2011 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 $\sin x^\circ = 0.5 = 30^\circ$.

13 A transcription error, where a number is erroneously transcribed from the examination question, 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 as the final one, mark all attempts and award the lowest mark.

2011 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: 2·491** • knowing correct order of operations • carrying out correctly a division and an addition	• 0·091 • 2·491 **2KU**

NOTES:

(i)	for 2·491	with or without working	award 2/2
(ii)	for 0·091	with or without working	award 1/2
(iii)	for 0·131	with or 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	**Ans:** $2(m-3)(m+3)$ • beginning to factorise • factorised fully	• $2(m^2-9)$ • $2(m-3)(m+3)$ **2KU**

NOTES:

(i) the 1st mark is available for $2(m^2-9)$ or $(2m-6)(m+3)$ or $(m-3)(2m+6)$

(ii) All 3 factors must be shown <u>together</u> to obtain the 2nd mark

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
3	**Ans: -4** • substitution • evaluation	• $5-(-3)^2$ • -4 **2KU**

NOTES:

(i) for -4, with or without working — award 2/2

(ii) for 14, <u>with</u> working — award 1/2

(iii) Candidates who misinterpret functional notation receive **no** marks

eg $-3 = 5-(-3)^2$ or $f(-3) = -4$

$f = \frac{-4}{-3}$

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
4	**Ans:** $-\frac{7}{5}$ • starting to solve equation • collecting like terms • solution	• $6x+2=x-5$ • $5x=-7$ • $x=-\frac{7}{5}$ **3KU**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
5	**Ans: 17** • strategy • processing • communication	• $7 \div \frac{2}{5}$ • $\frac{35}{2}$ • 17 **3RE**

NOTES:

(i) for an answer of 17 with no working award 0/3

(ii) the third mark is available only for a whole number

(iii) a pictorial representation or a build up of fractions are each valid strategies

Caution: many candidates confuse "number of cakes" and "quantities of butter"

eg $7 \times \frac{1}{5} = \frac{7}{5} = 3{\cdot}5$ cakes

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
6 (a)	**Ans: 4** • method • solution	• $15{\cdot}5^{th}$ value • 4 tests booked **2KU**
NOTES: (i) for an answer of 4 with/without working award 2/2		
(b)	**Ans:** $\frac{\mathbf{7}}{\mathbf{15}}$ • solution	• $\frac{14}{30}$ or equivalent **1KU**

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
7 (a)	**Ans:** $2a + 4c = 56$ • correct equation	• $2a + 4c = 56$ **1KU**
(b)	**Ans:** $a + 3c = 36$ • correct equation	• $a + 3c = 36$ **1KU**
(c)	**Ans: £8 and £12** • evidence of scaling • processing • processing	• $2a + 6c = 72$ or equivalent • $c = 8$ or $a = 12$ • second value **3RE**

NOTES:

Trial/Error method:

1st mark not available

2nd mark for $c = 8$ and $a = 12$

3rd mark for verification of $c = 8$ and $a = 12$ in BOTH equations

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
8 (a)	**Ans:** $y = -\frac{3}{2}x + 12$ • gradient • y-intercept • equation	• $m = -\frac{12}{8}$ • $c = 12$ • $y = -\frac{3}{2}x + 12$ **3KU**
NOTES: (i) for a correct equation without working award 3/3 (ii) where the gradient and/or y-intercept are wrong, but explicitly stated, the 3rd mark is still available		
(b)	**Ans:** $\left(\frac{8}{3}, 8\right)$ • method • substitution • solving equation • solution	• recognising $y_p = 8$ • $8 = -\frac{3}{2}x + 12$ • $x = \frac{8}{3}$ • $\left(\frac{8}{3}, 8\right)$ **4RE**
NOTES: (i) for the 4th mark, both coordinates must be consistent with the candidate's response for 1st and 3rd marks		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
9 (a)	**Ans:** $2a^{-3}$ • solution	• $2a^{-3}$ or $\frac{2}{a^3}$ **1KU**
(b)	**Ans:** **2** • simplifying $\sqrt{18}$ • rearrangement • solution	• $\sqrt{x}+3\sqrt{2}=4\sqrt{2}$ • $\sqrt{x}=\sqrt{2}$ • $x=2$ **3KU**
NOTES: (i) the 3rd mark is available only for the solution of an equation involving $\sqrt{x}$		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
10	**Ans: proof** • correct application of sine rule • rearranging • dealing with sin150° • completion	• $\frac{10}{\sin 150^\circ} = \frac{4}{\sin B}$ • $10\sin B = 4\sin 150^\circ$ • $10\sin B = 4 \times \frac{1}{2}$ • $\sin B = \frac{1}{5}$ **4RE**
NOTES: (i) the 4th mark cannot be awarded where sin $B > 1$		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
11 (a)	**Ans:** $F\alpha\frac{s}{d^2}$ **or** $F=\frac{ks}{d^2}$ • statement	• $F\alpha\frac{s}{d^2}$ or $F=\frac{ks}{d^2}$ **1KU**
(b)	**Ans: reduced to** $\frac{1}{8}F_1$ • strategy • simplification • solution	• $F_2=\frac{k(\frac{1}{2}s)}{2d^2}$ • $F_2=\frac{ks}{8d^2}$ • $\frac{1}{8}$ of original **3RE**

