

Applications of Mathematics (Pilot)

General Certificate of Secondary Education

Unit **A381/02**: Higher 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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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 awarded for a correct final 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.
 - **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).
 - **nfww** 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**.

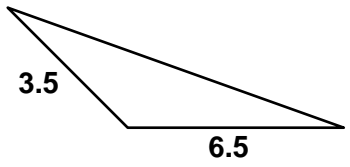
6. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.
7. As a general principle, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (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.

Question			Answer	Marks	Part marks and guidance
1			25.3	2	M1 for 25.28(...) or 25.2 SC1 for their pre-rounded answer seen and correctly rounded to 1dp.
2			2.5 oe	3	M1 for $15x - 5 = 9x + 12 - 2$ and M1 FT for $ax = b$ either a or b correct A1 FT from <i>their</i> equivalent 2 nd M1 (3 marks can only be awarded for a fully correct solution) FT <i>their</i> expansion with either x terms collected or number terms collected. Embedded solutions score 2 marks.
3	(a)		C	1	
	(b)		D	1	
	(c)		4	3	B2 for 16 seen. or B1 for one of following areas seen either in text or on diagram 1 or 3 or 4. For full credit the 4 must clearly be the intended final answer (not on answer line). Full credit for correct drawn solution on grid – does not require numbers ie can be a drawing of a 4 by 4 square (internal structure not required).
4			200	2	M1 for any two numbers rounded 300, 4, 6 or any partial calculation ($300 \div 6 =$) 50, 1200 or 0.6 – 0.7
5	(a)		15180	2	M1 for $1.15 \times 13\ 200$, oe
	(b)		3125	2	M1 for $2875 \div 0.92$ oe
6	(a)	(i)	$7(m) - 2x$ oe	1	Accept $5(m) - 2x$, oe Condone either dimension

Question		Answer	Marks	Part marks and guidance	
	(ii)	$24(m) - 8x$	2	M1 for $2(5 - 2x) + 2(\text{their (i)})$ or $2(7 - 2x) + 2(\text{their (i)})$ if reversed or $2(7 + 5) - 8x$	Accept equivalent expressions SC1 for $8x - 24$
	(b)	6 m by 4 m nfw	3	M2 FT for $x = \frac{1}{2}$ or 0.5 oe or M1 FT for $8x = 24 - 20$ or $-8x = 20 - 24$	FT their expression in a(ii)
7		2.0 - 2.5 grams/cm ³	4 1	M1 for $350 \leq \text{mass} \leq 375$ and M1 for $150 \leq \text{vol} \leq 175$ and M1 for their mass \div their vol Independent mark	Accept grams/ml
8		9.5 - 11.0 nfw	3	M1 for all dimensions needed for either $\frac{1}{2} \times b \times h$ or $\frac{1}{2} \text{absinC}$ oe sides: 6.5, 3.5, 8.5 (all ± 0.2) heights: 3.2, 5.9, 2.4 (all ± 0.2) angles: 114, 22, 44 (all $\pm 2^\circ$) and M1 FT for $\frac{\text{'base'} \times \text{'verticalheight'}}{2}$ or use of $\frac{1}{2}\text{absinC}$ A1 9.5 - 11.0	 <p>eg $\frac{6.5 \times 3.5}{2} = 11.375$ scores M0 vertical height needed with 6.5 M0 incorrect method for area A0 needs 2nd M1 before A mark can be considered</p>

Question		Answer	Marks	Part marks and guidance	
9		18 cao	4	<p>M1 for $1 - \frac{5}{8} - \frac{1}{4}$</p> <p>A1 $\frac{1}{8}$</p> <p>and</p> <p>M1 for <i>their</i> $\frac{1}{8} \times n$</p> <p><u>ALT</u></p> <p>M1 for $\frac{5}{8} \times n$ or $\frac{1}{4} \times n$ correctly evaluated (may be rounded up or down)</p> <p>A1 both evaluated</p> <p>and</p> <p>M1 n – <i>their</i> two answers</p> <p><u>ALT</u></p> <p>M1 for $\frac{7}{8} \times n$</p> <p>A1 evaluated (may be rounded up or down)</p> <p>and</p> <p>M1 n – <i>their</i> answer</p>	Throughout the scheme n refers to any square number greater than 100
10	(a)	$L = \frac{452}{M}$	2	<p>M1 for $L = \frac{k}{M}$ o.e</p> <p>(can be implied by $11.3 = \frac{k}{40}$) or</p> <p>($k =$) 452 seen but not contradicted</p>	
	(b)	9.04 or 9.0	1	Accept 9 if correct answer seen in working	

Question	Answer	Marks	Part marks and guidance
11*	Complete and correct solution (133) supported by correct reasons for all steps involving correct terminology for alternate angles, corresponding angles and allied/interior angles	4	<p>eg $BFG = 105^\circ$ corresponding angles $KFG = 75^\circ$ angles on a line (add to 180°) $FGC = 133^\circ$ exterior angle of a triangle or $ABF = 105^\circ$ opposite angles $BFG = 105^\circ$ alternate angles $KFG = 75^\circ$ angles on a line $FGK = 47^\circ$ angles in a triangle (add to 180°) $FGC = 133^\circ$ angles on a line or any other possible method or B3 as above but with inadequate terminology (Z angles or F angles) used or a correct solution with one incorrect or missing reason or B2 correct solution with no reasons or with at least two incorrect reasons or with one of BFG, BFE, KFG KFE found with correct reasons for each step or B1 one of BFG, BFE, KFG KFE found with no reasons or incorrect reasons for each step</p>

Several methods available:

Accept if marked on diagram.

Question		Answer	Marks	Part marks and guidance		
12	(a)	580	1			
	(b)	(i)	8 hours 55 minutes nfw	4	<p>M2 for $\frac{548}{120} + \frac{348}{80}$ or 4.56(...) + 4.35</p> <p>or</p> <p>M1 for $\frac{548}{120}$ or $\frac{348}{80}$ or better</p> <p>A1 for 8.91(...) or 8.92 or 4h 34(m) or 4h 21(m)</p> <p>If M0 then SC2 for 4h 56/7(m) + 4h 35(m)</p> <p>If A0 then SC B1 for changing their total time into hours and minutes</p>	Accept 4.57 or 4.6
		(ii)	124.80 – 126.10 nfw	4	<p>M3 for</p> $\left(\frac{548}{100} \times 11.3 + \frac{348}{100} \times 10.0 \right) \times 1.30$ <p>or</p> $(61.9(24) + 34.8) \times 1.30$ <p>or</p> <p>M2 for $\frac{548}{100} \times 11.3 + \frac{348}{100} \times 10.0$</p> <p>or 61.9(24) + 34.8 or 96.7(...)</p> <p>or $\left(\frac{548}{100} \times 11.3 \right) \times 1.30$ or 80.50(..)</p> <p>or $\left(\frac{348}{100} \times 10.0 \right) \times 1.30$ or 45.24</p> <p>or</p> <p>M1 for $\frac{548}{100} \times 11.3$ or $\frac{348}{100} \times 10.0$</p> <p>or 11.3 × 1.30 or 10.0 × 1.30</p> <p>or 14.69 or 13</p>	

Question			Answer	Marks	Part marks and guidance	
13	(a)	(i)	5^0	1		
		(ii)	5^{-2}	1		If 0 in both parts award SC1 for answers of 0 and -2
	(b)		64	2	M1 for evaluation of square root or for evaluation of cube	

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