2010 Mathematics

Standard Grade − Credit

Paper 1 and Paper 2

Finalised Marking Instructions

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 $\sin x^0 = 0{\cdot}5 = 30^0$.

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

14 When multiple solutions are presented by the candidate and it is not clear which is intended to be the final one, mark all attempts and award the lowest mark.

2010 Mathematics SG – Credit Level – Paper 1

Draft Marking Instructions

Award marks in whole numbers only

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
1	**Ans: £2·79** • knowing correct order of operations • carrying out both calculations	• 4·60 • 2·79 **2KU**
NOTES: (i) for 2·79, with or without working — award 2/2 (ii) for 3·876, 3·88 or 3·87, with or without working — award 1/2		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
2	**Ans:** $\frac{4}{11}$ • valid strategy • correct calculation	• $\frac{2}{5}\times\frac{10}{11}$ • $\frac{4}{11}$ or equivalent **2KU**

NOTES:

(i) alternative valid strategies for first mark:

- $\frac{4}{10}\div\frac{11}{10}$
- $\frac{0\cdot4}{1\cdot1}$

(ii) for $\frac{2}{5}\times\frac{11}{10}=\frac{22}{50}$

or $\frac{5}{2}\times\frac{11}{10}=\frac{55}{20}$

or $\frac{5}{2}\times\frac{10}{11}=\frac{50}{22}$ award 1/2

(iii) for $\frac{4}{11}=2\frac{3}{4}$ or $2\frac{3}{11}$ award 1/2

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
3	**Ans:** $\boldsymbol{s = \frac{2t-4}{7}}$ • beginning to rearrange • continuing to rearrange • completed rearrangement	 • $7s + 4 = 2t$ • $7s = 2t - 4$ • $s = \frac{2t-4}{7}$ **3KU**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
4 (a)	**Ans: proof** • forming equation • rearranging	 • $x^2 - 4x = 2x + 7$ • $x^2 - 6x - 7 = 0$ **2RE**
NOTES:		
(b)	**Ans: $x = -1$, $x = 7$** • factorising • solution	 • $(x+1)(x-7)$ • $-1, 7$ **2RE**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
5 (a)	**Ans:** $\frac{5}{9}$ • probability	• $\frac{5}{9}$ or equivalent **1KU**
NOTES:		
(b)	**Ans: 15** • solution	• 15 **1RE**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
6	**Ans: 750 grams** • valid strategy • processing • solution	 • $120\% = 900$ • $20\% = 150$ or similar • 750 **3KU**

NOTES:

(i) for 750 with or without working — award 3/3

(ii) for 720 $(80\% \text{ of } 900)$ with or without working — award 0/3

(iii) for 1080 $(120\% \text{ of } 900)$ with or without working — award 0/3

(iv) caution: some candidates state 120% = 900 but follow this as note (ii) or (iii); in these cases, the 1st mark is still available

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
7 (a)	**Ans:** $\mathbf{2m + c = 7}$ • equation	• $2m + c = 7$ **1KU**
(b)	**Ans:** $\mathbf{4m + c = 17}$ • equation	• $4m + c = 17$ **1KU**
NOTES: (i) marks can only be awarded for equations in terms of m and c		
(c)	**Ans:** $\mathbf{m = 5, c = -3}$ • method • value of m • value of c	• $2m = 10$ or similar • 5 • -3 **3RE**
NOTES: (i) accept alternative methods eg $m = \frac{17 - 7}{4 - 2}$ or graphical solution		
(d)	**Ans:** **5** • gradient	• 5 **1RE**
NOTES: (i) the final mark is awarded for either the correct gradient (5) or the value of m from part (c)		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
8 (a)	**Ans: 6** • simplifying	• 6 **1KU**
NOTES:		
(b)	**Ans: $4\sqrt{2}$** • simplifying	• $4\sqrt{2}$ **1KU**
NOTES:		
(c)	**Ans: $\frac{3\sqrt{2}}{4}$** • rationalise denominator • simplification	• $\frac{6}{4\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ • $\frac{3\sqrt{2}}{4}$ **2KU**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
9 (a)	**Ans:** **B$(-6, 0)$** • starting to solve • coordinates of B	• $\frac{1}{3}x + 2 = 0$ • $(-6, 0)$ **2KU**
NOTES: (i) for $(-6, 0)$ with or without working — award 2/2 (ii) for $(0, -6)$ with or without working — award 1/2 (iii) answer must be in co-ordinate form		
(b)	**Ans:** $x < -6$ • solution	• $x < -6$ **1RE**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
10 (a)	**Ans:** $\dfrac{\mathbf{5^2 \times 6^2}}{\mathbf{4}}$ • solution	• $\dfrac{5^2 \times 6^2}{4}$ **1RE**
NOTES:		
(b)	**Ans:** $\dfrac{\boldsymbol{n^2(n+1)^2}}{\mathbf{4}}$ • starting expression • solution	• n and $n+1$ • $\dfrac{n^2(n+1)^2}{4}$ **2RE**
NOTES:		
(c)	**Ans: 2025** • starting expression • solution	• $\dfrac{9^2(9+1)^2}{4}$ • 2025 **2RE**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
11	**Ans:** $x = \frac{6}{5}$ • strategy • forming a valid equation • starting to solve • solution	• $\frac{1}{2} \times 1 \times \frac{x}{2}$ or $\frac{1}{2} \times 3 \times (x-1)$ • $\frac{1}{2} \times 1 \times \frac{x}{2} = \frac{1}{2} \times 3 \times (x-1)$ • $x = 6(x-1)$ • $x = \frac{6}{5}$ **4RE**

