

**Mathematics B (MEI)**

General Certificate of Secondary Education

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

**Mark Scheme for June 2011**

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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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**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 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.
  - **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**.

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 and the answer given in the answer space is a clear transcription error allow full marks unless the
  - (i) mark scheme says 'mark final answer' or 'cao'. Place the annotation ✓ next to the correct answer.
  - (ii) 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.
  - (iii) 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.
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	
5	(a)	$3\frac{9}{10}$	3	M1 for 1 cm(10) seen A1 for $\frac{9}{10}$ seen oe	
	(b)	$3\frac{1}{2}$	3	M1 for attempt to turn into improper fractions A1 for $\frac{5}{2}$ and $\frac{7}{5}$ seen	
6	(a)	11	3	M1 Multiply out or collect A1 $3x - 12 = 21$ or $x - 4 = 7$	
	(b)	24	2	M1 Multiply out or collect giving $\frac{x}{4} = 6$ or $x - 4 = 20$	
7	(a)	72	3	M1 for evidence of frequency density, ie half middle values or double last M1 (dep) Add	SC2 for 720 nfw
	(b)	$\frac{5}{18}$ oe	2	M1 $20 \div$ their (a)	$\frac{200}{720}$ is OK
8	(a)	(i) $\frac{1}{8}$ or 0.125	1		
		(ii) 1	1		
	(b)	8	1		Accept $10^8$
	(c)	$4.9 \times 10^{-4}$	1		

Section A Total: 36

## Section B

Question		Answer	Marks	Part marks and guidance	
9		Constant speed at beginning or end slows down then speeds up Then slows down	<b>B1</b> <b>B1</b> <b>B1</b>	Accept acceleration for speeds up and deceleration for slows down oe	
10	(a)	18.85 isw	2	<b>M1</b> for substitution in formula	Accept 18.8(4) but not 18.9
	(b)	28.27	2	<b>M1</b> for substitution into formula	Accept 28.3 but not 28.2
11	(a)	284	1		
	(b)	$C = \frac{5}{9}(F - 32)$	3	<b>M1</b> $F - 32 = \frac{9}{5}C$ or $5F = 9C + 160$ <b>M1</b> $9C = 5F - 160$ or $9C = 5(F - 32)$ <b>SC1</b> for $\frac{5}{9}F$ or $kF - 32$	Accept $C = \frac{F - 32}{\frac{9}{5}}$ or $C = \frac{F - 32}{1.8}$ 3 marks Or: <b>SC2</b> $C = \frac{F + 32}{\frac{9}{5}}$ or $C = F - 32 \div \frac{9}{5}$ or $C = \frac{5F}{9} - 32$
	(c)	175 or 177 or 176. (6....)	1		
12	(a)	499	1		
	(b)	203.7	4	<b>M1</b> Use of midpoints 50.5, 150.5 etc <b>M1</b> for sum of $xf$ , 4242, 15351, etc <b>A1</b> for sum: 73330 soi	<b>SC M1</b> Use of midpoints 50, 150 etc <b>M1</b> for sum of $xf$ , 4200, 15300, etc <b>A1</b> for sum: 73150 (A0 ans) ( <b>SC3</b> for 203 nfw)
	(c)	Because we do not know exact values and so use midpoint	1	Reference to both required. "Midpoint" must be seen)	

Question		Answer	Marks	Part marks and guidance	
	(d)	Mean up ( or total up or more per day oe) Range up (maximum number up oe)	<b>B1</b> <b>B1</b>		
13		AC = 520  Seth: $\frac{520}{1000} \times \frac{60}{2} = 15.6$  Ruth: $\frac{680}{1000} \times \frac{60}{3} = 13.6$ So Ruth by 2 minutes	<b>2</b>  <b>4</b>	<b>M1</b> for Pythagoras soi  <b>M1</b> for working out time <b>A1</b> for one of the times (in hrs or mins) <b>A1</b> for other time (in hrs or mins)  Accept 2.04 or better	le dist/speed – ignore units  Accept 0.226 hrs or better  This statement must be seen
14	(a)	Choose numbers $n-2, n-1, n, n+1, n+2$ Add to give $5n$ Therefore is a multiple of 5	<b>3</b>	<b>M1</b> for choosing correct set and adding <b>A1</b> . May need justification by factorisation or explanation.	Allow any sequence of 5 consec numbers, eg $n, n+1$ , etc Leading to correct conclusion
	(b)	Any correct example eg $1 + 2 + 3 + 4 = 10$ which is not a multiple of 4.	<b>1</b>	Must include words “and this is not a multiple of 4” oe	Eg $4n - 2$ is not a multiple of 4 is ok
15	(a)	Major arc = $2\pi \times 21 \times \frac{300}{360} = 35\pi (= 109.95)$  $2\pi r = 35\pi \Rightarrow r = \frac{35\pi}{2\pi} = 17.5$	<b>3</b>	<b>M1</b> major arc <b>M1</b> formula to find $r$	Allow arithmetic calculation that results in 17.50 or 17.51 to 4sf



Question		Answer	Marks	Part marks and guidance	
	(b)	Height of cone is given by $h^2 = 21^2 - r^2$ $= 134.75$ $\Rightarrow h = 11.61$ $\Rightarrow V = \frac{1}{3}\pi r^2 h = 3722.79 = 3723$ or 3730	3	<b>M1</b> for use of Pythagoras to find $h$  <b>M1</b> for volume using $r = 17.5$ and <i>their</i> $h$ from Pythagoras or 21	

Section B Total: 36

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