2012 Mathematics

Standard Grade Credit

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 has been erroneously transcribed from the examination question, is not normally penalised except where the question has been simplified as a result.

14   Where 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.

2012 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:** **2·37** • knowing correct order of operations • carrying out both calculations	 • 4·83 • 2·37 **2KU**

NOTES:

   (i)   for 2·37 with or without working   award 2/2

   (ii)   for 4·83 with or without working   award 1/2

   (iii)   for 211· 17 with or without working $(7·2 - 0·161) \times 30$ award 1/2

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
2	**Ans: $6x^3 - x^2 + 13x - 10$** • beginning to expand • completing expansion • simplification	• any **3** correct terms • a further **3** correct terms • $6x^3 - x^2 + 13x - 10$ **3KU**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
3	**Ans:** $m = (kL)^2$ • beginning to rearrange • completed rearrangement	• $\sqrt{m} = kL$ • $m = (kL)^2$ or k^2L^2 **2KU**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
4	**Ans: $2\sqrt{11}$** • recognition of right angle at R • correct substitution into valid strategy • calculation of QR • simplification of surd	 • $\hat{R} = 90°$ or $PQ^2 = PR^2 + QR^2$ or indication on diagram • $QR^2 = 12^2 - 10^2$ • $QR = \sqrt{44}$ • $2\sqrt{11}$ **4RE**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark

5	**Ans: yes, plus justification**
	
	• strategy
	
	• continue strategy
	
	• communication
		• $\dfrac{90}{150}$ or 0·6
		
		• $\dfrac{96}{150}$ or 0·64
		
		• yes, because $\dfrac{96}{150} > \dfrac{90}{150}$
		
		  or
		
		  0·64 > 0·6
		
		                                      3RE

NOTES:

(i)   The communication must include reference to both values or the use of comparative language.

(ii) $\dfrac{18}{30} = \dfrac{3}{5} = \dfrac{15}{25}$ gains the first 2 marks.

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
6 (a)	**Ans:** $x = 2$ • strategy • correct equation	 • 2 • $x = 2$ **2KU**
NOTES:		
(b)	**Ans:** 9 • substitution • solution	 • $y = 5 + 4(2) - 2^2$ • 9 **2KU**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
7	**Ans: proof** • starting proof • processing • starting to simplify • final simplification	• $x = \dfrac{2 \pm \sqrt{(-2)^2 - 4(2)(-1)}}{2 \times 2}$ • $\sqrt{12}$ • $2\sqrt{3}$ • $\dfrac{1 \pm \sqrt{3}}{2}$ **4RE**

NOTES:

(i) Final mark can be awarded only if $2\sqrt{3}$ is explicitly stated.

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
8	**Ans: (4,5)** **Method 1** • re-arranging terms • evidence of scaling • one value • coordinates	• $2y = -x + 14$ • $4y = -2x + 28$ • $y = 5$ • $(4,5)$ **4KU**
	Ans: (4,5) **Method 2** • substitution • simplifying • one value • coordinates	• $x + 2(2x - 3) = 14$ • $5x - 6 = 14$ • $x = 4$ • $(4,5)$ **4KU**

NOTES:

(i)   for (4, 5) without working but checked in **both** equations   award 1/4

(ii)   for (4, 5) without either working or checking   award 0/4

(iii)   The final mark is available only for an answer in coordinate form

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
9 (a)	**Ans:** $\dfrac{40}{x}$ • statement of time	 • $(T=)\dfrac{40}{x}$ **1KU**
(b)	**Ans:** $\dfrac{40}{x+5}$ • statement of time	 • $(T=)\dfrac{40}{x+5}$ **1RE**
(c)	**Ans:** $\dfrac{200}{x(x+5)}$ • strategy • common denominator • simplified expression	 • $\dfrac{40}{x}-\dfrac{40}{x+5}$ • $\dfrac{\ldots}{x(x+5)}-\dfrac{\ldots}{x(x+5)}$ • $\dfrac{200}{x(x+5)}$ **3RE**

NOTES:

(i)   A candidate who writes $\dfrac{40}{x+5}-\dfrac{40}{x}$ gains the first mark

(ii)   The final mark may be awarded for $\dfrac{-200}{x(x+5)}$ if it leads to $\dfrac{200}{x(x+5)}$

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
10 (a)	**Ans: 64** • evaluation	• 64 **1KU**
(b)	**Ans: − 2** • solution	• $n = -2$ **1RE**
NOTES:		

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
11 (a)	**Ans: 110** • solution	 • 110 **1RE**
(b)	**Ans:** $\dfrac{n}{2} \times \left(\dfrac{n}{2} + 1 \right)$ • expression	 • $\dfrac{n}{2} \times \left(\dfrac{n}{2} + 1 \right)$ **1RE**
NOTES:		
(c)	**Ans: 2530** • starting strategy • completing strategy	 • 2550 • 2530 **2RE**
NOTES:		