NOTES:

(i) areas need not be explicitly stated

(ii) for $1 \times \frac{x}{2} = 3(x-1)$ award the first two marks

(iii) for $1 \times \frac{x}{2} = 3(x-1)$ arising from Area of Triangle $= b \times h$, the first two marks cannot be awarded

KU 19 marks
RE 19 marks

[END OF PAPER 1 MARKING INSTRUCTIONS]

2010 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	**Ans: 35 400 tonnes** • multiplying factor • power of 3 • solution • rounding	 • 0·75 • $0 \cdot 75^3$ • 35 437·5 • 35 400 **4KU**

NOTES:

(i) for 35 400, with or without working — award 4/4

(ii) for 1310, with or without working $\left(\times 0 \cdot 25^3\right)$ — award 3/4

(iii) for 164 000, with or without working $\left(\times 1 \cdot 25^3\right)$ — award 3/4

(iv) for 21 000, with or without working — award 0/4

For any other final answers

(v) the 3rd mark is for an unrounded answer

(vi) the last mark is for correctly rounding the number given for the 3rd mark

(vii) candidates who do not give an unrounded number cannot be awarded the last two marks

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
2	**Ans:** $x^3 - 2x^2 + x$ • correct expansion of $x(x-1)$ or $(x-1)^2$ • further expansion and simplification	• $x^2 - x$ or $x^2 - x - x + 1$ • $x^3 - 2x^2 + x$ **2KU**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
3 (a)	**Ans: 101, 1·69** • calculating mean • starting to calculate standard deviation • standard deviation	 • 101 • as far as 20 or 81 628 • 1·69 **3KU**

NOTES:

x	$x-\bar{x}$	$(x-\bar{x})^2$		x^2
101	1	1		10404
102	1	1		10404
101	0	0		10201
98	−3	9		9604
99	−2	4		9801
101	0	0		10201
103	2	4		10609
102	1	1		10404
		20		81628

$$s=\sqrt{\frac{\sum(x-\bar{x})^2}{n-1}} \qquad s=\sqrt{\frac{\sum x^2-\frac{(\sum x)^2}{n}}{n-1}}$$
$$=\sqrt{\frac{20}{7}} \qquad =\sqrt{\frac{81628-\frac{808^2}{8}}{7}}$$
$$=\sqrt{2\cdot857} \qquad =\sqrt{2\cdot857}$$
$$=1\cdot69 \qquad =1\cdot69$$

(b)	**Ans: two valid statements** • comparing means • comparing standard deviations	 • the second sample has on average, a greater number of pins per box • the second sample has a greater variability in the number of pins per box **2RE**

NOTES:

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
4	**Ans: −2·6, 0·9** • method • processing • solution • rounding	 • substitution into quadratic formula • $\sqrt{109}$ • −2·573, 0·907 • −2·6, 0·9 **4KU**

NOTES:

alternative evidence for 3rd and 4th marks

(i) 3rd mark (one solution and rounding) −2·573 → −2·6
4th mark (another solution and rounding) 0·907 → 0·9

(ii) only the first mark is available for candidates who process to a negative discriminant

