

**Mathematics A**

General Certificate of Secondary Education

Unit **A502/02**: Mathematics B (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 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  $\times$  *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.

Question			Answer	Marks	Part marks and guidance	
1	(a)	(i)	13	3	<p><b>B2</b> for <math>12\frac{3}{4}</math> or <math>\frac{51}{4}</math> or 12.(...)</p> <p>Or <b>M1</b> for <math>17 \times \frac{3}{4}</math> or <math>51 \div 4</math></p> <p>or <math>17 \times 0.75</math> or <math>4.25 \times 3</math></p> <p>And <b>B1FT</b> for rounding <b>up</b> any non-integer answer &gt;1</p> <p>If ratio method used</p> <p><b>B2</b> for 12 pizzas = 16 scouts</p> <p>Or <b>B1</b> for 3 pizzas = 4 scouts or better</p>	<p><math>\frac{51}{68}</math> implies M1</p> <p>Calculation doesn't need to be attempted for M1</p> <p>If 'counting on' used (eg 0.75, 1.5, 2.25 ...) award B marks if 12 pizzas = 16 scouts or for 3 pizzas = 4 scouts are reached and recorded clearly</p>
		(ii)	2.21	3	<p><b>M2</b> for 2.60 – <i>their</i> 15%</p> <p>Or <math>2.60 \times 0.85</math> with attempt at long multiplication</p> <p>Or <b>M1</b> for 0.26 and 0.13 seen or full method for getting 15% of 2.60</p> <p><b>SC2</b> 28.73</p>	<p>If <i>their</i> 13 pizzas considered allow FT for M2 or M1 provided method is clear.</p> <p>Condone confused units for M marks (eg 2.60- (26 + 13))</p> <p>Also 221 implies M2.</p>
	(b)		3240	2	<b>B1</b> for 100 used	

2	(a)		Ruled line within overlay	3	<b>B2</b> for 2 or more correct points plotted or a correct line of any length Or <b>B1</b> for 2 or more correct points calculated (e.g. in a table) Or <b>SC1</b> for a ruled line gradient 2, any length	For 3 marks line at least $0 < x < 4$ Line, if extended, should be within tramlines If more than one line, mark the best in this part
	(b)		5 3	1 1		Condone $\frac{5}{1}$ but 5x scores 0 Condone (0, 3) or 0, 3 or $y = 3$
	(c)	(i)	5	1FT	FT <i>their</i> 5 from (b) ie $k$ or $kx$ but not ratio, %, coordinate, positive, $kx + c$ , $y = \dots$ etc	
		(ii)	$y = -\frac{1}{5}x + c$ oe	2FT	(any numerical $c$ value including 0) <b>B1FT</b> for $-\frac{1}{5}$ oe seen	FT $y = -\frac{1}{\text{their } 5}x + c$ from (b) or (c)(i) to candidates benefit.
3	(a)		3 values correctly plotted	2	<b>B1</b> for 1 value correctly plotted	Touching overlay
	(b)		No, plus any reasonable comment	1	'No' alone does not score	Mark best comment Ignore any comments about correlation

4		<p><math>p = 50</math> with correct working and reasons, clearly laid out with correct spelling, punctuation and grammar.</p> <p><math>p = 50</math> with correct working and reasons and minor errors in spelling, punctuation and grammar. Or <math>p = 50</math> with correct working with one incorrect or missing reason with correct spelling, punctuation and grammar Or 'correct' solution, with full reasons, with no more than one arithmetic slip</p> <p>One angle seen with reason given e.g. <math>ACE = 110^\circ</math> with 'Angles round a point' Or two angles found without reasons</p> <p>No correct work seen</p>	5	<p>Condone eg <math>D = 70</math> if consistent with their argument for up to 4 marks.</p> <p><b>4-3</b> For the lower mark reasons will be missing or incorrect. E.g. correct answer with no working</p> <p>Or for the lower mark, 'correct' solution with no more than one arithmetic slip and one incorrect or missing reason.</p> <p><b>2-1</b> For the lower mark, either one correct angle seen or there would be a correct reason with an incorrect conclusion.</p> <p><b>0</b></p>	<p>E.g. <math>ACE = 110^\circ</math> (Angles round a point/ in a circle) <math>ADB = 110^\circ</math> (Alt(ernate)/Z angles) <math>ABD = 40^\circ</math> (Angles in a triangle) <math>p = 50</math> (Angle in a semicircle / from a diameter)</p> <p>'Parallel' is insufficient as a reason. Either alternate/Z angles or corresponding/F angles</p> <p>If totals quoted they must be correct eg Angles in a triangle = 150 does not count as a correct reason</p> <p>Note that 'alternate segment' is an incorrect reason.</p> <p>Angles (and reasons) may be marked on diagram.</p> <p>ABC marked with a 'square' counts as 1 angle found. eg <math>110^\circ</math> and <math>90^\circ</math></p>
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5	(a)		$\frac{7}{20}$ oe	2	<b>M1</b> for 1 correct conversion to 20ths, 40ths, etc or one correct decimal conversion	Condone 0.35, 35% for 2
	(b)		$\frac{3}{20}$ oe	2	<b>M1</b> for $\times \frac{1}{5}$ or $0.75 \div 5$	Condone 0.15, 15% for 2 $0.75 \div 5$ must have a reasonable attempt at evaluation.
6	(a)		Enlargement 3 (-5, -1)	<b>B1</b> <b>B1</b> <b>B1</b>	Enlargement as the only transformation.	eg 'enlargement and translation' does not score the 1 <sup>st</sup> B mark  Condone missing brackets 'Centre of enlargement' implies the first mark if no other transformation given.
	(b)		Correct rotation	2	<b>B1</b> if wrong centre but correct angle	Condone freehand. Mark vertices. Ignore any labels.