KU 17 marks
RE 20 marks

[END OF PAPER 1 MARKING INSTRUCTIONS]

Marking Instructions

Award marks in whole numbers only

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark

1	**Ans: 3·03 million**
	
	  • multiplying factor
	
	  • power of 3
	
	  • solution
	
	  • rounding
		
		  • 1·04
		
		  • $1·04^3$
		
		  • 3 025 884
		
		  • 3·03 million
		
		 4KU

NOTES:

   (i)   for 3 030 000, with or without working   award 4/4

   (ii)   for 2 380 000 $\left(\times 0·96^3\right)$, with or without working   award 3/4

   (iii) for 3·03, with or without working   award 3/4

   (iv) for 3 010 000 $\left(2·69 \times 1·12\right)$, with or without working   award 1/4

   (v)   for 8 390 000, with or without working   award 0/4

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
2 (a)	**Ans: 14** • SIQR	 • 14 **1KU**
(b)	**Ans: two valid statements** • one valid comparison • a second valid comparison	 • on average the **number** of sit-ups per athlete has risen • the number of sit-ups is less varied **2RE**

NOTES:

   (i)   other valid statements could compare

       • least number of sit-ups
       • greatest number of sit-ups

   (ii)   since numerical comparisons are not required, do not penalise numerical inaccuracies

   (ii)   as a comparison between performances/sit-ups is required do <u>not</u> accept

       • everyone could do more sit-ups after training
       • the median is higher
       • the range is smaller

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
3	**Ans: 5 litres** **Method 1** • strategy (area of cross section) • strategy (volume of prism) • all calculations correct • correct rounding	 • $(28 \times 20) + \left(\dfrac{1}{2} \times 20 \times 4 \cdot 5\right)$ (605) • $\left[(28 \times 20) + \left(\dfrac{1}{2} \times 20 \times 4 \cdot 5\right)\right] \times 9$ • 5445 • 5 **4KU**
	Method 2 • strategy (volume of cuboid) • strategy (volume of triangular prism) • all calculations correct • correct rounding	 • $9 \times 20 \times 28$ (5040) • $9 \times \left[\dfrac{1}{2} \times 20 \times 4 \cdot 5\right]$ (405) • 5445 • 5 **4KU**
	Method 3 • strategy (volume of extended cuboid) • strategy (volume of triangular prism) • all calculations correct • correct rounding	 • $9 \times 20 \times 32 \cdot 5$ (5850) • $9 \times \left[\dfrac{1}{2} \times 20 \times 4 \cdot 5\right]$ (405) • 5445 • 5 **4KU**

NOTES:

(i)   for candidates who calculate $28 \times 9 \times 20 \times 32 \cdot 5$, only the final mark is available

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
4	**Ans: 2·61m** • ratio • strategy • all calculations correct	• $\dfrac{65}{360}$ or $\dfrac{360}{65}$ • $\dfrac{65}{360}\times\pi\times4\cdot6$ or $\pi\times4\cdot6\div\dfrac{360}{65}$ • $2\cdot609$ **3KU**

NOTES:

(i)   for 2·61 with or without working   award 3/3

(ii)   for $1\cdot3$ $(\times\pi\times2\cdot3)$ award 2/3

(iii)   for $3\cdot0$ $(\times\pi\times2\cdot3^2)$ award 1/3

(iv)   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
5	**Ans: 40 cm** • valid strategy • substitution • processing • solution	 • $d \propto \dfrac{v}{r^2}$ or $d = \dfrac{kv}{r^2}$ • $50 = \dfrac{k \times 60\,000}{20^2}$ • $k = \frac{1}{3}$ • 40 **4KU**

NOTES:

(i)   for 50 $\left(d \propto \dfrac{v}{r} \right)$ award 3/4

(ii)   for 56 $\left(d \propto \dfrac{v}{\sqrt{r}} \right)$ award 3/4

(iii) for 97·7 $\left(d \propto vr^2 \right)$ award 2/4

(iv) for 62·5 $\left(d \propto \dfrac{r^2}{v} \right)$ award 2/4

(v)   for 78 $\left(d \propto vr \right)$ award 1/4

(vi) accept an answer of 36 coming from $k = 0 \cdot 3$

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
6	**Ans:** **£860** • valid strategy • processing • solution	• $104\% = 894\cdot40$ • $1\% = \dfrac{894\cdot4}{104}$ or similar • 860 **3KU**

NOTES:

(i) for 860 with or without working   award 3/3

(ii) for 931·67 (96% = 894·4) with or without working   award 2/3

(iii) for 930·17 (104% of 894·4) with or without working   award 0/3

(iv) for 858·62 (96% of 894·4) with or without working   award 0/3

(v) CAUTION: Some candidates state 104% = 894·40 and follow this as note (iii) or (iv); in these cases, the 1st mark is still available

