

**Methods in Mathematics (Pilot)**

General Certificate of Secondary Education

Unit **B392/01**: Foundation Tier

**Mark Scheme for November 2013**

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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 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 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.
- 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  $180 \times (\textit{their} \text{'37'} + 16)$ , or FT  $300 - \sqrt{(\textit{their} \text{'5}^2 + 7^2)}$ . 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 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.
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	(a)	Churchill Arms 95 Royal 100	1 1	If 0 scored, allow B1 for Churchill Arms and Royal correctly identified or evidence of any 2 from G 99, R 100, CA 95.	
	(b)	Royal 200 Churchill Arms 214	1 1	If 0 scored, allow B1 for Royal and Churchill Arms correctly identified from 2 nights or evidence of any 2 from G 206, R 200, CA 214	
2	(a)	[a = ] 62 [b = ] 118	2 2	M1 for $180 - 54 - 64$ M1 for $54 + 64$ or $180 - \text{their (a)}$ A1 for 118 or FT $180 - \text{their (a)}$	64 and 116 scores 0 2
	(b)	[c = ] 121	2	M1 for $<ABC = 59$ or $c = 180 - 59$	
3	(a)	2184	1		
	(b)	9.2	1		
	(c)	1.728	1		
4	(a)	2 rectangles shaded	1		
	(b)	£42	1		
	(c)	48	2	M1 for $\frac{1}{4}$ used or $\times 4$ implied	Allow M1 for answer 3

Question		Answer	Marks	Part marks and guidance	
5	(a)	(-4,2) (0,5) (4,2) joined	2	M1 for 2 points correct	
	(b)	Isosceles	1		
	(c)	(2, 3.5)	2	M1 for either coordinate correct FT their BC for 1 or 2 marks	
	(d)	12	2	M1 for rectangle 24 or $8 \times 3$ FT their triangle for 1 or 2 marks	
6	(a) (i)	7	1		
	(ii)	16	1		
	(b) (i)	18	1		
	(ii)	20	2	M1 for 25	
7	(a) (i)	229	1		
	(ii)	0.5 or $\frac{1}{2}$ oe	1		
	(iii)	2700	1		
	(b) (i)	0.15	1		
	(ii)	Two equivalent fractions eg $\frac{6}{40}$ $\frac{30}{200}$	2	B1 for each	
8	(a)	Tessellation using minimum 8 shapes	2	M1 for 4 shapes correct or 8 shapes with no gaps	
	(b)	10	1		

Question		Answer	Marks	Part marks and guidance	
	(c)	B correct	3	M2 for enlargement SF2 attempted or 6 lengths correct or M1 for shape with perimeter 20 cm	
	(d)	Area A 4[cm <sup>2</sup> ] Area B 16 [cm <sup>2</sup> ]	1 1	Allow FT of <i>their</i> B if B ≠ 4×A stated	
9	(a)	(i)	1 1	If 0 scored, M1 for 8+16=24 and 24+32=56 or double 12=24 and double 28=56	
		(ii)	M1 A1		
	(b)	(i)	2	M1 for $n + 2$	
		(ii)	1 1 1	$n + n + 8 = 2(n + 4)$ scores 1 1 0 $n + n + 8 = 2n + 8$ $2(n + 4) = 2n + 8$ scores 1 1 1  FT for 3 marks from algebraic expressions in part (i) using consecutive numbers  FT for 1 mark from other algebraic expressions in (i)	eg $n, n+1, n+2, n+3, n+4$ then part (ii) $n + n + 4 [= 2n + 4]$ $2(n + 2)$ $= 2n + 4$ Scores 1 1 1  Eg (i) $n n^3 n^5 n^7 n^9$ then (ii) $n + n^9 = n^{10} n^{10} \div 2 = n^5$ scores 1 0 0



Question		Answer	Marks	Part marks and guidance	
10	(a)	9 16 25	2	M1 for any two correct	Allow 16, 25, 36 for M1
	(b)	Correct possible expression with at least 5 terms of sequence eg $3n - 2$ and 1, 4, 7, 10, 13	3	M2 for <i>their</i> sequence with rule described eg 1 4 5 9 14 and eg $1 + 4 = 5$ or eg 1 4 7 10 13 with '+3' or M1 for 3 extra terms of acceptable sequence	Condone $n + 3$ for '+3'
11	(a)	(10, 1200) and (50,6000) plotted and joined	2	M1 for 2 points plotted or straight line through (50, 6000)	Line through points implies plotting
	(b)	$120x$	1	Allow eg $2 \times 60 \times x$	
	(c)	125	2	M1 for 15000 substituted in formula or readings from eg $y = 7000$ and $y = 8000$ . A1 for 120 to 130 if fully supported by readings from graph	
12	(a)	* Explanation eg $\frac{1}{4} = 0.25$ , $\frac{1}{2} = 0.5$ , $\frac{1}{3} = 0.33$ closer to $\frac{1}{4}$	2	For 2 marks accept fractions marked on graduated line or equivalent fractions used. 1 for $\frac{1}{4} = 0.25$ and $\frac{1}{2} = 0.5$ or from percentages or simple use of diagrams or $\frac{3}{8}$ is the middle without any explanation	

