

# **Applications of Mathematics (Pilot)**

General Certificate of Secondary Education

Unit **A382/01**: Foundation Tier

## **Mark Scheme for January 2012**

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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.

**M** (method) marks are not lost for purely numerical errors.

**A** (accuracy) marks 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.

## Subject Specific Marking Instructions

- a. Two additional situations may appear in the mark scheme allowing the award of **A** marks or independent (**B**) marks:
  - i. Correct answer with no working
  - ii. Work follows correctly from a previous answer whether correct or not (“FT” on mark scheme and on the annotations tool).
- b. The following abbreviations are commonly found in GCSE Mathematics mark schemes.
  - i. Where you see **oe** in the mark scheme it means **or equivalent**.
  - ii. Where you see **cao** in the mark scheme it means **correct answer only**.
  - iii. Where you see **soi** in the mark scheme it means **seen or implied**.
  - iv. Where you see **www** in the mark scheme it means **without wrong working**.
  - v. Where you see **rot** in the mark scheme it means **rounded or truncated**.
  - vi. Where you see **seen** in the mark scheme it 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.
  - vii. Where you see **figs 237**, for example, this means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point e.g. 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
- c. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
- d. 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).
- e. 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.
- f. 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.
- g. 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’. If the answer is missing, but the correct answer is seen in the body allow full marks. If the correct answer is seen in 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.
- h. Ranges of answers given in the mark scheme are always inclusive.

- i. 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.
- j. Where a follow through mark is indicated on the mark scheme for a particular part question, you must ensure that you refer back to the answer of the previous part question if this is not shown within the image zone. You may find it easier to mark follow through questions candidate by candidate rather than question by question by question.
- k. 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)	$\frac{1}{4}$ selected	1																																	
	(b)	13% to 17%	1																																	
	(c)	£100 to £125	2	<b>M1</b> 20% or $\frac{1}{5}$ or 72° or 'less than $\frac{1}{4}$ '																																
2	(a)	£6.43	2	<b>B1</b> for correct number of pounds or correct pence <b>or</b> <b>M1</b> for an organised method																																
	(b)	<table style="border: none; margin: 0 auto;"> <tr> <td>£2</td><td>£1</td><td>50p</td><td>20p</td><td>10p</td><td>5p</td><td>2p</td><td>1p</td> </tr> <tr> <td>1</td><td>1</td><td>1</td><td></td><td>1</td><td>1</td><td>2</td><td>1</td> </tr> <tr> <td></td><td>3</td><td>1</td><td></td><td>2</td><td></td><td></td><td></td> </tr> <tr> <td></td><td>3</td><td>1</td><td></td><td>1</td><td>1</td><td>2</td><td>1</td> </tr> </table>	£2	£1	50p	20p	10p	5p	2p	1p	1	1	1		1	1	2	1		3	1		2					3	1		1	1	2	1	3	<b>B1</b> for each correct row.  <b>If 0</b> scored then award <b>SC1</b> for any amount adding to £3.70
£2	£1	50p	20p	10p	5p	2p	1p																													
1	1	1		1	1	2	1																													
	3	1		2																																
	3	1		1	1	2	1																													
	(c)	10	2	<b>M1</b> for evidence that candidate has looked for the number of coins used for at least three options <b>or</b> 15 – <i>their</i> chosen number of coins <b>or</b> <b>B1</b> for 5 as answer																																
3	(a)	Maths: Group 1; Swimming: Group 2; Art: Group 1	2	<b>B1</b> for two of the three groups correct																																
	(b)	12	1																																	

Question		Answer	Marks	Part Marks and Guidance													
	(c)	15	1														
4	(a)	<table style="border: none; margin-left: 20px;"> <tr> <td style="padding-right: 20px;">Lola</td> <td>Ethan</td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="text-align: center;">✓</td> <td></td> </tr> </table>	Lola	Ethan		✓	✓		✓			✓	✓		3	<b>B2</b> for four correct <b>B1</b> for three correct	
Lola	Ethan																
	✓																
✓																	
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	(b)	A valid game	1	Examples of valid games: <ul style="list-style-type: none"> <li>• a number over 5</li> <li>• the highest number</li> <li>• one in the 10 times table</li> <li>• 7</li> </ul>													
5			5	<b>B1</b> for each correct match													

