

GCSE

Applications of Mathematics (Pilot)

Unit **A382/01**: Applications of Mathematics (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for November 2016

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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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.
- i. **cao** means **correct answer only**.
 - ii. **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.
 - iii. **isw** means **ignore subsequent working** (after correct answer obtained).
 - iv. **nfw** means **not from wrong working**.
 - v. **oe** means **or equivalent**.
 - vi. **rot** means **rounded or truncated**.
 - vii. **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.
 - viii. **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	Guidance
1	(a)	(i)	Oak	1	
		(ii)	Lime	1	Condone 23 clearly indicated
		(iii)	776	1	
		(iv)	No with correct reason	2	M1 for No with unconvincing reason Need "no" plus one comparative example showing not proportional
	(b)		$g = \pi d$ o.e.	1	Condone $g=3d$ or $g =$ numerical value for $\pi \times d$
	(c)	(i)	5	1	
		(ii)	400	1	
		(iii)	Straight line through (0,0) oe	1	Must have both parts
	(d)	(i)	3 6 9	2	B1 2 correct
		(ii)	Points joined up to make a straight line	1FT	
(iii)		[How much the] girth increase[s] in a year oe	1	Accept the rate at which the tree grows	
(e)		0.5(0774 ...) to 0.51	2	M1 for 0.0676 oe or 0.0289 oe or 0.0387 oe seen	
2	(a)		F5 and G5	1	Must have both
	(b)		R: 1	1	
			S: 3	1	
	(c)		100 to 150 m or metres	B1 B1	
	(d)		Correct drawing	3	M1 for at least one correct $52^\circ \pm 1^\circ$ M1 for two straight lines from base intersecting each other
	(e)	(i)	2574466.[66...]	3	M1 for 52900 or 7723400 seen and M1 for evidence of " $\div 3$ " Allow answer rounded or truncated to a minimum of 3 sf

Question		Answer	Marks	Guidance																																																														
	(ii)	3861700	1FT	M1	<i>“their 25474466.[...]”</i> × 1.5																																																													
	(iii)	1200 or 1287 or 1288 or 1300 or 1500 labourers supported by working	4 FT	M1	for figs 5 x figs 3 for 1 year and M1 for <i>their</i> figs 15 x 20 and M1 for ‘their’ 3861700 ÷ 3000 and B1 for ‘their’ result rot to the nearest integer or 10 or 100 or 500																																																													
	(f)	3.5 supported by at least one calculation	3	B1	each correct calculation between 3 and 5 to a maximum of 2.																																																													
				Or																																																														
				3	<i>for correct answer clearly via algebra ...</i>																																																													
				M1	for $x + \frac{x}{7} = 4$																																																													
				or																																																														
				M2	for $8x = 28$																																																													
				A1	[x=] 3.5																																																													
					<table border="1"> <thead> <tr> <th>heap</th> <th>heap÷7</th> <th>total</th> </tr> </thead> <tbody> <tr><td>3.1</td><td>0.44285714</td><td>3.542857143</td></tr> <tr><td>3.2</td><td>0.45714286</td><td>3.657142857</td></tr> <tr><td>3.3</td><td>0.47142857</td><td>3.771428571</td></tr> <tr><td>3.4</td><td>0.48571429</td><td>3.885714286</td></tr> <tr><td>3.5</td><td>0.5</td><td>4</td></tr> <tr><td>3.6</td><td>0.51428571</td><td>4.114285714</td></tr> <tr><td>3.7</td><td>0.52857143</td><td>4.228571429</td></tr> <tr><td>3.8</td><td>0.54285714</td><td>4.342857143</td></tr> <tr><td>3.9</td><td>0.55714286</td><td>4.457142857</td></tr> <tr><td>4</td><td>0.57142857</td><td>4.571428571</td></tr> <tr><td>4.1</td><td>0.58571429</td><td>4.685714286</td></tr> <tr><td>4.2</td><td>0.6</td><td>4.8</td></tr> <tr><td>4.3</td><td>0.61428571</td><td>4.914285714</td></tr> <tr><td>4.4</td><td>0.62857143</td><td>5.028571429</td></tr> <tr><td>4.5</td><td>0.64285714</td><td>5.142857143</td></tr> <tr><td>4.6</td><td>0.65714286</td><td>5.257142857</td></tr> <tr><td>4.7</td><td>0.67142857</td><td>5.371428571</td></tr> <tr><td>4.8</td><td>0.68571429</td><td>5.485714286</td></tr> <tr><td>4.9</td><td>0.7</td><td>5.6</td></tr> </tbody> </table>	heap	heap÷7	total	3.1	0.44285714	3.542857143	3.2	0.45714286	3.657142857	3.3	0.47142857	3.771428571	3.4	0.48571429	3.885714286	3.5	0.5	4	3.6	0.51428571	4.114285714	3.7	0.52857143	4.228571429	3.8	0.54285714	4.342857143	3.9	0.55714286	4.457142857	4	0.57142857	4.571428571	4.1	0.58571429	4.685714286	4.2	0.6	4.8	4.3	0.61428571	4.914285714	4.4	0.62857143	5.028571429	4.5	0.64285714	5.142857143	4.6	0.65714286	5.257142857	4.7	0.67142857	5.371428571	4.8	0.68571429	5.485714286	4.9	0.7	5.6	
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Question		Answer	Marks	Guidance		
	(g)	(i)	52	2	M1 Figs 52 seen as answer	
		(ii)	$3^2 + 4^2 = 5^2$ $9 + 16 = 25$	2	B1 Correct value for square of side (25, 16 or 9) seen	Multiples of 3,4 and 5 used appropriately can score full marks and the B1
	(h)	(i)	“product of half the sums of the opposite sides” oe	1		Description must be clear following the rules of Bodmas
		(ii)*	Area found by square counting or otherwise 36 to 46 cm ² Compared with 49 to 56 cm ² using the Egyptian method. It is not very accurate.	6	<p>5 Either of the areas by counting squares or Egyptian method correct and other method attempted and correct comparison stated. Or both correct areas found with no or incorrect comparison</p> <p>or</p> <p>4 One of areas correct and evidence of other attempted but no or incorrect comparison.</p> <p>or</p> <p>3 Correct statement based on two incorrect areas Or correct area found using the expression</p> <p>or</p> <p>2 Correct lengths found and inserted into the formula Or correct area found by counting squares or similar</p> <p>or</p> <p>1 At least three correct lengths found or an attempt to substitute any four lengths into the expression or evidence of counting method for the estimate</p>	6.4, 5.7, 9.5, 7.6 all ±0.2

