

# **Applications of Mathematics (Pilot)**

General Certificate of Secondary Education

Unit **A382/01**: Foundation Tier

## **Mark Scheme for June 2011**

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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 awarded for a correct final 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.

## MARK SCHEME

Question			Answer	Marks	Part marks and guidance	
1	(a)		75	1		
	(b)		3 shillings	2	<b>M1</b> for 3	
	(c)		4	2	<b>M1</b> for $2\frac{1}{2} + 1\frac{1}{4} (= 3\frac{3}{4})$ or for $1.5 \times 2.5 (= 3.75)$	
2	(a)	(i)	Counter at (5, 4) shaded	1	Accept indication that counter should be dropped at top of column 5.	
		(ii)	(5, 4)	1FT	FT coordinates of <i>their</i> counter	
	(b)	(i)	Counter at (2, 2) shaded	1	Accept indication that counter should be dropped at top of column 2.	
		(ii)	(2, 2)	1FT	FT coordinates of <i>their</i> counter	
3			122.40	3	<b>M2</b> for <i>their</i> $16 \times 15.3 \div 2$ <b>M1</b> for total hours 16 or $2 + 2.5 + 4 + 4.5 + 3$ or hourly rate $15.3 \div 2$ or £7.65	Condone answer of 122.4
4	(a)	(i)	49 circled	1		Accept Glasgow and Plymouth indicated
		(ii)	Glasgow and Plymouth are a long way apart	1		Accept any sensible reason
	(b)		589	1		

Question		Answer	Marks	Part marks and guidance	
	(c) (i)	465	2	M1 for one correct distance selected [153 or 312] correctly added to one incorrect distance or for the two correct distances [153 and 312] selected, but incorrectly added.	
	(ii)	38.75	1FT	FT <i>their (c)(i)</i> $\div$ 12	Accept rounded or truncated
	(d) (i)	Indicates 'Yes', <b>and</b> explains that all the journeys include Plymouth to Leeds.	1	Plymouth to Leeds implied by 323	
	(ii)	4, 1, 2, 3	3	M2 for any two in the correct position or all correct but order reversed <b>or</b> M1 for journey 4 as longest or for journey 3 as shortest	
5	(a)	970	1		
	(b) (i)	Line from (500, 1106) to (1500, 2076)	2	M1 for 2 or 3 points plotted correctly with no line or short correct line	
	(ii)	750 - 850 inclusive	1		
6	(a)	3	1		
	(b)	Any three of: 1 and 60; 2 and 30; 3 and 20; 4 and 15; 5 and 12, 6 and 10	2	Accept factor pairs in either order. B1 for two correct pairs of different factors.	

Question		Answer	Marks	Part marks and guidance	
7	(a)	Pie chart completed with all five new sectors correct All five new sectors correctly labelled	2 1	M1 for three correct and two incorrect sectors Accept any unambiguous indication of the correct labels, eg B, P, R etc For follow-through, the order of the sizes of the sectors must be correct, ie Finch $\geq$ Sparrow $\geq$ Pigeon $\geq$ Blackbird $\geq$ Thrush $\geq$ Robin	Correct sector sizes are: Blackbird: $1\frac{1}{2}$ Pigeon: 2 Robin: $\frac{1}{2}$ Finch: 4 Thrush: 1
	(b)	Indicates 'cannot tell', and total number of visits in the second pie chart is unknown.	1	May indicate pie charts show proportions.	Accept any valid reason
8	(a)	Centre of square B2 marked.	1		
	(b)	Woodland	1	Accept any unambiguous indication, eg 'trees'	
	(c)	The junction in B3 between the fish and the lions	1		Accept clear intention
	(d)	3500 to 4000, to the nearest 100	3	M1 for $50 \times 50 [= 2500]$ or B2 for 3000 to 4500, to the nearest 100 or 3500 to 4000, not to the nearest 100	
9	(a)	£15.63	2	M1 for $3 \times £1.89 [=£5.67] + 4 \times £2.49 [=£9.96]$	

Question	Answer	Marks	Part marks and guidance	
(b)*	<p>Clear statement that they will save £94.46, with full details of costs.</p> <p>Correct solution but no or incomplete costs or complete costs but with arithmetical errors or correct savings ignoring cost of buying energy saving bulbs</p> <p>Total cost of using old light bulbs and total cost of using energy saving bulbs or one total cost found with attempt to find the saving. or correct savings ignoring cost of buying energy saving bulbs but with arithmetical errors</p>	<p><b>4</b></p> <p><b>or</b></p> <p><b>3</b></p> <p><b>or</b></p> <p><b>2-1</b></p>	<p>For lower mark finds one total cost or both with errors in calculation</p>	<p>Cost of using old light bulbs: £137.64 (= <math>3 \times £14.24 + 4 \times £23.73</math>)</p> <p>Cost of using new light bulbs: £27.55 (= <math>3 \times £2.85 + 4 \times £4.75</math>)</p> <p>Difference: £110.09 (= <math>£137.64 - £2.85</math>)</p> <p>Cost of buying new light bulbs subtracted: £94.46 (= <math>£110.09 - £15.63</math>)</p> <p>eg for 3 marks: £94.46 shown, with no or incomplete calculations</p> <p><b>or</b></p> <p>Cost of buying new light bulbs added instead of subtracted: £125.72 (= <math>£110.09 + £15.63</math>)</p> <p><b>or</b></p> <p>Cost of buying new light bulbs missed out: £110.09</p> <p>eg for 1 mark: Cost of using old light bulbs: <math>3 \times £14.24 + 4 \times £23.73</math> (= £137.64)</p> <p><b>or</b></p> <p>Cost of using new light bulbs: <math>3 \times £2.85 + 4 \times £4.75</math> (= £27.55)</p>