Question			Answer	Marks	Part Marks and Guidance
6	(a)		30	1	Condone half hour
	(b)		15	1	Accept half of <i>their</i> answer to (a).
	(c)	(i)	7	1	
		(ii)	30	1	Accept <i>their</i> answer to (a).
	(d)		$37\frac{1}{2}$	1	
7	(a)	(i)	bag Q: 18; bag R: 16	2	<b>B1</b> for each number in correct place Allow <b>FT</b> for <i>their</i> Q – 2 for R
		(ii)	bag P: 7; bag R: 19	2	<b>B1</b> for each number in the correct place.
		(iii)	A set of whole numbers with the relationship: $n; 3n; 3n - 2$ , with $n$ not equal to 6 or 7	1	
	(b)		$3p - 2$ <b>oe</b>	2	<b>M1</b> for $3p$ seen
	(c)		Selects No, and explains that this would mean that there would not be a whole number of marbles in Bag P, or that 10 is not a multiple of 3	1	eg It would mean A had $3\frac{1}{3}$ marbles or shows 3 in P leads to 7 in R and 4 in P leads to 10 in R

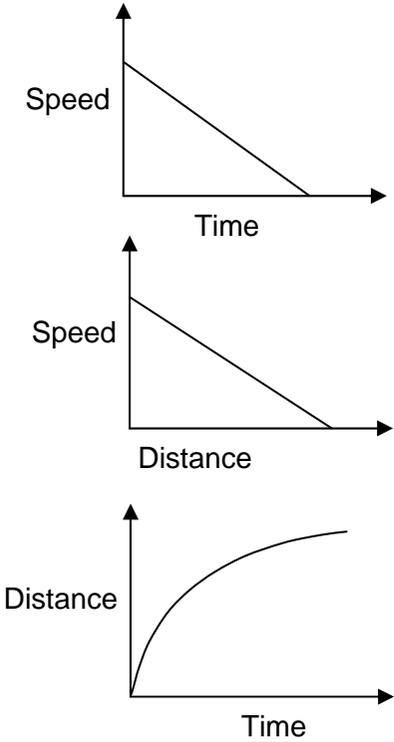
Question		Answer	Marks	Part Marks and Guidance	
8	(a)	105 or 106	4	<p><b>B3</b> for 103 to 107.1(...)</p> <p><b>M1</b> for attempting to find 5 fl oz in ml eg <math>(170 + 114)/2</math> or a value between 114 and 170</p> <p><b>A1</b> for 142</p> <p><b>and</b></p> <p><b>M1</b> for <math>15000 \div \text{their } 142 (=105.6)</math>.</p> <p><b>A1</b> for 105 or 106</p>	<p><u>Alternative Method</u></p> <p><b>M1</b> for 28 or 28.5 or 29</p> <p><b>and</b></p> <p><b>M1</b> for <math>15000 \div 28</math> or 28.5 or 29 ( or 517.(...) or 526.(...) or 537.(...)</p> <p><b>and</b></p> <p><b>M1</b> for <math>(\text{their } 15000 \div \text{their } 28.5) / 5</math></p> <p><b>A1</b> for 105 or 106</p>
	(b)	£58.22.	5	<p><b>B1</b> bottles of water [£]39.50</p> <p><b>and</b></p> <p><b>M2</b> 6 packs or <b>M2</b> <math>5 \times \text{their (a)} \div 100</math> rounded up...</p> <p><b>or</b></p> <p><b>M1</b> <math>5 \times \text{their (a)} \div 100</math></p> <p><b>and</b></p> <p><b>M1</b> for <math>\text{their } 6 \times 3.12</math> with their 6 as an integer greater than 1</p> <p><b>and</b></p> <p><b>B1 FT</b> <i>their</i> total bottles price + <i>their</i> total cups price correctly added</p>	
9		14	3	<p><b>B2</b> for 36 cubes in complete T-shape</p> <p><b>or</b></p> <p><b>M1</b> for incorrect number of cubes in T-shape subtracted from 50</p>	

Question		Answer	Marks	Part Marks and Guidance																
10	(a)	60	1																	
	(b)	£31.55 or 3155p	6	<p><b>M5</b> for finding the correct values of all four sets of coins and attempting to add them or finding the correct values of three sets of coins, and adding <i>their</i> four values correctly</p> <p><b>or</b></p> <p><b>M4</b> for finding the correct values of four sets of coins or finding the correct values of three sets of coins, and attempting to add their four values or finding the correct values of two sets of coins, and adding <i>their</i> four values correctly</p> <p><b>or</b></p> <p><b>M3</b> for finding the correct number of all four coins, and attempting to find the values of at least two sets of coins</p> <p><b>or</b></p> <p><b>M2</b> for finding the correct number of at least three coins or for finding correct values for one row</p> <p><b>or</b></p> <p><b>M1</b> for attempting to find the correct number of at least two coins eg relevant divisions attempted</p>	<p>Correct values are:</p> <table> <thead> <tr> <th>Coin</th> <th>No</th> <th>Val</th> </tr> </thead> <tbody> <tr> <td>50p</td> <td>47</td> <td>23.5(0) or 2350</td> </tr> <tr> <td>20p</td> <td>23</td> <td>4.6(0) or 460</td> </tr> <tr> <td>10p</td> <td>30</td> <td>3 or 300</td> </tr> <tr> <td>5p</td> <td>9</td> <td>(0).45 or 45</td> </tr> </tbody> </table>	Coin	No	Val	50p	47	23.5(0) or 2350	20p	23	4.6(0) or 460	10p	30	3 or 300	5p	9	(0).45 or 45
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10p	30	3 or 300																		
5p	9	(0).45 or 45																		