NOTES:

(i) for "reduced to $\frac{1}{4}F_1$" from $F_2=\frac{k(\frac{1}{2}s)}{2d^2}$ award 2/3

FOR USE OF SPECIFIC VALUES

(ii) specific values for *s*, *d* (and *k*) may be awarded the final 2 marks

(iii) ignoring *k* completely may be awarded the final mark

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
12 (a)	**Ans: 55** • solution	• 55 **1KU**
(b)	• **Ans:** $s_n = \frac{1}{2}n(n+1)$ • solution	• $(s_n =) \frac{1}{2}n(n+1)$ **1RE**

NOTES:

(i) ignore subsequent expansion after correct formula

(ii) treat $\frac{1}{2}n \times n + 1$ as bad form

KU 23 marks
RE 18 marks

[END OF PAPER 1 MARKING INSTRUCTIONS]

2011 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: 40·9948** • multiplying factor • power of 4 • solution	• $1{\cdot}1$ • $1{\cdot}1^4$ • 40·9948 or 40·995 or 40·99 **3KU**

NOTES:

(i) for 40·9948, with or without working — award 3/3

(ii) for 40 or 41 $(28 \times (1{\cdot}1)^4)$ — award 3/3

(iii) for 18·3708 $\left(28 \times 0{\cdot}9^4\right)$, with or without working — award 2/3

(iv) for 39·2 $(28 \times 1{\cdot}4)$, with or without working — award 0/3

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
2	**Ans:** $3x^3 - 14x^2 + 7x + 4$ • starting to expand • completed expansion • simplification	• any 3 correct terms • $3x^3 - 15x^2 + 12x + x^2 - 5x + 4$ • $3x^3 - 14x^2 + 7x + 4$ **3KU**
NOTES: Caution: Error(s) in the completed expansion may result in a significant easing of the simplification. The final mark may not be available.		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
3	**Ans: – 2·8, 1·3** • method • processing • solution • rounding	• substitution into quadratic formula • $\sqrt{65}$ • -2·765, 1·265 • - 2·8, 1·3 **4KU**

NOTES:

alternative evidence for 3rd and 4th marks

(i) 3rd mark (one solution and rounding) -2·765 → -2·8
4th mark (another solution and rounding) 1·265 → 1·3

(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
4	**Ans: £4500** • valid strategy • processing • solution	• 84% = £3780 • $100\% = \frac{3780}{0.84}$ • 4500 **3KU**

NOTES:

(i) for £4500, with or without working — award 3/3

(ii) for £3258·62 (116% = £3780), with working — award 2/3

(iii) for £3175·20 (84% of £3780), with or without working — award 0/3

(iv) for £4384·80 (116% of £3780), with or without working — award 0/3

(v) caution: some candidates state 84% = £3780 and follow this as note (iii) or (iv); in these cases, the 1st mark is still available

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
5	**Ans: no, plus justification** • strategy • processing • processing • communication	• $\frac{42}{360}$ • $\frac{42}{360} \times \pi \times 2{\cdot}4$ • 0·879 • no, as 0·879 < 0·9 **4RE**

NOTES:

(i) $\frac{42}{360} \times \pi \times 1{\cdot}2 = 0 \cdot 439$ → no etc award 3/4

(ii) $\frac{42}{360} \times \pi \times 1{\cdot}2^2 = 0 \cdot 527$ → no etc award 2/4

(iii) $\frac{42}{360} \times \pi \times 2{\cdot}4^2 = 2 \cdot 11$ → yes etc award 2/4

(iv) the communication must include reference to both values, the difference between them or the use of comparative language

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
6	**Ans: no, plus justification** • linear scale factor • area scale factor • multiplying by area scale factor • communication	• $\frac{125}{90}$ • $\left(\frac{125}{90}\right)^2$ • 7754·6 • no, as 7754·6 $\neq$ 8040 (8040 must be explicit) **4RE**

NOTES:

