

# **Applications of Mathematics (Pilot)**

General Certificate of Secondary Education

Unit **A381/01**: 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.

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
<b>BOD</b>	Benefit of doubt
<b>FT</b>	Follow through
<b>ISW</b>	Ignore subsequent working (after correct answer obtained), provided method has been completed
<b>M0</b>	Method mark awarded 0
<b>M1</b>	Method mark awarded 1
<b>M2</b>	Method mark awarded 2
<b>A1</b>	Accuracy mark awarded 1
<b>B1</b>	Independent mark awarded 1
<b>B2</b>	Independent mark awarded 2
<b>MR</b>	Misread
<b>SC</b>	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**

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 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.
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.
  - **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.
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	Part Marks and Guidance																			
1	(a)	25[%]	1																				
	(b)	6	1																				
	(c)	70	1																				
	(d)	E.g. $2 + 3 = 5$ shows that Kevin is wrong, 5 is prime.	2	<b>M1</b> for adding two primes.	Other examples are: $2 + 5 = 7$ , $2 + 9 = 11$ , $2 + 11 = 13$ etc.  In effect rewarding the counter example.																		
	(e)	One million (and) thirty three	1		Condone suspect spelling if intent reasonably clear.																		
	(f)	141 125	1		Accept correct in words.																		
	(g) *	Statement to the effect that Kevin is right, supported by: two proportional results (these may be percentages or decimals) compared (RH column) <b>or</b> the proportional argument “if x gives y then nx gives less than ny” or equivalent .	4	<b>3:</b> for Kevin is right together with two % <b>or</b> the proportional argument “x gives y but nx gives less than ny” or equivalent, but no comment or wrong comment <b>or</b> a general proportional statement without quoting actual numbers together with Kevin is right.  <b>2:</b> one successful % <b>oe</b> and “Kevin is right”.  <b>1:</b> for one successful % attempt or equivalent but no comment or “no” (i.e. correct working but wrong conclusion).	<table border="1"> <thead> <tr> <th>number</th> <th>prime</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>200</td> <td>46</td> <td>23</td> </tr> <tr> <td>400</td> <td>63</td> <td>15.75</td> </tr> <tr> <td>800</td> <td>113</td> <td>14.125</td> </tr> <tr> <td>1600</td> <td>208</td> <td>13</td> </tr> <tr> <td>3200</td> <td>376</td> <td>11.75</td> </tr> </tbody> </table> <p>Condone 199 for 200 etc. for internals.  See Appendix</p>	number	prime	%	200	46	23	400	63	15.75	800	113	14.125	1600	208	13	3200	376	11.75
number	prime	%																					
200	46	23																					
400	63	15.75																					
800	113	14.125																					
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3200	376	11.75																					

Question		Answer	Marks	Part Marks and Guidance	
	(h)	631	1		
	(i)	15	1		
	(j)	“No” or equivalent, supported by two numerical examples.	3	<b>M2</b> for “no” with one example or two numerical examples and no comment <b>or</b> <b>M1</b> for one example and no comment.	A negative not supported by examples gains zero.  See Appendix
	(k) (i)	4 [cm]	1		
	(ii)	400 (km) full follow through from part (i).	3	<b>M1</b> for $100\,000\,000 \div 10 = 10\,000\,000$ or ten million <b>M1</b> for their “ten million” $\times$ their “4” <b>M1</b> for their “number” $\div 100\,000$  (these may be in any order – depending on the candidate’s method)	Condone if all working carried through (correctly) in millions as the unit, e.g. 480 from 4.8 cm in part (i). Also follow through 350, 360, 370, 380 or 390 – full credit. (result of re-measuring)
	(l) (i)	31                      yes	1 + 1	Second dependent on first, but allow follow through on the number (prime/non-prime).	e.g. 34    and    no    gains 0 + 1
	(ii)	Clear or systematic indication of prime or integer chosen, concluding with the correct solution. (see some possible correct solutions on RHS)	3		Correct solutions are: $n = 10 \rightarrow 61$ $n = 11 \rightarrow 67$ $n = 12 \rightarrow 73$ $n = 13 \rightarrow 79$ $n = 16 \rightarrow 97$  Condone just correct substitution into formula e.g. $(6 \times 53)+1=319$ i.e. actual result does not give a prime. See Appendix

Question			Answer	Marks	Part Marks and Guidance
2	(a)	(i)	914 to 915	1	
		(ii)	995	1	<b>M1</b> for 2112 or 2890 or $44 \times 48$ <b>or</b> $17 \times 170$
		(iii)	1632	2	<b>M1</b> for 2112 or 2890 or $44 \times 48$ <b>or</b> $17 \times 170$
		(iv)	Any correct observation.	1	E.g. “they vary” or “X is better than Y” based on their figures, i.e. need only compare two or “X gives the highest/lowest” (again based on their figures).  See Appendix
	(b)		950	1	
3	(a)	(i)	1920 or £19.20	1	
		(ii)	9[p]	2	<b>M1</b> for 8.75 <b>or</b> 0.0875 <b>or</b> $21/2100 \div 240$ seen in working.
		(b)		5000	2
4	(a)		Correct	2	<b>M1</b> for apex of sail 6 horizontal units to the right of the mirror line.
	(b)		All correct	3	<b>M1</b> for each correctly labeled.  Condone ambiguity in labelling the acute angle A only. (Others must be unambiguously labelled).
	(c)		$x = 70^\circ$ $y = 100^\circ$ $z = 80^\circ$	1 1 1	<b>FT</b> $180 - y^\circ$ <b>or</b> $250 - y^\circ - x^\circ$

