

Mathematics A (Two Tier)

General Certificate of Secondary Education

Component **J512/02**: Paper 2

Mark Scheme for January 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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MARKING INSTRUCTIONS FOR ASSISTANT EXAMINERS

- 1 Mark strictly to the mark scheme.
- 2 Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
- 3 Work crossed out but not replaced should be marked.
- 4 **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.
- 5 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).
- 6 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.
- 7 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 normally be given.
- 8 For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work
- 9 For answers scoring no marks, you must either award NR (no response) or 0, as follows:
Award NR (no response) if:
 - Nothing is written at all in the answer space
 - There is any comment which does not in any way relate to the question being asked ("can't do", "don't know", etc.)
 - There is any sort of mark that is not an attempt at the question (a dash, a question mark, etc.)Award 0 if:
 - There is any attempt that earns no credit. This could, for example, include the candidate copying all or some of the question, or any working that does not earn any marks, whether crossed out or not.
- 10 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.

J512/02 MARK SCHEME AND RATIONALE JANUARY 2011

General comments

- Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen. E.g. answer on 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.
- Anything in the mark scheme which is in brackets (...) is not required for the mark to be earned, but if present it must be correct.
- Ranges of answers given in the mark scheme are always inclusive.
- Where you see **oe** in the mark scheme it means **or equivalent**.
- Where you see **isw** in the mark scheme it means **ignore subsequent working** (after correct answer obtained), provided the method has been completed.
- Where you see **cao** in the mark scheme it means **correct answer only**.
- Where you see **soi** in the mark scheme it means **seen or implied**.
- Where you see **www** in the mark scheme it means **without wrong working**.
- 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.
- Figs: for example **figs 237** means any answer with just these digits with leading or trailing zeros disregarding any decimal point. E.g. 237000, 2.37, 2.370, 0.00237 but not 23070 or 2374.

1	(a)	8	2	M1 for $10 \div 1.15$ or $8.6(\dots)$ or 8.7 seen or $8 \times 1.15 = 9.2$	
	(b)	£4.85 or 485p clearly labelled	2	M1 for $9.70 \div 2$ or $9.70 \times 0.5(00)$	Ignore p(ence) sign eg £4.85p etc
	(c)	£7.65 or 765p clearly labelled	2	M1 for $750 \div 250 = 3$	
	(d)	£7.02 or 702p clearly labelled	2	M1 for 11.70×0.6 oe or figs702 seen	
2	(a)	(i) 12	1		
		(ii) 6	1		
	(b)	7	1		
	(c)	(i) Isosceles	1		Ignore spelling
		(ii) 8	1		
3	(a)	Unlikely	1		
	(b)	Impossible	1		
	(c)	Evens	1		
4	(a)	Parallel	1		
	(b)	(i) (1, 3)	1		
		(ii) (-4, -2)	1		
	(c)	(i) (3, 4)	1		
		(ii) (1, 0.5) or (1, 1/2) Midpoint marked correctly (by eye)	1 1	For y coordinate accept any number in the range 0.3 to 0.7 oe	
	(d)	Line drawn perpendicular to the line AB	1	Straight line $\pm 5^\circ$	

5	(a)	8	1		
	(b)	9	1		
	(c)	Sensible correct comparison	1	<p>Figures on their own are not enough there needs to be some form of explanation, interpreting the figures.</p> <p>Any figures used must be correct. Ignore figures on diagram.</p> <p>Ignore any incorrect/irrelevant statements with a correct statement.</p>	<p><u>Examples:</u> There are more boys than girls (overall). There are more boys than girls in every year except Year 7. There are a lot more boys than girls in Year 10. The number of boys stays about the same, but the number of girls decreases. There are 6 more boys than girls 43 boys, 37 girls so difference = 6 (43 boys and 37 girls on their own is not good enough)</p>
6	(a)	24 cm ³ or cubic cm etc	1 1		24 ³ is 1,0
	(b)	1.6	2	M1 for $480 \div (12 \times 25)$	Do not accept $480 \div 12 \times 25$ for method mark
7		135 isw or 2 hours 15 (minutes) or 2.25 hours	2	M1 for 50×2.3 or 115	Do not accept 2.15
8		1.4 m	4	<p>M3 for $4.2 \div 3$ or $(11 - (4 \times 1.7)) \div 3$ or answer of 1.4 embedded and incorrect answer given Or M2 for $11 - 6.8$ or $11 - (4 \times 1.7)$ or sight of 4.2 Or M1 for 4×1.7 or sight of 6.8</p>	May be done in stages

