

GCSE

Applications of Mathematics

Unit **A381/01**: Applications of Mathematics 1 (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.

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1. 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

2. **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.
3. 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.

4. 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.

5. 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.
6. 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**.
7. 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'.
8. 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).
9. 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.

10. 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.
11. 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.

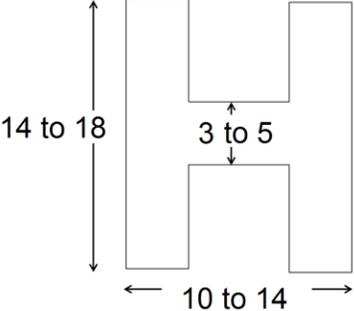
If the answer space is blank but the correct answer is seen in the body allow full marks. Place the annotation ✓ next to the correct answer.

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.
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.
14. 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)	$3\frac{1}{2}$ [hours] oe	2	M1 $2\frac{1}{2}$ [hours] or M1 $7 \times \frac{1}{2}$ or 7×30 or 210 seen	Accept 210 min(utes), 3 h(ours) 30 min(utes) 3:30 3 30 i.e. alternative forms must have the correct time units/commonly used format
	(b)	$8^\circ - 12^\circ$	1		
	(c)	Yes, (he climbs) 9 (miles)	3	B3 yes o.e. + 9 (miles) <hr/> M2 $0.15 \times 60 = 9$ soi or M1 $60 \div 10$ or $60 \div 100$ or $15 \times 60 (=900)$ soi <hr/> A1 Comparison based on "their" climb figures (i.e.FT)	Condone $15\% \times 60 (=900)$ Need to have some calculated figures albeit incorrect.
	(d)	192 [bpm]	1		
	(e)	$s = 220 - a$ oe	2	Must be given as a formula M1 $220 - a$	
	(f)	144 [bpm]	2FT	M1 'their' $192 \div 4$ soi or "their" 192×3 soi	FT from part (d) If (d) correct 48 or 576 seen
c	(g)	A: 181	2	B1 24.64 or 181.(36)	Mark for rounding here
		B: 186.(512) or 187	2	B1 784 or 5.488 seen	Partial evaluation of the a^2 term

Question		Answer	Marks	Guidance	
c	(h)	She burns up 235.(32) kcals not enough from the ice cream o.e.	4	<p>B3 235.(32) Or B2 385.32 or 7.844 Or B1 $(0.1 \times 138 - 0.006 \times 66 - 0.02 \times 28 - 5) \times 30$ or better Or SC1 -137.56 Or B1 each to maximum of 2 for 13.8 (-) 0.396 (-) 0.56</p> <hr/> <p>1 Correct observation made based on “their” positive figure compared with 300 kcal for the ice cream. But does not necessarily require specific reference to the 300 kcals.</p>	<p>Omitting the “-5” or “×30”</p> <p>Mark to candidates’ advantage</p> <p>Oder of operations on calculator (but must have negative attached)</p> <p>Do not accept “almost” oe unless same to 2 sf B3 does not guarantee this mark. (Think of question given verbally and getting a verbal response.)</p>
	(i)	(i)	1		
		(ii)	2	M1 figs 11... seen	
		(iii)	1FT	Greater than not sufficient need to have “not quite/almost/a little bit more” or equivalent qualifier.	

Question			Answer	Marks	Guidance
2	(a)	(i)	26	1	
		(ii)	2010	1	
		(iii)*	108 m supported with <u>relevant working</u> _____ or _____ By measuring the sign lengths (4.5 to 5.5) cm and (7.5 to 8.5) cm So 1949 sign is $\frac{(4.5 \text{ to } 5.5)}{(7.5 \text{ to } 8.5)} \times 156 =$ = (82 to 115) metres	4	<p>3 Answer of 108 (no units) or 108 m with no <u>relevant working</u> (or only one item from the list)</p> <p>2 Relevant working seen</p> <p>1 1 item from “relevant working” list soi by 4, 9, 12, 13 or 48</p> <p>_____ or _____</p> <p>3 Answer in range (82 to 115) – ‘no units, but with working in evidence</p> <p>2 Evidence of measuring sign length and answer in range (80 to 120) metres.</p> <p>1 At least one length measurement of (4.5 to 5.5) or (7.5 to 8.5) units not necessary</p>

Question		Answer	Marks	Guidance	
	(b) (i)	[\$] 22 777 to [\$]22 778	3	M1 [250 000 – 45 000 =] 205 000 M1 “Their” 205 000 (or 205) ÷ 9	Condone 250 – 45 = 205
	(ii)	(\$)23 000	1FT		Do not condone 23 Condone 2300.00 but not 2300.0 etc.
	(c) (i)	 <p>14 to 18</p> <p>3 to 5</p> <p>10 to 14</p>	3	B1 each correct If zero SC1 if the rank order of dimensions are correct i.e. crosspiece / width / height	Units not needed
	(ii)	30 to 70	2	M1 Strict FT for their dimensions from part (i) A1 Multiplied correctly.	
	(d) (i)	L	1	CAO	Any wrong – no credit
	(ii)	HO	1	CAO	Any wrong – no credit
	(e) (i)	Congruent	1		Be liberal with spelling, mark for intent
	(ii)	$a = 80$ $b = 100$ $c = 80$ $d = 20$	1 1 1 1		

Question		Answer	Marks	Guidance	
3	(a)	Two from: 19, 17, 13, 11	2	B1 each	
	(b)	$2^4 - 1 = 15$, rule doesn't work oe	1 1	Dependent on gaining the first mark	Not necessary to state that 15 isn't prime. (Think of question given verbally and getting a verbal response.)
	(c)	(i) 10.5[00] [km] (ii) 0, 2, 4, 5, 6, 8 and at least one reason for each of these digits 0 divisible by 10 o.e. 0/5 divisible by 5 o.e. 0/ 2/ 4/ 6/ 8 divisible by 2 / even o.e.	1 3	B2 two correct digits with two different reasons Or B1 one correct digit with its correct reason or 0,2,4,5, 6, 8 with no correct reasons	B1 or B2 Can be awarded even if incorrect digits listed or incorrect reasons for other digits.
4	(a)	(i) 11	1		
		(ii) -3	1		
	(b)	(i) Scale $S = 2 \times$ Scale T o.e.	1	Must mention the scales, not just "double" or "twice" or "half" etc. without mention of both (scales) S and T .	e.g. T multiplied by 2 = S or Scale S is double scale T Scale T divides S by 2 Allow the correct algebraic formula
		(ii) $s = 2t$ o.e.	1FT	$t = s \div 2$ is allowed (as is t written as T) FT must be for words (part (i)) \rightarrow algebraic part (ii), unless both parts have correct equation.	Condone $s = 2 \times t$ (or $t \times 2$) but must have the $s = \dots$ or $t = \dots$ Do not condone $1 \times s = \dots$ or $1 \times t = \dots$ Repeat of incorrect algebraic formula in part (i) gains no credit

Question		Answer	Marks	Guidance	
	(c)	“Does not go up evenly” “Gaps between vary” or better	1		“Gaps not the same” (implying size) gains credit. (Think of question given verbally and getting a verbal response.) Comparisons involving typography (labelling or extent of labelling etc.) of the two scales gain no credit. (e.g. “one has millimetres”).
	(d)	$d = \sqrt{a}$ or $a = d^2$ o.e.	2	B1 \sqrt{a} or d^2 seen	Full credit for $a = d \times d$ Condone changes from low case to high case in variables. Algebraic equation or expressions only allowed.

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