Question		Answer	Marks	Guidance	
3	(a)	Eritrea = 35 Paraguay = 10.1	3	B2 for first correct And B1 for second correct Or M1 for clear attempt to add three percentages in a row	
	(b)	(i)	$X < 5$	1	
		(ii)	$10 \leq X < 20$	1	
		(iii)	$X \geq 30$	1	
	(c)	(i)	36 to 40 countries	2	M1 for $115 \div 3$ or 118 to 122 or 31% to 35%
		(ii)	First box indicated Last box indicated	1 1	-1 each error
	(d)	(i)	Haiti	1	
		(ii)	Cuba	1	
		(iii)	Two correct statements summing up the change from 1990 to 2013 e.g. GHI has been declining	2	B1 for first correct statement B1 for second correct statement •The GHI decreased for all [the countries] •Only Haiti was “alarming” 2013
	(e)	(i)	2005	1	
(ii)		2004	1		
(iii)		Asia 15	B1 B1		
(f)	121 265	1+1			
4	(a)	Feeling sick	1		
	(b)	(i)	Common	1	
		(ii)	Very common	1	
	(c)	Lowest 1130 Highest 3395	1 1	If 0 then SC1 for both 1000 and 3000	

Question		Answer	Marks	Guidance	
	(d) (i)	$\frac{13392}{13395}$ or $\frac{4464}{4465}$ o.e. isw	2	M1 for correct numerator or denominator or M1 for $\frac{\text{number} - 3}{\text{number}}$	e.g. 99.9(977 ...)%
	(ii)	No and $\frac{3}{13395}$ oe and greater than $\frac{1}{1000000}$ oe	2	M1 for $\frac{3}{13395}$ o.e. (0.0002396 ...) or 0.000001 seen	Allow FT from part (i) All three parts required
5	(a) (i)	$\frac{1}{2}$ of (80+1) = 40.5 & 40 th & 41 st is 25 Or 15+4+5=24 so 40 th number must be 25 oe	2	M1 for [$\frac{1}{2}$ of (80+1) =] 40.5 or 40th / 41st number [is 25] or full unambiguous description with no mention of 40.5, 40 th , 41 st	Condone $\frac{1}{2}$ of 80 with correct description for M mark
	(ii)	24.625	3	M2 for (20x15 + 23x4 + 24x5 + 25x30 + 26x18 + 30x8) ÷ 80 or M1 for all 6 products soi by 1970 20x15 23x4 24x5 25x30 26x18 30x8 or sum of at least 4 products	1970 ÷ 80 300 92 120 750 468 240
	(iii)	Any correct general statement eg Most or on average people saw the line in Picture B as smaller	1		
	(b)	Any correct general statement eg Most did not see C and D the same [length] or most saw D as longer oe	1		

Question		Answer	Marks	Guidance	
	(c)	All 6 points plotted correctly ± 1 mm by eye	2	M1 for at least 3 points plotted correctly ± 1 mm by eye	
	(d)	Plotted points for women similar pattern to those for men oe	1		
	(e)	(i)	1	Line $y = x$ drawn through at least the plotted points	Allow line straight by eye
		(ii)	1	[Points / people plotted] below [the line] oe	
		(iii)	1FT	Not good, more points above line oe	FT <i>their</i> graph MUST have reason
6c		402	3	M2 for $(6 \times 50) + (5 \times 11) + 33 + 14$ or M1 for attempt to sum widths of at least 7 characters with no incorrect value	50+11+50+11+50+11+50+33+50+11+50+11+14

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