9	(a)	(i) -8	1		
		(ii) Taking away (subtracting) 3	1	Condone – 3 or minus 3 or $-5 - 3 = -8$ on answer line	Do not accept: difference of 3 between each number or $n - 3$ in any form
	(b)	(i) 16	1		
		(ii) Adding on 1 more each time	1	Adding 5 implies adding 1 more each time	Accept: next number will have a difference of 5 or going up by 1, 2, 3, 4, 5 each time (must mention 5)
10	(a)	$n + 10$	1	Accept $10 + n$	Accept $J(ake) = n + 10$ but not $N(n) = n + 10$ etc
	(b)	$2n$	1	Accept $2 \times n$, $n \times 2$, $n2$, $n + n$	Accept $L(uke) = 2n$ but not $N(n) = 2n$ etc
	(c)	$4n + 10$ or $4 \times n + 10$ or $n \times 4 + 10$	2	M1 for $n + n + 10 + 2n$ (for adding <i>their</i> three expressions) or $n^4 + 10$ SC1 for $3n + 10$ or $n \times 3 + 10$ or $3 \times n + 10$ (but not $n^3 + 10$)	Accept $T(otal) = 4n + 10$ but not $N(n) = 4n + 10$ etc In all parts accept n replaced by N (but no other letter)
11	(a)	3 and 11	2	1 mark for each B1 for both correct answers and 1 incorrect answer	1 correct and 1 incorrect, no marks
	(b)	1, 2, 4, 5, 10, 20	2	B1 for 4 or 5 correct or 5 or 6 correct and 1 incorrect	Accept 1×20 , 2×10 , 4×5
	(c)	(i) 3, 23	1	Either order	Accept 3×23
		(ii) 5, 17	1	Either order	Accept 5×17

12	(a)	(i) 5.4	1		
		(ii) 4.4 to 4.5	1		
	(b)	(i) 14.2 to 14.6	1		
		(ii) Read the conversion for 16 pounds and doubled it	1	Accept any sensible, correct equivalent. Readings from the graph do not need to be correct.	Can be numerical for example £20 = 9kg + £12 = 5.4 kg 14.4 kg

13	(a)	(i) 86 www	3	<p>M2 for $(89+87+88+89+84+81+84) \div 7$ or $602 \div 7$</p> <p>Or M1 for $89+87+88+89+84+81+84$ soi or sight of 602</p> <p>or adding at least 6 correct figures then dividing the result by 7</p> <p>SC1 530</p>	
		(ii) 8	1		
	(b)	<p>Pulse rates in the second week are lower oe</p> <p>Pulse rates in the second week are less spread out (more consistent) oe</p>	<p>1</p> <p>1</p>	<p>Strict FT from their mean and range in terms of increase or decrease</p> <p>B1 for a correct statement interpreting the mean pulse rate compared in both weeks</p> <p>B1 for a correct statement interpreting the range of the pulse rates compared in both weeks, must allude to the spread of the data</p> <p>If two statements have been written both referring to the mean (or the range), mark the better statement for 1 mark.</p>	<p>Ignore figures</p> <p>Accept</p> <p>'Pulse rate has gone down' (from the first to the second week is implicit)</p> <p>'They have got lower' (minimum)</p> <p>'Her pulse rates are very similar in both weeks there is only a difference of 3 in her mean pulse rate'</p> <p>'Range is smaller in the last week, her pulse rates were quite close'</p> <p>Do not accept</p> <p>'Mean has decreased by 3' on its own as there is no interpretation</p>

