

2006 Mathematics

Standard Grade Credit

Finalised Marking Instructions

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Special Instructions

- 1 The main principle in marking scripts is to give credit for the skills which have been demonstrated. Failure to have the correct method may not preclude a pupil gaining credit for the calculations involved or for the communication of the answer.

Care should be taken to ensure that the mark for any question or part question is entered in the correct column, as indicated by the horizontal line.

Where a candidate has scored zero marks for any question attempted, "0" should be shown against the answer in the appropriate column.

It is of great importance that the utmost care should be exercised in adding up the marks. Where appropriate, all summations for totals and grand totals must be carefully checked.

- 2 The answer to one part, correct **or incorrect** must be accepted as a basis for subsequent dependent parts of a question. Full marks in the dependent part is possible if it is of equivalent difficulty.

- 3 Do not penalise insignificant errors. An insignificant error is one which is significantly below the level of attainment being assessed.

eg An error in the calculation of $16 + 15$ would not be penalised at Credit Level.

- 4 Working after a correct answer should **only** be taken into account if it provides **firm** evidence that the requirements of the question have not been met.

- 5 In certain cases an error will ease subsequent working. **Full** credit cannot be given for this subsequent work but **partial** credit may be given.

- 6 Accept answers arrived at by inspection or mentally, where it is possible for the answer to have been so obtained.

- 7 Do not penalise omission or misuse of units unless marks have been specifically allocated to units.

- 8 A wrong answer without working receives no credit unless specifically mentioned in the marking scheme.

The rubric on the outside of the Papers emphasises that working must be shown. In general markers will only be able to give credit to partial answers if working is shown. However there may be a few questions where partially correct answers unsupported by working can still be given some credit. **Any such instances will be stated in the marking scheme.**

- 9 Acceptable alternative methods of solution can only be given the marks specified, ie a more sophisticated method cannot be given more marks.

Note that for some questions a method will be specified.

- 10 In general do not penalise the same error twice in the one question.

- 11 Accept legitimate variations in numerical/algebraic questions.

- 12 Do not penalise bad form eg $\sin x^0 = 0.5 = 30^0$.

- 13 A transcription error is not normally penalised except where the question has been simplified as a result.