Question		Answer	Marks	Part marks and guidance	
C	(b)	$\frac{3}{16}$	3	<p><b>M2</b> for equivalent fraction to <math>\frac{3}{16}</math></p> <p>or <math>\frac{1}{2}\left(\frac{1}{8} + \frac{1}{4}\right)</math> or <math>\frac{1}{8} + \frac{1}{2}\left(\frac{1}{4} - \frac{1}{8}\right)</math> or <math>\frac{1.5}{8}</math> or 0.1875</p> <p><b>OR</b></p> <p><b>M1</b> for changing to same denominator or <math>\left(\frac{1}{4} \pm \frac{1}{8}\right)</math> or <math>(0.125 \pm 0.25)/2</math> or <math>\frac{1}{16}</math> <b>oe</b></p>	
13	(a)	50 [%]	1		
C	(b)	$\frac{1}{6}$	2	<b>M1</b> for equivalent fraction (not cancelled)	Accept eg $\frac{2}{4+2+6}$
C	(c)	2 : 1 : 3	2	<b>M1</b> for 4 : 2 : 6 <b>oe</b>	Condone fractions, decimals and included consistent units for <b>M1</b>
14 C	(a)	3.6	3	<p><b>M2</b> for <math>\sqrt{(3.9^2 - 1.5^2)}</math></p> <p><b>OR</b></p> <p><b>M1</b> for <math>3.9^2 - 1.5^2</math> or <math>a^2 + 1.5^2 = 3.9^2</math></p> <p><b>OR</b></p> <p><b>SC1</b> for any Pythagoras statement</p>	eg $3.9^2 + 1.5^2$ (probably <b>soi</b> by 17.46 or 4.1785...or 4.18)

Question		Answer	Marks	Part marks and guidance	
C	(b)	21.6	3	<p>FT from <i>their (a)</i> for full marks  <b>OR</b>  <b>M2</b> <i>their (a)</i> <math>\times 0.5 \times 1.5 \times 8</math>  <b>OR</b>  <b>M1</b> <i>their (a)</i> <math>\times 0.5 \times 1.5</math> or <i>their</i> area of end section <math>\times 8</math></p>	<p>FT from 4.2 will give 25.07 to 25.2</p> <p>NB only accept '2D' <math>\times 8</math></p>
15 C	*	$p + q = 270$ [ $^{\circ}$ ] with complete, correct reasoning.	4	<p>Must see <b>all</b> of ....</p> <ul style="list-style-type: none"> <li>• [Interior] angles [of pentagon] add up to <math>540^{\circ}</math> <b>oe</b></li> <li>• <math>\angle EFB = 138^{\circ}</math> clearly identified (condone <math>F =</math>)</li> <li>• Interior (or allied) angles <b>or</b> alt angles <b>and</b> angles on straight line (allow clear use of 180 to indicate straight line).</li> <li>• <math>p + q = 540 - 90 - 42 - 138 = 270</math> <b>oe</b> correct method = 270</li> </ul> <p>NB use of <math>\angle CBF + \angle EFB = 180^{\circ}</math> with interior angles implies 2<sup>nd</sup> and 3<sup>rd</sup> aspects</p> <p><b>OR</b>  <b>3</b> for <math>p + q = 270</math> with <b>three</b> out of four aspects covered <b>or</b> completely correct reasoning (all four aspects) but with one error leading to wrong <math>p + q</math>.</p> <p><b>OR</b>  <b>2</b> for any <b>two</b> out of the four aspects. Allow <math>p + q = 270</math> (eg <math>p = 132</math> <b>and</b> <math>q = 138</math>) with 90, 138 and 42 as evidence for angles add up to 540.</p> <p><b>OR</b>  <b>1</b> for <b>one</b> aspect or relevant angle (eg <math>\angle ABF = 138</math>) or 270 without working</p> <p>For all of the above, aspects may be seen on the diagram.  Do not condone supplementary as a reason</p>	

Question		Answer	Marks	Part marks and guidance	
16 C		$68 \times 0.77$ $68 \times 1.05$ $68 \times 1.23$	<b>1</b> <b>1</b> <b>1</b>		Do not give a mark for any statement on the left which is joined to more than one statement on the right
17 C	(a)	[x =] 3	<b>3</b>	<b>M1</b> for $2x - 1 = 5$ or $6x - 3 [= 15]$ <b>AND</b> <b>M1</b> for collecting <i>their</i> x and <i>their</i> number terms on opposite sides of equation eg $2x = 6$ or $6x = 18$  <b>M1</b> for correct FT from $kx = n$	Condone correct embedded answer  $6x - 1 = 15$ then $6x = 16$ then $x = 2\frac{2}{3}$ scores <b>M0, M1, M1</b> (condone 2.66[....] or 8/3 but not 16/6)
C	(b)	$x > 1.2$ <b>oe</b> final answer	<b>2</b>	<b>M1</b> for $5x > 6$ <b>or</b> $-5x < -6$ <b>OR</b> <b>SC1</b> for $(x=)1.2$ <b>or</b> $x < 1.2$ <b>oe</b> or $x > 2.4$ <b>oe</b>	Condone 6/5 for 2 marks

## APPENDIX

Exemplar responsesQuestion 12a

Response	Mark
$\frac{1}{3} = 0.\dot{3}$ $\frac{1}{4} = 0.25$ $\frac{1}{2} = 0.5$ . Halfway between 0.25 and 0.5 is 0.375	2
$\frac{1}{2}$ (0.5), $\frac{1}{4}$ (0.25), $\frac{1}{3}$ (0. $\dot{3}$ ) is not exactly half way between 0.5 and 0.25	2 bod
Because $\frac{1}{4}$ is 0.25 and $\frac{1}{2}$ is 0.5 which means 0.3 isn't half way.	1

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