14	(a)	12 correct combinations	2	B1 for 9 or 10 new correct combinations Ignore repeats.	T replaced by another letter consistently is OK
	(b)	(i) $\frac{1}{12}$ oe	1	FT from <i>their</i> answer to (a) ignoring repeats.	No marks for ratios in (b) Accept 0.08(3...) ie 2dp or better
		(ii) $\frac{3}{12}$ (isw) or $\frac{1}{4}$ or $\frac{6}{24}$ or 0.25	1	FT from <i>their</i> answer to (a) providing there is more than 1 combination SC1 (b)(i) 1 in (out of) 12 and (ii) 3 in (out of) 12 or 1 in (out of) 4 or SC1 1/11 and 3/11	
15	(a)	Correct enlargement	2	B1 for 3 lines correctly enlarged	
	(b)	Correct shape	3	B2 Correct shape except for 1 error (this can be repeated) Or B1 for 1 correct new quarter of the diagram	
16	(a)	11.28 or $11\frac{7}{25}$	2	M1 for $16.9(2) \div 1.5$ or $\frac{282}{25}$ If M0 then SC1 for 11.3	
	(b)	0.38	2	B1 for 0.37(7...) seen	

17		<p>Maths English Science or 63 65 66 (or 65.7(1...))</p>	<p>3</p> <p>B3 for (English) 65 and (Science) 66 or 65.7(1...) (or 65 with figs 657 seen) Or B2 for 65 or 66 or 65.7(1...) Or M1 13 ÷ 20 or 23 ÷ 35 or 0.65(...) or 0.66 seen or 13/20 = 65/100 oe</p> <p>B1</p> <p>B1 ordering <i>their</i> values, dependent on scoring at least 2 above. But if B3 obtained, it must have an answer of Maths, English, Science or 63, 65, 66 (or 65.7 or both).</p>	<p>For M1 there must be a clear, method that would lead to a correct percentage</p>																		
18	(a)	<table border="0" style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">3</td> <td style="padding-left: 5px;">4 4</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">4</td> <td style="padding-left: 5px;">6</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">5</td> <td style="padding-left: 5px;">4 7 9</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">6</td> <td style="padding-left: 5px;">1 3 8</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">7</td> <td style="padding-left: 5px;">0 3 7 9</td> <td></td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">8</td> <td style="padding-left: 5px;">1 4</td> <td style="padding-left: 20px;">cao</td> </tr> </table> <p>Any correct numerical key eg 6 3 = 63 (°F)</p>	3	4 4		4	6		5	4 7 9		6	1 3 8		7	0 3 7 9		8	1 4	cao	<p>2</p> <p>M1 for complete unordered stem & leaf or ordered stem & leaf with up to & including 3 errors/omissions</p> <p>1</p> <p>If M0 then SC1 for stem written 30, 40, 50 ... with <u>all</u> leaves correct and matching key eg 60 3 = 63 (°F)</p>	<p>Take care the 4, as in 34, may be crossed out and replaced by 7, as in 57 in their working for part (b) Or may see 7 as in 57 added as their working for part (b) Must clearly see this to award both marks</p>
3	4 4																					
4	6																					
5	4 7 9																					
6	1 3 8																					
7	0 3 7 9																					
8	1 4	cao																				
	(b)	<p>(Mode) increase (by 23) (to 57) (from 34)</p> <p>(Median) unchanged / stays the same</p>	<p>1</p> <p>If numbers quoted they need to be correct</p> <p>1</p> <p>If number quoted it needs to be correct</p>	<p>Allow <u>change from 34 to 57</u>, not just the mode becomes or is 57 Just 34, 57 seen without words indicating increase or change scores <u>no</u> marks</p> <p>Stays as 63</p>																		