Question		Answer	Marks	Part Marks and Guidance	
	(d) (i)	(110 to 115)°	1		
	(ii)	12 [m <sup>2</sup> ]	3	<b>M2</b> for answer of 6 or 24 (arising from omitting the ½ or the other half of the sail) <b>or</b> <b>M1</b> for answer in range 10 to 14 if obviously arising from square counting.	
	(e)	5.6(68 ...) or 5.7	2	<b>M1</b> for 94.09 or “number” ÷ 16.6 <b>seen</b>	
	(f) (i)	C and G	1		
	(ii)	B and E	1		
	(g) (i)	9.1 [km]	1		
	(ii)	600 ± 10 [m]	1		
	(iii)	(30 to 100) m stated as answer <b>and</b> statement of estimated length of car <b>and</b> how many times this “fits” along the train.	3	<b>M2</b> for answer (30 to 100) metres but little indication as to how this was arrived at or explanation but units omitted <b>or</b> <b>M1</b> for statement giving correct estimate of length of car (2 to 5) metres – but not translated into a correct answer <b>or</b> Evidence of train being estimated as (15 to 35) times the length of a car.	See Appendix N.B. a Smart car is 2.5m long and an Astra estate is 4.5m long.  Accept clear statement if width used within range 1.5 m to 2.5 m.

Question		Answer	Marks	Part Marks and Guidance	
	(h)	$L = 2a + b + 2c$	3	<p><b>M2</b> for <math>2a + b + 2c</math> or  <math>L =</math> "non-standard algebra"  <b>or</b>  <b>M1</b> for at least one term correct in  <math>L = 2a + b + 2c</math>  <b>or</b>  <b>1:</b> for at least two terms correct in  <math>2a + b + 2c</math>.</p>	<p>See below for non-standard algebra.   For the single mark only condone non-standard algebra such as <math>a^2</math>, <math>1b</math>  or <math>a + a + b + c + c</math>  or <math>(a \times 2) + b + (c \times 2)</math>.   See Appendix</p>

## APPENDIX

Exemplar responses for Q1(g)

Response	Mark
Kevin is correct because there is double the whole numbers so if it would have more it would double the prime numbers.	3
Kevin is incorrect because as the numbers get larger the range of prime numbers look larger but against the number range its not.	0

Exemplar responses for Q1(j)

Response	Mark
No, because it takes 30 minutes to find two prime numbers in a 150 digit number. But if you add 50 more numbers it increases the time to one year. For example 800 digits = hundreds of thousands of years, 1600 digits is millions. <i>[last sentence gains nothing as not based on data, but first sentence worthy of 2 as "no" and an example (BOD)]</i>	2
No, because it takes 1 year to test 200 numbers which isn't in direct proportion and neither is 400 because it takes thousands of years. <i>[apparently circular argument so no credit]</i>	0

Exemplar responses for Q1(l)(ii)

Response	Mark																		
<table style="border: none; margin-left: 20px;"> <tr> <td>53</td> <td>59</td> <td>61</td> <td>67</td> <td>71</td> <td>73</td> </tr> <tr> <td>↓</td> <td>↓</td> <td>↓</td> <td>↓</td> <td>↓</td> <td>↓</td> </tr> <tr> <td>319</td> <td>355</td> <td>367</td> <td>403</td> <td>427</td> <td>439</td> </tr> </table> <p>The answer is 367 <i>[Clear indication of number chosen and a correct solution, so full credit]</i></p>	53	59	61	67	71	73	↓	↓	↓	↓	↓	↓	319	355	367	403	427	439	3
53	59	61	67	71	73														
↓	↓	↓	↓	↓	↓														
319	355	367	403	427	439														

Exemplar responses for Q2(a)(iv)

Response	Mark
They are all very high <b>or</b> Choy's legs are very strong	0
All the (completely) different <b>or</b> X is the odd one out <b>or</b> They all vary ( <i>as a minimum</i> )	1

Exemplar responses for Q4(g)(iii)

Response	Mark
Car = 34, train = 1200 <i>[Strong indication that train = 35 × length of car – BOD1]</i>	1
40 metres as car is about 1 metre wide <i>[correct answer and but wrong estimate of width of a car]</i>	1

Exemplar responses for Q4(h)

Response	Mark
$L = (a \times 2) + 1a + (2 \times c)$ <i>[Correct, with subject shown but non-standard algebra]</i>	2
$2a + 1b + 2c \times L$ <i>[no subject, but two terms correct (BOD)]</i>	1
$L = 2a + 2c = b$ <i>[subject, with at least one term correct]</i>	1

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