 dp	
	(b)	(i) 2.89523 (ii) 3.33968	1 1	Condone 6 dp Condone 6 dp	
14		- 1, 0, 1, 2, 3, 4	3	B2 all 6 plus one extra B1 omit 0 and no extras SC2 $2 < n < 4.5$ SC1 for $2 < n$ or $n < 4.5$ soi	
15	(a)	$f(1) = -3, f(2) = 7$	1		
	(b)	Root between 1.4 and 1.5 $f(1.45) > 0$ giving $x = 1.4$	2	B1 seen by $f(1.4) < 0, f(1.5) > 0$ or better B1 seen by $f(1.45) > 0$ or better	$F(1.4) = -0.056$ $F(1.5) = 0.857$ $F(1.45) = 0.399$
16	(a)	Yes. Details of survey not related to order of school list.	2	B1 For answer with some attempt at justification B1	
	(b)	Divide the number of students in a year group by 10 Then take a random sample	2	B1 B1 SC1 divide 60 by number of year groups	

Question		Answer	Marks	Part Marks and Guidance
	(c)	2.8 (3)	4	B1 for taking midpoints M1 for $0.5 \times 3 + 1.5 \times 13 + \dots$ M1 for dividing by 60 SC3 for 2.33 or 3.33
17		$\frac{2}{3}$	2	B1 for sight of 60

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