Question			Answer	Marks	Part marks and guidance
10	(a)	(i)	$\frac{2}{6}$ or $\frac{1}{3}$	1	Accept equivalent fraction, decimal or percentage
	(a)	(ii)	Probability indicated on the scale in the range 3 to 5 cm from 0.	1	Follow through from their probability $\pm$ 1cm provided this is not $\frac{1}{2}$
	(b)		Spinner completed to give: Four Cs Twice as many Cs as Ds. Equal numbers of As, Bs and Es. All four conditions met.	1 1 1 1	The numbers of each letter that need to be added are: A: 2 B: 1 C: 3 D: 1 E: 2, giving totals of C: 4; D: 2; A = B = E = 3
11			112	4	<b>M3</b> for $7 \times 16$ <b>or</b> <b>M2</b> for $160 \div 22$ or 7 or 7.27 – 7.3 AND $160 \div 10$ or 16 <b>or</b> <b>M1</b> for $160 \div 22$ or 7 or 7.27 or $160 \div 10$ or 16 If <b>M0</b> then <b>SC1</b> for comparing areas correctly giving answer of 116.(36...)
12	(a)		28	1	
	(b)		10	3	<b>M2</b> for $6^2 + 8^2 = d^2$ , or for 5 <b>or</b> <b>M1</b> for $3^2 + 4^2 = 5^2$ , or for 3, 4, 5 or for $d^2 = 3^2 + 4^2$

Question		Answer	Marks	Part marks and guidance		
13	(a)	53	1			
		30	1			
		65	1			
	(b)	(i)	80	1		
		(ii)	On average times are now quicker	1	Condone average time lower	Allow median time for average but not mean or mode. Allow range of times is unchanged. Must be comparison of summary measure, not individual values
			Times before and after are consistent	1		
		(iii)	No, the time 75 could have become 80	1	Must have reason	Accept any valid reason
14	(a)		$22 < n < 33$ or $33 > n > 22$	2	<b>M1</b> for one correct inequality.	Condone $22 \leq n < 33$ or $33 > n \geq 22$
	(b)*		A suitable situation, with $n$ defined	2	<b>B1</b> suitable situation defined, but $n$ not defined	
15	(a)		30	1		Accept $\frac{1}{2}$ hour, but not just $\frac{1}{2}$
	(b)		29 or 30 or 31	2	<b>M1</b> for $2 + 17 + 10$ or $2.5 + 17.5 + 10$ or $3 + 17 + 10$ If <b>M0</b> then <b>SC1</b> for final answer 25	May be done in stages. Allow M1 for $2 + 17 + 10$ or 29 or $3 + 18 + 10$ or 31.
	(c)		Last 30 mins or $\frac{1}{2}$ hour or 10:15–10:45 Gradient or slope steepest	1 1	Marks independent	Accept final section, last part Condone line and steeper or implies most miles in shortest time.

Question		Answer	Marks	Part marks and guidance	
16		40 ÷ 0.611 65.46 or 65.47 45 ÷ 0.713 63.11 Euros	<b>M1</b> <b>A1</b> <b>M1</b> <b>A1</b> <b>B1</b>	For <b>B1</b> mark <b>FT</b> their method and solutions shown & accept any clear indication of currency  If <b>M0</b> and <b>M0</b> then <b>SC1</b> for 40 × 0.611 or 24.44 AND 45 × 0.713 or 32.08 or 32.09 and <b>B1</b> for pounds	For A marks cost to be given as correct money term Allow answers in cents ( 100 cents = AU\$ 1) For B1 must have scored at least M1 and M1or SC1
17	(a)	(£) 625	3	<b>M2</b> for <i>their</i> total ÷ 12 <b>M1</b> for 7500 or evidence of adding the correct 12 values	
	(b)	Mean would increase	1		Allow average for mean Accept any valid reason
18	(a)	600	4	<b>B3</b> for 75 + 300 + 225 or 75 × 8 or <b>M2</b> for using 75 as a multiplier consistently e.g. 75 225 and 300 seen or <b>M1</b> for 310 ÷ 4 or 77.5 or 225 ÷ 3	
	(b)	0.13(3...)	2	<b>M1</b> for 1.6 × 1.5 [=2.4]	

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