19	(a)	100	1		Do not accept $100/5 = 20$ alone
	(b)	6 www	3	<p>M2 for $3p - p = 18 - 6$ oe Or SC2 $3 \times 6 + 6 = 6 + 18$ seen</p> <p>Or M1 subtracting p or 6 from both sides Or SC1 $3 \times 6 = 18 + 6 = 24$ and $6 + 18 = 24$ seen</p>	<p>Look out for $4p=24$ $p=6$ which scores no marks</p> <p>Implied by sight of $2p$ on LHS as only term in p in an equation (or $-2p$ on RHS of equation) or Implied by sight of 12 on RHS as only constant term in an equation (or -12 on LHS of equation)</p>
20	(a)	157488 Allow 157500 or 157000 www	3	<p>M2 for 81600×1.93 or $81600 + (81600 \times 0.93)$ Or M1 for 81600×0.93 or 75888 or $81600 + \text{their}75888$</p>	<p>May be done in stages If full correct method followed by subtracting 81600 award M2 If full correct method followed by other working, method spoilt award M0</p>
	(b)	60.3(...) www Accept 60 if obtained from non T&I method If T&I method allow 60 only if 60.3(...) or 160.3(...) seen in working	3	<p>M2 for $(81600 - 50900) \div 50900 \times 100$ or $(81600 \div 50900) - 1$ or $(81600 \div 50900) (\times 100) - 100$ or 160.3(...) seen Or M1 for $(81600 - 50900) \div 50900$ or $81600 \div 50900$ or $(81600 \div 50900) \times 100$ or 160 For T&I method leading to an answer 60.(...) award SC1</p>	<p>May be done in stages</p>

21	(a)	10.5	1		
	(b)	$14^2 + \text{their}10.5^2$ or 306.25 $\sqrt{14^2 + \text{their}10.5^2}$ 17.5	M1 M1 A1	dep on first M1 dep on both method marks	

<p>22</p>	<p>Correct trial from 2 to 3 inclusive Improved correct trial to 1dp or better</p>	<p>M1 M1</p> <p>Improved trial means a further trial which does give an answer closer to 7</p> <p>For both M and A marks: Trials <u>must</u> be evaluated Allow rounding or truncating to 1dp or better Condone missing .0</p> <p>A1</p> <p>Two correct trials between 2.25 and 2.3(5) inclusive that give answers below 7 & above 7</p>	<p>M1 M1</p> <p>Improved trial means a further trial which does give an answer closer to 7</p> <p>For both M and A marks: Trials <u>must</u> be evaluated Allow rounding or truncating to 1dp or better Condone missing .0</p> <p>A1</p> <p>Dependent on both M marks only</p>	<p>Condone 2.2 if 2.3 is first trial</p> <p>Allow correct trials 2.2 and 2.3 with numerical explanation that 2.3 gives a closer answer than 2.2</p> <table border="0"> <tr> <td>Trial</td> <td>Result:</td> </tr> <tr> <td>2</td> <td>4</td> </tr> <tr> <td>2.1</td> <td>5.061</td> </tr> <tr> <td>2.2</td> <td>6.248</td> </tr> <tr> <td>2.25</td> <td>6.89....</td> </tr> <tr> <td>2.26</td> <td>7.02...</td> </tr> <tr> <td>2.27</td> <td>7.157...</td> </tr> <tr> <td>2.28</td> <td>7.29...</td> </tr> <tr> <td>2.29</td> <td>7.4...</td> </tr> <tr> <td>2.3</td> <td>7.567</td> </tr> <tr> <td>2.4</td> <td>9.024</td> </tr> <tr> <td>2.5</td> <td>10.625</td> </tr> <tr> <td>2.6</td> <td>12.376</td> </tr> <tr> <td>2.7</td> <td>14.283</td> </tr> <tr> <td>2.8</td> <td>16.352</td> </tr> <tr> <td>2.9</td> <td>18.589</td> </tr> <tr> <td>3</td> <td>21</td> </tr> </table> <p>It is possible to award M1 M1 A0 A1 It is not possible to award M1 M0 A0 A1 or M1 M0 A1A1 or M1 M0 A1 A0</p>	Trial	Result:	2	4	2.1	5.061	2.2	6.248	2.25	6.89....	2.26	7.02...	2.27	7.157...	2.28	7.29...	2.29	7.4...	2.3	7.567	2.4	9.024	2.5	10.625	2.6	12.376	2.7	14.283	2.8	16.352	2.9	18.589	3	21
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