2006 Mathematics SG – Credit Level – Paper 1

Marking Instructions

Award marks in whole numbers only

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
1	Ans: 6·4 <ul style="list-style-type: none">• knowing correct order of operations• carrying out both calculations	<ul style="list-style-type: none">• 50• 6·4 <p style="text-align: right;">2 KU</p>
Notes: <ul style="list-style-type: none">(i) For an answer of 6·4 without working award 2/2(ii) For an answer of 2206 without working award 1/2(iii) For an answer of 50 without working award 1/2(iv) For any other answer without working award 0/2		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
2	<p>Ans: $4\frac{6}{35}$ (or $\frac{146}{35}$)</p> <ul style="list-style-type: none"> • finding a fraction with a common denominator • carrying out all calculations 	<ul style="list-style-type: none"> • $\frac{41}{35}$ or $\frac{56}{35}$ or $\frac{90}{35}$ • $\frac{146}{35}$ or equivalent <p style="text-align: right;">2 KU</p>
<p>Notes:</p> <p>(i) For an answer of $3\frac{41}{35}$ award 1/2</p>		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
3	<p>Ans: -5</p> <ul style="list-style-type: none"> • substitution • correct evaluation 	<ul style="list-style-type: none"> • $4 - (-3)^2$ • -5 <p style="text-align: right;">2 KU</p>
<p>Notes:</p> <ul style="list-style-type: none"> (i) For a correct answer of -5 without working award 2/2 (ii) For an answer of 13 without working award 1/2 		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
4	<p>Ans: $y = \frac{2}{3}x + 8$</p> <ul style="list-style-type: none"> • gradient • y–intercept • correct equation 	<ul style="list-style-type: none"> • $\frac{2}{3}$ (or equivalent) • 8 • $y = \frac{2}{3}x + 8$ <p style="text-align: right;">3 KU</p>
<p>Notes:</p> <p>(i) For a correct equation without working award 3/3.</p> <p>(ii) To gain the third mark, the equation must be consistent with the gradient and the y–intercept calculated.</p> <p>(iii) For an answer of $y = \frac{2}{3}x$ award 1/3 unless the y–intercept has been explicitly marked as zero in which case award 2/3.</p> <p>(iv) An answer of $y = \frac{2}{3}x + c$ cannot be awarded the third mark.</p>		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
5 (a)	Ans: $(2x - y)(2x + y)$ <ul style="list-style-type: none"> • factorising 	<ul style="list-style-type: none"> • $(2x - y)(2x + y)$ <p style="text-align: right;">1 KU</p>
Notes:		
(b)	Ans: $\frac{2x - y}{3}$ <ul style="list-style-type: none"> • factorising denominator • consistent simplification 	<ul style="list-style-type: none"> • $3(2x + y)$ • $\frac{2x - y}{3}$ <p style="text-align: right;">2 KU</p>
Notes: (i) The second mark can be awarded only if simplification is consistent with part (a).		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
6	<p>Ans: -10</p> <ul style="list-style-type: none"> • expanding brackets • collecting terms • consistent solution 	<ul style="list-style-type: none"> • $-2x - 2$ • $-x = 10$ • $x = -10$ <p style="text-align: right;">3 KU</p>
<p>Notes:</p> <ul style="list-style-type: none"> (i) The second mark cannot be awarded if the collection of terms involves only constants. (ii) The third mark can be awarded only if the candidate has correctly dealt with a negative coefficient of x. 		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
7	<p>Ans: 540 ml</p> <ul style="list-style-type: none"> • linear scale factor • volume scale factor • method • solution 	<ul style="list-style-type: none"> • $\frac{3}{2}$ or $\frac{21}{14}$ • $\frac{27}{8}$ or $\left(\frac{3}{2}\right)^3$ • $\frac{27}{8} \times 160$ • 540 <p style="text-align: right;">4 KU</p>
<p>Notes:</p> <p>(i) For candidates who use a 'linear' scale factor, marks 2 and 4 are not available.</p> <p>(ii) For candidates who use an 'area' scale factor, mark 2 is not available.</p>		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
8	<p>Ans: $y = (x - 1)^2 - 4$</p> <ul style="list-style-type: none"> • horizontal displacement • vertical displacement 	<ul style="list-style-type: none"> • $(x - 1)^2$ • - 4 <p style="text-align: right;">2 RE</p>
Notes:		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
9 (a)	Ans: $x + y = 20$ <ul style="list-style-type: none"> • equation 	<ul style="list-style-type: none"> • $x + y = 20$ <p style="text-align: right;">1 KU</p>
Notes:		
(b)	Ans: $5x + 2y = 79$ <ul style="list-style-type: none"> • terms • equation 	<ul style="list-style-type: none"> • $5x$ and $2y$ • $5x + 2y = 79$ <p style="text-align: right;">2 RE</p>
Notes:		
(c)	Ans: 13 <ul style="list-style-type: none"> • evidence of scaling • eliminating • solution 	<ul style="list-style-type: none"> • $2x + 2y = 40$ or $5x + 5y = 100$ • $x = 13$ or $y = 7$ • $x = 13$ <p style="text-align: right;">3 RE</p>
Notes: <ul style="list-style-type: none"> (i) For 13 without working award 0/3. (ii) For 13 verified in both equations award 1/3. 		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
10 (a)	Ans: 150 m² <ul style="list-style-type: none"> • calculation 	<ul style="list-style-type: none"> • 150 <p style="text-align: right;">1 KU</p>
Notes:		
(b)	Ans: 12 m <ul style="list-style-type: none"> • equating expressions • consistent substitution • consistent solution 	<ul style="list-style-type: none"> • $\frac{1}{2} \times AC \times BD = 150$ • $\frac{1}{2} \times 25 \times BD = 150$ • 12 <p style="text-align: right;">3 RE</p>
Notes:		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
11 (a)	Ans: $3x$ <ul style="list-style-type: none"> • expression 	<ul style="list-style-type: none"> • $3x$ <p style="text-align: right;">1 RE</p>
Notes:		
(b)(i)	Ans: £38 <ul style="list-style-type: none"> • evaluation 	<ul style="list-style-type: none"> • 38 <p style="text-align: right;">1 KU</p>
(ii)	Ans: $2x + 8$ (or $20 + 2(x - 6)$) <ul style="list-style-type: none"> • starting expression • expression 	<ul style="list-style-type: none"> • $(x - 6)$ • $20 + 2(x - 6)$ <p style="text-align: right;">2 RE</p>
Notes:		
(c)	Ans: 9 <ul style="list-style-type: none"> • inequality • solving inequality • solution 	<ul style="list-style-type: none"> • $2x + 8 < 3x$ • $x > 8$ • 9
	<ul style="list-style-type: none"> • Trial and check method: 	<ul style="list-style-type: none"> • using at least 3 trials • two trials must be for 8 and 9 • explicit statement of solution <p style="text-align: right;">3 RE</p>
Notes:		
(i) An answer of 9 without working is awarded 0/3		