Question		Answer	Marks	Part Marks and Guidance	
11	(a)	Complete, correct diagram drawn within the tolerances indicated	4	<p><b>M3</b> for correct shape with one error in dimensions or all shapes drawn accurately but incorrectly placed</p> <p><b>or</b></p> <p><b>M2</b> for two semi-circles of radius 3cm drawn on opposite sides of <i>their</i> rectangle or correct rectangle and one correctly drawn semi-circle</p> <p><b>or</b></p> <p><b>M1</b> for rectangle drawn (15.4 × 4.3) or one correct semi-circle</p> <p><b>or</b></p> <p><b>SC2</b> for all three pieces accurately drawn separately</p>	Do not accept freehand drawings
	(b*)	Complete description eg Half a cylinder, semi-circular prism, half a circle top and bottom (or at each end) with a curved face and a rectangular face.	2	<p><b>M1</b> Partial but incomplete description eg a solid with 4 faces</p>	For <b>M1</b> allow a rounded solid or a bridge shape curved over the top or a cuboid with semi-circled sides

Question		Answer	Marks	Part Marks and Guidance
12	(i)	$10 \div 8 = 1.25$	2	<b>M1</b> for diameter of lawn and path is 10m
	(ii)	1.25 or $1\frac{1}{4}$	1	
	(iii)	10	3	<p><b>M1</b> for <math>1.25 \times 240</math> tiles required  <b>and</b>  <b>M1</b> for their number of tiles required <math>\div 30</math> for number of packs required</p> <p><u>Alternative method:</u>  <b>M1</b> for 8 packs contain 240 tiles  <b>and</b>  <b>M1</b> for <math>1.25 \times</math> <i>their</i> number of packs for 240 tiles</p> <p><u>Alternative method:</u>  <b>B1</b> for circumference of outer circle = <math>31(.4\dots\text{m})</math>; circumference of inner circle = <math>25(.1\dots\text{m})</math>  <b>and</b>  <b>M1</b> for <i>their</i> circumference of outer circle <math>\div</math> <i>their</i> circumference of inner circle <math>\times 240</math> tiles required, <math>\div 30</math> for number of packs required</p>

Question		Answer	Marks	Part Marks and Guidance	
13	(a)	Team 2 has higher total/mean score than team 1	1		Not Team A has more consistent scores. <b>oe</b>
	(b)	Two teams each with a total score of 38 eg Team 1: A, C, E, J, I Team 2: B, D, F, G, H	2	<b>M1</b> for teams of six and four pupils with total scores of 38 <b>or</b> <b>M1</b> for correct teams indicated with pupils' scores instead of their names.	Accept initial letters for names, but for 2 marks do not accept numbers instead of names.
	(c)	The two teams have equal means/total scores, or three points moved from Team 2 to Team 1.	1		

Question		Answer	Marks	Part Marks and Guidance	
14	(a)	A (✓) B ✓ C ✓ D ✓ E ✓ F ✓	3	<b>B2</b> for four ticks correctly placed <b>or</b> <b>B1</b> for two or three ticks correctly placed	Do not accept more than one tick per row.
	(b)	A correct graph, with axes correctly labelled eg  <p>The first graph shows Speed on the vertical axis and Time on the horizontal axis, with a straight line decreasing from the vertical axis to the horizontal axis.</p> <p>The second graph shows Speed on the vertical axis and Distance on the horizontal axis, with a straight line decreasing from the vertical axis to the horizontal axis.</p> <p>The third graph shows Distance on the vertical axis and Time on the horizontal axis, with a curve starting at the origin and increasing at a decreasing rate.</p>	1		Condone trail of points

