

**GCSE**

**Applications of Mathematics (Pilot)**

Unit **A381/02**: Application of Mathematics 1 (Higher Tier)

General Certificate of Secondary Education

**Mark Scheme for November 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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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  $180 \times (\textit{their} '37' + 16)$ , 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 and applies as a default.
- **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. In questions with no final answer line, make no deductions for wrong work after an acceptable answer (ie **isw**) unless the mark scheme says otherwise, indicated by the instruction 'mark final answer'.

7. In questions with a final answer line following working space,

- (i) if the correct answer is seen in the body of working and the answer given on the answer line is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.

- (ii) if the correct answer is seen in the body of working but the answer line is blank, allow full marks. Place the annotation ✓ next to the correct answer.
  - (iii) if the correct answer is seen in the body of working but a completely different answer is seen on the answer line, 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.
8. In questions with a final answer line:
- (i) If one answer is provided on the answer line, mark the method that leads to that answer.
  - (ii) If more than one answer is provided on the answer line and there is a single method provided, award method marks only.
  - (iii) If more than one answer is provided on the answer line and there is more than one method provided, award zero marks for the question unless the candidate has clearly indicated which method is to be marked.
9. In questions with no final answer line:
- (i) If a single response is provided, mark as usual.
  - (ii) If more than one response is provided, award zero marks for the question unless the candidate has clearly indicated which response is to be marked.
10. 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.
11. 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.
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.

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.

MARK SCHEME

Question			Answer	Marks	Part marks and guidance	
1	(a)	(i)	137	2	M1 for 60 seen in working	
		(ii)*	Adults aren't growing all their life e.g. a specific age over 20 chosen, giving a height over 2 m (or 200 cm) which is unlikely or impossible  Impossible because adults don't continue to grow Or correct height predicted for stated 16+ age oe, but no or incorrect comment	3  2 - 1	For lower mark a clear attempt to substitute a 16+ age into the formula	Allow all 3 marks where age and its correct height given without actual calculation seen  An attempt such as '6 x age + 77' or better
	(b)		164	3	M1 for 162 + 179 soi or 1.62 + 1.79 -13 soi  AND M1 for division by 2 evident in working  Allow "1.64 m[etres]" for full marks.  SC2 for 1.64 given as the answer	341 9.59

Question		Answer	Marks	Part marks and guidance	
	(c)	9.4[4]	5	<p><b>nfw</b> Allow 9 provided correct working shown</p> <p><b>M1</b> for <math>110 \times 1.54</math> <b>oe soi</b> <b>A1</b> for 169(.4) And <b>M1</b> for <math>124 \times 1.29</math> <b>oe soi</b> <b>A1</b> for 159.96 (or 160)</p> <p>Or <b>M1</b> for <math>110 \times 1.43</math> <b>oe soi</b> by 157(.3) And <b>M1</b> for <math>124 \times 1.40</math> <b>oe soi</b> by 173.6 or 174</p> <p>If 0 scored, <b>SC4</b> for mixing up one gender resulting in final answer of 2.66 or 2.7 or 3 or 4[.2] Or <b>SC3</b> for 9 with no working Or <b>SC2</b> for mixing up both genders resulting in final answer of 16.3 or 16 with working shown Or <b>SC1</b> for 16 with no working</p>	<p>Equivalents could come from finding percentages and adding/subtracting. i.e. <b>M1</b> for <math>110 + 59(.4)</math> <b>M1</b> for <math>124 + 35.96</math> or 36</p>
2	(a)	0.05 or $\frac{1}{20}$	2	<b>M1</b> for $\frac{2700}{3600 \times 15}$ or better seen	Look for $\frac{2700}{54000}$ for 1 mark

Question		Answer	Marks	Part marks and guidance	
	(b)	$2.2 \times 1.5 - 2 \times (0.5 \times 0.6 \times 0.5)$ oe  0.3[0175..] or 0.302 or 0.3018  or $\frac{86}{285}$	2	M1 for calculating missing dimensions of top section (height = 0.5) or central gap (width = 1)	
			2	M1 for $860 \div (950 \times 3)$ soi	
3	(a)	24320	2	M1 $760 \times 2^n$ where $3 < n \leq 7$ Condone one error in repeated doubling.  If 0 scored, allow <b>SC1</b> for <b>EITHER</b> 778 240 <b>OR</b> 34 320 000 000 million	Allow full marks for 24 320 000 000 final answer, but NOT 24 320 000 000 million  For $n = 4, 6, 7$ , look for 12160, 48640, 97280  Repeated doubling results in: 1520, 3040, 6080, 12160  for doubling 10 times instead of 5
	(b)	576	2	M1 for $16 \times 6^2$ oe  OR  M1 for $6 \times \sqrt{16}$ or better, possibly soi by 24	
	(c) (i)	1024	1		
	(ii)	$2^8$	1		