KU 22 marks
RE 16 marks

[END OF PAPER 1 MARKING INSTRUCTIONS]

2006 Mathematics SG – Credit Level – Paper 2

Marking Instructions

Award marks in whole numbers only

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
1	<p>Ans: $3 \cdot 12 \times 10^8$ km</p> <ul style="list-style-type: none"> • substitution • calculation • scientific notation 	<ul style="list-style-type: none"> • $\pi \times 2 \times 4 \cdot 96 \times 10^7$ • 311 645 991 • $3 \cdot 12 \times 10^8$ <p style="text-align: right;">3 KU</p>
<p>Notes:</p> <ul style="list-style-type: none"> (i) Allow legitimate variations for π. (ii) For $3 \cdot 12 \times 10^8$ without working, award 3/3 (iii) For $1 \cdot 56 \times 10^8$ without working, award 2/3 (iv) For $7 \cdot 73 \times 10^{15}$ without working, award 2/3 (v) For any other incorrect answer, the third mark is only available if that answer has first been expressed in full. (vi) For any other answer without working, award 0/3 		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
2 (a)	<p>Ans: 76.5, 6.75</p> <ul style="list-style-type: none"> • mean • method • process/solution 	<ul style="list-style-type: none"> • 76.5 • $\sqrt{\frac{35341 - \frac{459^2}{6}}{5}}$ or equivalent • 6.75 <p style="text-align: right;">3 KU</p>
<p>Notes:</p> <p>(i) An answer without working which can be rounded to 6.75 may be awarded the 2nd and 3rd marks.</p>		
(b)	<p>Ans: valid comments</p> <ul style="list-style-type: none"> • comparing means • comparing standard deviations 	<ul style="list-style-type: none"> • the children's pulse rates tend to be higher • there is less variation in the children's pulse rates <p style="text-align: right;">2 RE</p>
<p>Notes:</p> <p>(i) Statements must show understanding of the concept. eg: "children have a higher pulse rate" is acceptable <u>but</u> "children have a higher mean" is not acceptable.</p>		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
3	<p>Ans: £300</p> <ul style="list-style-type: none"> • valid strategy • process • solution 	<ul style="list-style-type: none"> • 108% = 324 • division by 1.08 • 300 <p style="text-align: right;">3 KU</p>
<p>Notes:</p> <ul style="list-style-type: none"> (i) For £300 without working award 3/3 (ii) For £298.08 (324×0.92) with or without working award 0/3 (iii) For £349.92 (324×1.08) with or without working award 0/3 		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
4 (a)	Ans: $3x^2 + 11x - 4$ <ul style="list-style-type: none"> • expression 	<ul style="list-style-type: none"> • $3x^2 + 11x - 4$ <p style="text-align: right;">1 KU</p>
Notes:		
(b)	Ans: $2m^{\frac{1}{2}} + m^{\frac{5}{2}}$ <ul style="list-style-type: none"> • first term • second term 	<ul style="list-style-type: none"> • $2m^{\frac{1}{2}}$ • $m^{\frac{5}{2}}$ <p style="text-align: right;">2 KU</p>
Notes:		
(c)	Ans: $\sqrt{5}$ <ul style="list-style-type: none"> • simplifying surd • subtraction 	<ul style="list-style-type: none"> • $\sqrt{20} = 2\sqrt{5}$ • $\sqrt{5}$ <p style="text-align: right;">2 KU</p>
Notes:		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