(i) for using a linear factor throughout, only the 1st and 4th marks are available

eg $\frac{125}{90} \times 4020 = 5583$

No, as $5583 \neq 8040$ award 2/4

(ii) Alternative strategy

• linear scale factor	$\frac{125}{90}$
• area scale factor	$\left(\frac{125}{90}\right)^2$
• evaluate area scale factor	1·929
• communication	No, as $1{\cdot}929 \neq 2$ (2 must be explicit)

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
7 (a)	**Ans: 108°** • solution	• 108° **1KU**
(b)	**Ans: 1·62 cm** • strategy • substitution/processing • solution	• use of appropriate trigonometry • correct application of valid strategy • 1·62 **3KU**

NOTES:

(i) chosen triangle must lead to calculation of AC
eg use $\triangle$CDE → CE → AC

(ii) use of invalid triangle (eg angle sum ≠ 180°) award 0/3

(iii) accept solutions in radians or gradians

(iv) evidence for ∠ABC=108° may appear in part(b)

(v)

part(a)	part(b)	
angle = x°	angle = x°	max 3/3
angle = 90°	angle = 90°	max 2/3
angle = x°	angle = y°	max 2/3
angle = x°	angle = 90°	max 1/3

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
8	**Ans: 10·6 cm** • strategy • correct use of Pythagoras • solution	• recognition of right angle at chord • $r^2 = (r - 5)^2 + 9^2$ • 10·6 **3RE**

NOTES:

(i) recognition of right angle may appear on a diagram

(ii) Caution:

The use of the wrong triangle leading to $\sqrt{106} \rightarrow 10{\cdot}3$ can only receive 1/3

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
9 (a)	**Ans: 1200 cm^2** • calculation of 1 area • composite area	• 216, 432, 768 or 1632 • 1200 **2KU**
NOTES: (i) the second mark must involve the addition/subtraction of at least 2 areas		
(b)	**Ans: 130 cm** • strategy • consistent units • solution	• $V = 1200 \times l$ • $156\,000 = 1200 \times l$ • 130 **3 RE**
NOTES: (i) consistent units (156 →156000 or 1200→1·2) may occur at any stage (ii) candidates who use $l \times b \times h$ in part (b) may still be awarded the last 2 marks		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
10	**Ans: £165**	
	• Valid strategy involving $\frac{1}{3}$	• $12 + \frac{1}{3}(12)$ or $x + \frac{1}{3}x$
	• Creating an equation	• $15 + 8 + 16 = 39$ Or • $15x + 8x + 12\left(\frac{4}{3}x\right) = 39x$
	• solution	• $\frac{429}{39} \times 15 = £165$ **3KU**

NOTES:

(i) the final mark is for obtaining an hourly rate × 15

eg $15 + 8 + 12 = 35$

$\frac{429}{35} \times 15 = £183{\cdot}86$ award 1/3

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
11	**Ans: 4·55 cm** • strategy • processing breadth • linking breadth with circumference • solution	• $l = \frac{3000}{70} (= 42{\cdot}86)$ • $b = \frac{42{\cdot}86}{3} (= 14{\cdot}29)$ • $b = \pi d$ • d = 4·55 **4RE**

NOTES:

Using $C = \pi d$

(i)	for d = 13·6	[no ÷ 3]	award 3/4
(ii)	for d = 318·5	[no ÷ 70]	award 3/4
(iii)	for d = 955·4	[no ÷ 70 and no ÷ 3]	award 1/4

Using $C = \pi r^2$

(i)	for d = 4·26		award 3/4
(ii)	for d = 7·4	[no ÷ 3]	award 2/4
(iii)	for d = 35·68	[no ÷ 70]	award 2/4
(iv)	for d = 61·8	[no ÷ 3 and no ÷ 70]	award 0/4

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
12 (a)	**Ans:** $(90, 1)$ • coordinates	• $(90, 1)$ **1RE**
(b)	**Ans:** **$48{\cdot}6^\circ$, $131{\cdot}4^\circ$** • strategy • processing • first solution • second solution	• $4\sin x^\circ - 3 = 0$ • $\sin x^\circ = \frac{3}{4}$ • $48{\cdot}6^\circ$ • $131{\cdot}4^\circ$ **4RE**
NOTES: (i) for an answer of 45° and 135°		award 1/4

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
13	**Ans: 12 seconds** • strategy • factorisation • roots • solution	• $48+8t-t^2=0$ • $(4+t)(12-t)=0$ • -4 , 12 • 12 **4RE**

NOTES:

(i) if due to error both roots are positive/negative, the last mark cannot be awarded

(ii) for an answer of 12 without working award 1/4

KU 22 marks
RE 27 marks

[END OF PAPER 2 MARKING INSTRUCTIONS]

Final Totals KU 45 RE 45