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
5 (a)	**Ans: 0·866 m** • method • solution	 • $1^2 = x^2 + 0 \cdot 5^2$ • $x = 0 \cdot 866\cdots$ **2RE**
NOTES:		
(b)	**Ans: $1 \cdot 57\ \text{m}^3$** • process − area of cross section • process – volume of prism • all calculations correct **OR** • process – volume of cuboid • process – volume of prism added to volume of cuboid • all calculations correct	 • $0 \cdot 5 \times 0 \cdot 5 \times 0 \cdot 866 + 0 \cdot 5 \times (2 - 0 \cdot 866)$ • $0 \cdot 7835 \times 2$ • 1·567 • $0 \cdot 5 \times 1 \cdot 134 \times 2 = 1 \cdot 134$ • $0 \cdot 5 \times 0 \cdot 5 \times 0 \cdot 866 \times 2 + 1 \cdot 134$ • 1·567 **3RE**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
6	**Ans: 88·0 cm** • fraction of circumference • use of formula • all calculations correct	 • $\frac{140}{360}$ • $\frac{140}{360} \times \pi \times 72$ • 87·96 **3KU**

NOTES:

(i) for 87·96 with or without working — award 3/3

(ii) for 1583·36 from $\frac{140}{360} \times \pi \times 36^2$ — award 2/3

(iii) the 3rd mark is available only for a calculation involving π

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
7	**Ans: 24 cm** • volume scale factor • linear scale factor • calculating height	 • 8 or equivalent • $\sqrt[3]{8}$ • 24 **3KU**
NOTES: (i) for 96 with or without working award 2/3		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
8	**Ans: 9**	
	• stating $\angle DEF$	• 64°
	• valid strategy	• $\frac{e}{\sin 64^\circ} = \frac{26.2}{\sin 34^\circ}$ or $e^2 = 26 \cdot 2^2 + 46 \cdot 4^2 - 2 \times 26 \cdot 2 \times 46 \cdot 4 \cos 64^\circ$
	• finding third side	• 42·1
	• solution	• 9 **4RE**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
9	**Ans: 5:6** • new sugar ratio • new fruit ratio • new ratio • simplified ratio	 • 4 parts • 4·8 parts • 4:4·8 • 5:6 **4RE**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
10	**Ans: $126 \cdot 9^\circ$** • valid strategy • rearranging • starting to solve • obtuse angle	 • $\frac{1}{2} \times 6 \times 5 \times \sin\ x^\circ = 12$ • $\sin\ x^\circ = \frac{12}{15}$ • $x = \sin^{-1}\left(\frac{12}{15}\right) = 53 \cdot 1^\circ$ • $126 \cdot 9^\circ$ **4RE**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
11 (a)	**Ans:** $\boldsymbol{h = \frac{kV}{b^2}}$ • variation statement • variation equation	 • $h \propto \frac{V}{b^2}$ • $h = \frac{kV}{b^2}$ **2KU**

NOTES:

(i) for $h = \frac{kV}{b^2}$ without working — award 2/2

(ii) if $h = \frac{kV}{b^2}$ is not stated in (a) but implicit in (b) — award 2/2

(iii) for $V = \frac{1}{3}b^2h$ — award 2/2

(iv) for any incorrect variation statement involving V and b leading to a consistent equation — award 1/2

(b)	**Ans: 18 cm** • substitution • formula • solution	 • $12 = \frac{k \times 256}{8^2}$ • $h = \frac{3V}{b^2}$ • 18 **3KU**

NOTES:

(i) for use of $V = \frac{1}{3}b^2h$ followed through to the correct answer — award 3/3

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
12	**Ans: $x = 5$** • valid strategy • starting to solve • quadratic equation • factorising • solution	 • $(x+8)^2 = x^2 + (x+7)^2$ • $x^2 + 16x + 64 = 2x^2 + 14x + 49$ • $x^2 - 2x - 15 = 0$ • $(x-5)(x+3)$ • $x = 5$ **5RE**
NOTES: (i) For the third mark to be awarded the form must be $ax^2 + bc + c = 0$		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
13 (a)	**Ans: 3·875 m** • substitution • solution	 • $3+1\cdot 75\sin(30\times 5)^\circ$ • 3·875 **2KU**
NOTES: (i) Accept 3 + 1·75 sin 30 × 5		
(b)	**Ans: 3·5 m** • beginning to solve • solution	 • 1·25 or 4·75 • 3·5 **2RE**
NOTES: (i) For two wrong substitutions calculated correctly the second mark is available (ii) For 3·5 without working award 1/2		

KU 26 marks
RE 26 marks

[END OF PAPER 2 MARKING INSTRUCTIONS]

Final Totals	**KU 45** **RE 45**