5	<p>Ans: 11.3°</p> <ul style="list-style-type: none"> • valid strategy • process • valid strategy • solution 	<ul style="list-style-type: none"> • use of Pythagoras • 10 • use of trigonometry • 11.3° <p style="text-align: right;">4 KU</p>
<p>Notes:</p> <p>(i) When MR is taken as 12 instead of 6, MS is 14.42 and the required angle is 7.89°. This may be awarded 3/4 (marks 1, 3 and 4)</p> <p>(ii) Candidates who use MS = 8 may be awarded the last two marks for</p> <ul style="list-style-type: none"> • $\tan x = \frac{2}{8}$ • 14° <p>(iii) Do not penalise candidates who work in radians or grads.</p>		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
6 (a)	Ans: 124° <ul style="list-style-type: none"> • strategy • consistent solution 	<ul style="list-style-type: none"> • $\angle BCN = 50^\circ$ • 124° <p style="text-align: right;">2 RE</p>
Notes: <ul style="list-style-type: none"> (i) For an answer of 124° with or without working award 2/2. (ii) Any other answer must be consistent with working to obtain the second mark. 		
(b)	Ans: 305 m <ul style="list-style-type: none"> • strategy • substitution • solution • consistent rounding 	<ul style="list-style-type: none"> • appropriate use of cosine rule • $b^2 = 110^2 + 230^2 - 2 \times 110 \times 230 \cos 124^\circ$ • 305.44 • 305 <p style="text-align: right;">4 RE</p>
Notes: <ul style="list-style-type: none"> (i) Within the correct solution, 305.44 need not be stated to gain full marks. (ii) For a wrong answer, the final mark is awarded only for an explicit rounding. (iii) Evaluating $14400 \cos 124^\circ$ loses the last two marks. (iv) Do not penalise candidates who work in radians or grads. 		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark																				
7 (a)	Ans: 504 cm³ <ul style="list-style-type: none"> • solution 	<ul style="list-style-type: none"> • 504 <p style="text-align: right;">1 KU</p>																				
Notes:																						
(b)	Ans: 327 cm <ul style="list-style-type: none"> • stating radius • consistent substitution • rearranging • solution 	<ul style="list-style-type: none"> • 0.7 cm • $504 = \pi \times 0.7^2 \times h$ • $\frac{504}{\pi \times 0.7^2}$ • 327 cm <p style="text-align: right;">4 RE</p>																				
Notes:																						
(i) <table border="1" data-bbox="368 1160 963 1346" style="margin-left: 40px;"> <thead> <tr> <th>Radius</th> <th>Volume</th> <th>Length</th> <th>Award</th> </tr> </thead> <tbody> <tr> <td>7 mm</td> <td>504 000</td> <td>3274 (mm)</td> <td>4/4</td> </tr> <tr> <td>7 mm</td> <td>5040</td> <td>32.7 (mm)</td> <td>3/4</td> </tr> <tr> <td>14 mm</td> <td>504 000</td> <td>818.5 (mm)</td> <td>3/4</td> </tr> <tr> <td>1.4 cm</td> <td>504</td> <td>81.85 (cm)</td> <td>3/4</td> </tr> </tbody> </table>			Radius	Volume	Length	Award	7 mm	504 000	3274 (mm)	4/4	7 mm	5040	32.7 (mm)	3/4	14 mm	504 000	818.5 (mm)	3/4	1.4 cm	504	81.85 (cm)	3/4
Radius	Volume	Length	Award																			
7 mm	504 000	3274 (mm)	4/4																			
7 mm	5040	32.7 (mm)	3/4																			
14 mm	504 000	818.5 (mm)	3/4																			
1.4 cm	504	81.85 (cm)	3/4																			
(ii) For candidates who use πd , marks 1 and 2 are not available.																						