Question		Answer	Marks	Part Marks and Guidance	
15		Gives three correct reasons	3	<b>B2</b> for two correct reasons or <b>B1</b> with one correct reason	See appendix for exemplars
16	(a)	Correct line drawn	1		Condone straight line that passes through (0, 0) and between (10, 7) and (10, 8)
	(b)	From x-axis go up to line then across to y-axis <b>oe</b> or gradient is $\frac{3}{4}$ and $\frac{3}{4}$ of x is equal to y <b>oe</b>	2	<b>M1</b> for part correct or reverse eg start at 10 on x-axis and go up to the line eg start at y = 7.5 go across to line and down to x = 10 eg indication gradient = $\frac{3}{4}$	Must refer to using the line or gradient
17	(a)	(Each population may have been) all rounded the same way or rounded separately	1		Condone 'because of the rounding'
	(b)	10 points plotted $\pm \frac{1}{2}$ small square	2	<b>M1</b> for at least 6 points plotted $\pm \frac{1}{2}$ small square	Allow for points joined or not joined Ignore any line of best fit
	(c)	Population increases (over the century) <b>oe</b>	1		Ignore any reference to (positive) correlation Condone population increases, decreases then increases again

Question	Answer	Marks	Part Marks and Guidance																																																																																																		
18	<p>No, with clear comparisons between at least two sets of places on both street map and underground map.</p> <p>For comparison allow: Two or more scale factors given to at least 1dp.</p> <p>Where two measurements taken on the same map give the same value (eg OxC to PC and TCR to PC both 61) and their corresponding measurements from the other map differ (29 and 20) allow all 4 marks even if no sf calculations provided a convincing reasoned argument why map scales must be different.</p>	4	<p><b>M3</b> for two pairs of consistent measurements from both maps with scale factor calculations to at least 1dp or clear comparison of relative size between places or use of one scale factor for a second pair of places and no conclusion or incorrect conclusion</p> <p>or clear comparison of scale factors between at least two sets of places on both maps and correct conclusion, but some errors in measurements</p> <p><b>or</b></p> <p><b>M2</b> for one pair of consistent measurements with scale factor calculation given to at least 1dp or for two pairs of consistent measurements for two pairs of places</p> <p><b>or</b></p> <p><b>M1</b> for a pair of measurements for one pair of places Allow M1 where units are inconsistent</p> <p><u>Alternative method:</u> for bearings Measurements <math>\pm 4^\circ</math> For full marks require consideration of position of North line on both maps</p> <p>Where scale factor to 1dp gives same value do not award final mark for an answer of yes. Check both maps for measurements</p> <table border="1" data-bbox="1473 379 2054 587"> <thead> <tr> <th>Street</th> <th>BSt</th> <th>OxC</th> <th>TCR</th> <th>PC</th> <th>LSq</th> <th>CG</th> </tr> </thead> <tbody> <tr> <td>BSt</td> <td>–</td> <td>46</td> <td>112</td> <td>98</td> <td>127</td> <td>149</td> </tr> <tr> <td>OxC</td> <td></td> <td>–</td> <td>65</td> <td>67</td> <td>88</td> <td>106</td> </tr> <tr> <td>TCR</td> <td></td> <td></td> <td>–</td> <td>61</td> <td>49</td> <td>50</td> </tr> <tr> <td>PC</td> <td></td> <td></td> <td></td> <td>–</td> <td>36</td> <td>64</td> </tr> <tr> <td>LSq</td> <td></td> <td></td> <td></td> <td></td> <td>–</td> <td>29</td> </tr> <tr> <td>CG</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>–</td> </tr> </tbody> </table> <table border="1" data-bbox="1473 619 1982 826"> <thead> <tr> <th>Tube</th> <th>BSt</th> <th>OxC</th> <th>TCR</th> <th>PC</th> <th>LSq</th> <th>CG</th> </tr> </thead> <tbody> <tr> <td>BSt</td> <td>–</td> <td>19</td> <td>36</td> <td>38</td> <td>50</td> <td>56</td> </tr> <tr> <td>OxC</td> <td></td> <td>–</td> <td>17</td> <td>23</td> <td>33</td> <td>37</td> </tr> <tr> <td>TCR</td> <td></td> <td></td> <td>–</td> <td>20</td> <td>19</td> <td>21</td> </tr> <tr> <td>PC</td> <td></td> <td></td> <td></td> <td>–</td> <td>16</td> <td>26</td> </tr> <tr> <td>LSq</td> <td></td> <td></td> <td></td> <td></td> <td>–</td> <td>10</td> </tr> <tr> <td>CG</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>–</td> </tr> </tbody> </table> <p>Measurements in table <math>\pm 4\text{mm}</math> All measurements in table in mm, measurements may be given in other units If no units condone consistent measurements for any pair of places</p>	Street	BSt	OxC	TCR	PC	LSq	CG	BSt	–	46	112	98	127	149	OxC		–	65	67	88	106	TCR			–	61	49	50	PC				–	36	64	LSq					–	29	CG						–	Tube	BSt	OxC	TCR	PC	LSq	CG	BSt	–	19	36	38	50	56	OxC		–	17	23	33	37	TCR			–	20	19	21	PC				–	16	26	LSq					–	10	CG						–
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