(vi) for candidates who ignore the initial 40p (leading to 859·62), the maximum mark available is 2/3

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
7	**Ans: 18·3 metres** Method 1 • strategy • processing • processing • solution Method 2 • strategy • strategy • processing • solution	• $\sin 59° = \dfrac{x}{8}$ • $x = 6·86$ • $\sin 22° = \dfrac{6·86}{BC}$ • $BC = 18·3$ • $\angle BAC = 121°$ • $\dfrac{a}{\sin 121°} = \dfrac{8}{\sin 22°}$ • $a = \dfrac{8 \sin 121°}{\sin 22°}$ • $a = 18·3$ **4RE**
NOTES:		

Question No	Give 1 mark for each ●	Illustrations of evidence for awarding each mark
8	**Ans: 15 cm^2** ● linear scale factor ● area scale factor ● solution	● $\dfrac{4}{0\cdot 8}$ ● $\left(\dfrac{4}{0\cdot 8}\right)^2 = 25$ ● 15 **3KU**

NOTES:

(i) for a final answer of $3\left(\dfrac{4}{0\cdot 8}\times 0\cdot 6\right)$ award 1/3

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
9	**Ans: 1503·5 cm^2** **METHOD 1** • valid strategy • substitution • processing • solution	 • $\frac{1}{2}\,ab \sin C$ • $\frac{1}{2} \times 40 \times 40 \times \sin 110°$ • 751·75 • 1503·5 **4RE**

NOTES:

   (i)   evidence for the 1st mark may be implicit in the substitution

| | **Ans: 1503·5 cm^2**

METHOD 2

• diagonal calculation

• diagonal calculation

• chosen strategy

• solution |

• 65·5 (one diagonal)

• 45·9

• $\frac{1}{2} \times$ product of diagonals

• 1503·5

                                                   4RE |

NOTES:

   (i)   evidence for 3rd mark may be implicit in the final mark

| | **Ans: 1503·5 cm^2**

METHOD 3

• base calculation

• height calculation

• area of one triangle

• solution |

• 22·95

• 32·75

• 375·875

• 1503·5

                                                   4RE |

GENERAL NOTE:

    for all methods an answer of 1503·5 with no working   award 0/4

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
10 (a)	**Ans:** $f = 1 \cdot 2d + 1 \cdot 8$ • gradient • y-intercept • linear equation **3KU**	 • $1 \cdot 2$ • $1 \cdot 8$ • $f = 1 \cdot 2d + 1 \cdot 8$

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:** **£10·20** • substitution • evaluation **2RE**	 • $1 \cdot 2 \times 7 + 1 \cdot 8$ • $10 \cdot 2(0)$

NOTES:

   (i)   for $10 \cdot 2(0)$ with or without working   award 2/2

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
11(a)	**Ans: 7·38 metres** • valid strategy • calculation	• $AC^2 = 6 \cdot 2^2 + 4^2$ • $7 \cdot 38$ **2KU**
(b)	**Ans: $73 \cdot 8°$** • valid strategy • substitution into valid formula • processing • solution	• cosine rule • $\cos D = \dfrac{5^2 + 7^2 - 54 \cdot 44}{2 \times 5 \times 7}$ • $\cos D = 0 \cdot 279 \cdots$ • $73 \cdot 8°$ **4RE**

NOTES:

(i)   evidence for the 1st mark may be implicit in the substitution

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
12 (a)	**Ans: -3** • evaluating	 • -3 **1KU**
NOTES:		
(b)	**Ans: $11 \cdot 5°, 168 \cdot 5°$** • equation • beginning to solve • first solution • second solution	 • $3\sin t° = 0 \cdot 6$ • $\sin t° = 0 \cdot 2$ • $11 \cdot 5°$ • $168 \cdot 5°$ **4RE**
NOTES:		

NOTES:

(i) the 2nd angle must be consistent with the 1st angle

(ii) candidates who **start** with $\sin t° = 0 \cdot 6$ may be awarded only the final two marks

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
13 (a)	**Ans: proof** • beginning proof • processing	 • $\dfrac{2x}{x^2+5} = \dfrac{6}{18}$ or $3 \times 2x = x^2 + 5$ • $x^2 - 6x + 5 = 0$ **2RE**

NOTES:

  (i) working for part (a) may appear in part (b)

(b)	**Ans: 5** • correct use of algebraic strategy • solving • solution	 • $(x-1)(x-5)=0$ • $x=1, \quad x=5$ • $x=5$ **3RE**

NOTES:

  (i) for 5 with no working   award 0/3

  (ii) final answer must satisfy **all** given conditions

  (iii) working for part (b) may appear in part (a)

  (iv) accept use of quadratic formula

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KU 28 marks
RE 25 marks

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[END OF PAPER 2 MARKING INSTRUCTIONS]

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

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