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
8	<p>Ans: 2230 grams</p> <ul style="list-style-type: none"> • valid strategy • length of arc • scaling • solution 	<ul style="list-style-type: none"> • $\frac{284}{360}$ • 44.6 • knowing to $\div 2$ and $\times 100$ • 2230 <p style="text-align: right;">4 RE</p>
<p>Notes:</p> <p>(i) Last mark can be awarded only if calculation involves π.</p>		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
9 (a)	Ans: 14 <ul style="list-style-type: none"> • substitution • solution 	<ul style="list-style-type: none"> • $\frac{1}{2} \times 7 \times (7 - 3)$ • 14 <p style="text-align: right;">2 KU</p>
Notes: <p>(i) For an answer of 14 without working award 2/2.</p>		
(b)	Ans: proof <ul style="list-style-type: none"> • equating • rearranging 	<ul style="list-style-type: none"> • $65 = \frac{1}{2}n(n - 3)$ • $n^2 - 3n - 130 = 0$ <p style="text-align: right;">2 RE</p>
Notes:		
(c)	Ans: 13 <ul style="list-style-type: none"> • factorising • solving • rejecting negative value 	<ul style="list-style-type: none"> • $(n - 13)(n + 10)$ • 13, -10 • 13 <p style="text-align: right;">3 RE</p>
Notes: <p>(i) The second mark is awarded only when both answers are shown.</p> <p>(ii) When the given quadratic produces two invalid solutions, the 3rd mark may be awarded for a statement such as “no such polygon exists”.</p> <p>(iii) For an answer of 13 justified by substitution award 1/3.</p> <p>(iv) For an answer of 13 without working award 0/3.</p>		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
10 (a)	Ans: 3.87 metres <ul style="list-style-type: none"> • substitution • solution 	<ul style="list-style-type: none"> • $-31\cos 20^\circ + 33$ • 3.87 <p style="text-align: right;">2 KU</p>
Notes: <p>(i) For an answer of 3.87 with or without working award 2/2.</p>		
(b)	Ans: 150.6 seconds <ul style="list-style-type: none"> • equation • rearranging • solution 	<ul style="list-style-type: none"> • $60 = -31\cos t^\circ + 33$ • $\cos t^\circ = -\frac{27}{31}$ • 150.6 <p style="text-align: right;">3 RE</p>
Notes: <p>(i) If $31 \cos t^\circ$ is used in part (a) there is no further penalty in part (b).</p>		
(c)	Ans: 209.4 seconds <ul style="list-style-type: none"> • consistent solution 	<ul style="list-style-type: none"> • 209.4 <p style="text-align: right;">1 RE</p>
Notes: <p>(i) Solution must be consistent with part (b).</p>		

Question No	Give 1 mark for each	Illustrations of evidence for awarding each mark
11(a)	Ans: $(3 + x)$cm <ul style="list-style-type: none"> • expression 	<ul style="list-style-type: none"> • $3 + x$ <p style="text-align: right;">1 RE</p>
Notes:		
(b)	Ans: proof Method 1: <ul style="list-style-type: none"> • strategy • cross-multiplication • proof 	<ul style="list-style-type: none"> • $\frac{PQ}{8} = \frac{3 + x}{6}$ • $6PQ = 8(3 + x)$ • $4 + \frac{4}{3}x$
	Method 2: <ul style="list-style-type: none"> • strategy • application • proof 	<ul style="list-style-type: none"> • Scale Factor = $\frac{3 + x}{6}$ • $\left(\frac{3 + x}{6}\right) \times 8$ • $4 + \frac{4}{3}x$
	Method 3: <ul style="list-style-type: none"> • strategy • application • communication 	<ul style="list-style-type: none"> • substitution of $4 + \frac{4}{3}x$ into a correct equation • cross-multiplication • $PQ = 4 + \frac{4}{3}x$ <p style="text-align: right;">3 RE</p>
Notes:		

KU 23 marks
RE 29 marks

Final KU 45 Totals RE 45

[END OF PAPER 2 MARKING INSTRUCTIONS]