Question		Answer	Marks	Part marks and guidance	
	(iii)	$2^{18}$	2FT	M1 for <i>their</i> $2^8 \times 2^{10}$ <b>seen</b> If 0 scored, <b>SC1</b> for 262144 as final answer	
	(iv)	$2^{20}$	2	M1 for $2^6$ <b>seen</b> If 0 scored, <b>SC1</b> for 1048576 as final answer	
	(d) (i)	awrt £63750	3	M2 for $12.75 \div 0.02 \div 0.01$ <b>oe soi</b> or M1 for $12.75 \div 0.02$ <b>oe soi</b> by 637.5[0] or 638 or M1 for <i>their</i> $637.50 \div 0.01$ <b>oe soi</b>  If 0 scored, <b>SC1</b> for 13[.14] or 50[.24] or 13[.27]	
	(ii)	[0].13	2	Condone 13 p for 2 marks M1 for $12.75 \times 0.01$ <b>soi</b> by 12.7[5] or 12.8	
4	(a)	033	2	M1 for $213 - 180$ <b>seen</b> OR M1 for $180 - (360 - 213)$ <b>seen</b>	Condone 33 for 2 marks Check diagram for working and correct answer shown at Sunsprite (with a north line drawn in) for 1 or 2 marks
	(b)	Correct position indicated clearly within tolerance shown	3	B1 for bearing from $61^\circ$ to $65^\circ$ drawn at Sunsprite And B1 for bearing from $288^\circ$ to $292^\circ$ drawn at Codcatcher	If multiple points are shown, only allow 3 if clearly labelled. Otherwise, max 2.  Allow 3 for correct position if no construction lines are visible.

Question		Answer	Marks	Part marks and guidance	
	(c)	Hakehunter, Sunsprite, Codcatcher with at least two supporting calculations	4	<p><b>M3</b> for  <math>220 \div 3.5 = 62.8[57142]</math> or 62.9 or 63                      and  <math>100 \div 1.75 = 57.[142857]</math></p> <p>OR</p> <p><b>M2</b> for <math>220 \div 3.5</math> and <math>100 \div 1.75</math></p> <p>OR</p> <p><b>M1</b> for <math>220 \div 3.5</math> or <math>100 \div 1.75</math></p> <p>If <b>M0</b> scored then  <b>SC1</b> for correct order with no working.</p> <p>If <b>M1</b> or <b>M2</b> scored then <b>also</b> score <b>SC1</b> for order consistent with their wrong working</p>	
(d)	(i)	[0].14[2857...] or 14[.2857...] % so within the limit oe	2-1	For lower mark, allow [0].14[2857] or 14[.2857...] % with no conclusion shown	<p><u>Alternative method:</u>  <math>\frac{1}{7}</math> and 15% both converted to fractions with common denominators such as  <math>\frac{1}{7} = \frac{20}{140} = \frac{100}{700}</math> and <math>\frac{15}{100} = \frac{21}{140} = \frac{105}{700}</math>                      for first mark</p>
	(ii)	$\frac{71}{770}$	3	<p><b>M2</b> for <math>1 - \left(\frac{1}{7} + \frac{2}{5} + \frac{3}{11}\right)</math> soi by <math>\frac{71}{385}</math> oe</p> <p><b>M1</b> for <math>\frac{1}{7} + \frac{2}{5} + \frac{3}{11}</math> soi by <math>\frac{314}{385}</math> oe</p>	<p>Method marks may be earned through use of <i>recurring</i> decimals, so  <b>M2</b> soi by 0.1844155̇  <b>M1</b> soi by 0.8155844̇</p>

Question			Answer	Marks	Part marks and guidance	
5	(a)	(i)	$14d + 35h = 763$	1	Any other work seen MUST lead correctly to $2d + 5h = 109$	
		(ii)	$d = 12$ $h = 17$ [Diamond scores] 12 [points] [Heart scores] 17 [points]	4	<b>M1</b> for both $18d + 22h = 590$ (or $45d + 55h = 1475$ ) and $18d + 45h = 981$ (or $22d + 55h = 1199$ )  And <b>M1</b> for $23h = 391$ (or $23d = 276$ )  <b>A1</b> for $h = 17$ (or $d = 12$ )	Allow equivalent multiples of the equations, e.g. $36d + 44h = 1180$  Substitution method: <b>M1</b> $d = \frac{295-11h}{9}$ <b>oe</b> Condone 1 error  <b>M1</b> $2 \left( \frac{295-11h}{9} \right) + 5h = 109$ or better <b>oe</b>

Question	Answer	Marks	Part marks and guidance
(b)	101, 103 or 104 rounded <u>correctly</u> from <i>their</i> working	4	<p><b>M3</b> for <math>\frac{35 \times 12^2}{7^2}</math> or 102.8 to 102.9 <b>seen</b></p> <p>Or</p> <p><b>M2</b> for <math>35 \times 12^2</math> or 5040 <b>seen</b></p> <p>Or</p> <p><b>M1</b> for <math>35 = \frac{k}{12^2}</math></p> <p>If <b>M0</b> then <b>SC2</b> for <math>\frac{35 \times 12}{7} = 60</math></p> <p>Or <b>SC1</b> for <math>\frac{35 \times 12}{7}</math></p> <p>Final answer must be rounded correctly from <i>their</i> working for full marks.</p> <p>Condone 103 with no working for all marks</p> <p>For all M marks allow '35' as either 34.5 or 35.5</p> <p><math>\frac{34.5 \times 12^2}{7^2} = 101.3</math> to 101.4</p> <p><math>34.5 \times 12^2 = 4968</math></p> <p><math>\frac{35.5 \times 12^2}{7^2} = 104.3\dots</math></p> <p><math>35.5 \times 12^2 = 5112</math></p>
(c)	110	3	<p><b>M1</b> for <math>(360 - 85) \div 5</math> <b>soi</b> by 55</p> <p>And</p> <p><b>M1</b> for <i>their</i> <math>55 \times 2</math></p> <p>Or</p> <p><b>M1</b> for <math>(360 - 2 \times \textit{their} 55)</math> <b>soi</b> by 125</p> <p>Look for 55 on diagram</p> <p>Look for 125 on diagram</p>

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