7	(a)		$7x + 2 < 5x + 25$ oe	1	Or better	Condone $\leq$ in both parts Condone other letters used instead of $x$ in both parts Condone $7x + 2b < 5x + 25b$
	(b)		$7x - 5x + b < a$ or $bx < 25 - 2 + ax$ or $7x - 5x = 25 - 2$ or $7x - 5x > 25 - 2$  $2x < 23$ or $x = 11.5$ or $x > 11.5$  $x < 11.5$  11	<b>M1</b>  <b>M1</b>  <b>A1FT</b>  <b>A1FT</b>	For correctly collecting <i>their</i> $x$ terms or <i>their</i> constants as an inequality or both as an equation  For correctly collecting <i>their</i> $x$ terms and <i>their</i> constants as an inequality or correctly solving their inequality but answering as an equation  For correctly solving their inequality  And, following at least <b>M1</b> , allow <b>A1FT</b> for rounding <i>down</i> their non-integer solution (or rounding <i>up</i> if appropriate from <i>their</i> inequality).  Allow <b>SC3</b> for answer 11	Follow through any linear inequality with two terms on each side.  The first M1 may be implied.  Allow marks retrospectively if solution attempted in (a) provided it's not contradicted in (b)  No FT for t & i approach
8			Weak negative No/zero (correlation) Strong positive	1 1 1	oe eg No pattern, random  Or <b>SC2</b> for negative, no/zero, positive Or <b>SC1</b> for negative and positive	Ignore 'fairly' weak etc and other irrelevant comments.  Mark to candidates advantage

9			$60x + 9y = 3$ or $100x + 15y = 5$ $60x - 50y = 180$ or $18x - 15y = 54$	<b>M1</b>	for multiplying both equations to get either coefficient equal (allow 1 error)	$x = \frac{59}{118}$ followed by $x = 2$ is common and scores 3 isw  Dep on M2 If no more than 1 error in multiplication follow through for a maximum of 3 marks  Correct answer with no working scores 4.
			$59y = -177$ or $118x = 59$	<b>M1dep</b>	for adding or subtracting as appropriate (allow 1 error)	
			$y = \frac{-177}{59}$ or $x = \frac{59}{118}$	<b>A1FT</b>	for either x or y correct oe isw	
			$x = \frac{1}{2}$ or 0.5 $y = -3$	<b>A1</b>	Mark final answer	
10	(a)	(i)	1	1		
		(ii)	$\frac{1}{64}$	2	<b>M1</b> for 64, -64, $\frac{1}{4^3}$ , $-\frac{1}{4^3}$ , $\frac{1^3}{4}$ , $-\frac{1^3}{4}$ , $-\frac{1}{64}$	NB isw
	(b)	(i)	3	2	<b>B1</b> for $9^{\frac{1}{2}}$ or $\sqrt{\quad}$ seen	
		(ii)	96	3	<b>B1</b> for 144 or $12^2$ soi <b>M1dep</b> for <i>their</i> $12^2 \times \frac{2}{3}$ oe	

11	(a)	(i)	25	1		Condone $5^2$ or $\sqrt{625}$ but not $5 \times 5$
		(ii)	$\sqrt{5}$	1		Condone $\frac{3\sqrt{5}}{3}$ or $1\sqrt{5}$
		(iii)	$10\sqrt{2}$	3	<p><b>B2</b> for <math>2\sqrt{50}</math> or <math>5\sqrt{8}</math> or <math>\sqrt{100 \times 2}</math> or <math>\sqrt{100}\sqrt{2}</math></p> <p>Or <b>B1</b> for <math>\sqrt{200}</math> or <math>\sqrt{4}\sqrt{50}</math> or <math>\sqrt{5}\sqrt{5}\sqrt{2}\sqrt{2}\sqrt{2}</math></p> <p>or <math>(\sqrt{40} \Rightarrow) 2\sqrt{10}</math> or <math>2\sqrt{5}\sqrt{2}</math> or <math>\sqrt{5}\sqrt{8}</math> or <math>\sqrt{2}\sqrt{20}</math> or <math>\sqrt{5}\sqrt{2}\sqrt{2}\sqrt{2}</math></p>	<p><math>\sqrt{5 \times 40}</math> does not score unless taken further</p> <p>If superfluous 'x' signs used (eg <math>10 \times \sqrt{2}</math>), withhold 1 mark</p>
	(b)					Mark as NR even if attempted

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