SCOTTISH QUALIFICATIONS AUTHORITY

2006 Mathematics

Intermediate 2 – Units 1, 2 and 3 Paper 1

Finalised Marking Instructions

General Marking Principles

These principles describe the approach to be taken when marking Intermediate 2 Mathematics papers. For more detailed guidance please refer to the notes which are included with the Marking Instructions.

1 Marks must be assigned in accordance with the Marking Instructions. The main principle in marking scripts is to give credit for the skills demonstrated and the criteria met. Failure to have the correct method may not preclude a candidate gaining credit for the calculations involved or for the communication of the answer.

2 The answer to one part of a question, even if incorrect, must be accepted as a basis for subsequent dependent parts of the question. Full marks in the dependent part(s) may be awarded provided the question is not simplified.

3 The following should not be penalised:

- working subsequent to a correct answer (unless it provides firm evidence that the requirements of the question have not been met)
- omission or misuse of units (unless marks have been specifically allocated for the purpose in the marking scheme)
- bad form, eg sin $x° = 0.5 = 30°$
- legitimate variation in numerical values / algebraic expressions.

4 Solutions which seem unlikely to include anything of relevance must nevertheless be followed through. Candidates still have the opportunity of gaining one mark or more provided the solution satisfies the criteria for the mark(s).

5 Full credit should only be given where the solution contains appropriate working. Where the correct answer may be obtained by inspection or mentally, credit may be given, but reference to this will be made in the Marking Instructions.

6 In general markers will only be able to give credit for answers if working is shown. A wrong answer without working receives no credit unless specifically mentioned in the Marking Instructions. The rubric on the outside of the question papers emphasises that working must be shown.

7 Sometimes the method to be used in a particular question is explicitly stated; no credit should be given where a candidate obtains the correct answer by an alternative method.

8 Where the method to be used in a particular question is not explicitly stated, full credit must be given for alternative methods which produce the correct answer.

9 Do not penalise the same error twice in the same question.

10 Do not penalise a transcription error unless the question has been simplified as a result.

11 Do not penalise inadvertent use of radians in trigonometry questions, provided their use is consistent within the question.

Practical Details

The Marking Instructions should be regarded as a working document and have been developed and expanded on the basis of candidates' responses to a particular paper. While the guiding principles of assessment remain constant, details can change depending on the content of a particular examination paper in a given year.

1 Each mark awarded in a question is referenced to one criterion in the marking scheme by means of a bullet point.

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

3 Where a marker wishes to indicate how s/he has awarded marks, the following should be used:

(a) Correct working should be ticked, ✓ .

(b) Where working subsequent to an error is followed through, if otherwise correct and can be awarded marks, it should be marked with a crossed tick, ✓̸.

(c) Each error should be underlined at the point in the working where it first occurs.

4. **Do not write any comments, words or acronyms on the scripts.**

Mathematics Intermediate 2: Paper 1, Units 1, 2 and 3 (non-calc)

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
1 (a)	**Ans: $S = -4T + 130$**	
	•[1] process: find gradient	•[1] m = –4 (or equivalent)
	•[2] process: state y-intercept or c in $y = mx + c$	•[2] c = 130
	•[3] communicate: state correct equation of straight line	•[3] $S = -4T + 130$ **3 marks**

NOTES:

1 For correct answer without working — award 3/3

2 For $y = -4x + 130$ — award 3/3

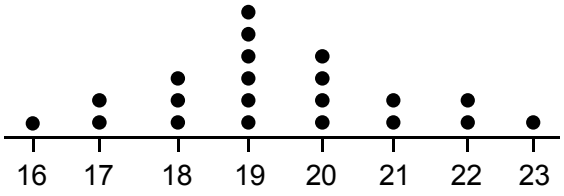
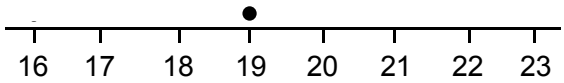
3 For $S = -4T$ award 1/3

4 Where m and/or c are incorrect the working must be followed through to give the possibility of awarding 1/3 or 2/3

5 If the equation is stated incorrectly and there is no working, 1/3 can be awarded for correct gradient or correct y-intercept

6 For an incorrect equation (ie both m and c incorrect) without working eg $S = 130T - 4$ — award 0/3

(b)	**Ans:** £10	
	•[1] process: calculate sales **using equation**	•[1] $-4 \times 30 + 130 = 10$ **1 mark**
2	**Ans: $2y^3 + 5y^2 - 14y + 3$**	
	•[1] process: start to multiply out brackets	•[1] evidence of 3 correct terms $(\text{eg } 2y^3 + 8y^2 - 2y\ )$
	•[2] process: complete the process of multiplying out brackets	•[2] $2y^3 + 8y^2 - 2y - 3y^2 - 12y + 3$
	•[3] process: collect like terms which must include y^3	•[3] $2y^3 + 5y^2 - 14y + 3$ **3 marks**

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
3 (a)	**Ans:**  •[1] process: start to draw dotplot •[2] process: complete dotplot	•[1] evidence (see note) •[2] complete dotplot **2 marks**
NOTE: Minimum acceptable evidence for the award of the first mark  		
(b)	**Ans:** (i) **19** (ii) **18** (iii) **20 · 5** •[1] communicate: state Q_2 •[2] communicate: state Q_1 •[3] communicate: state Q_3	•[1] 19 •[2] 18 •[3] 20 · 5 **3 marks**
(c)	**Ans: 15/21** •[1] process: find probability	•[1] 15/21 (or equivalent) **1 mark**

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
4	**Ans: 40 square centimetres** •[1] process: substitute correctly into area formula •[2] process: calculate area correctly	•[1] $\frac{1}{2} \times 12 \times 10 \times 2/3$ •[2] 40 **2 marks**
NOTES: 1 Alternative correct answers 40·2 cm^2 $\left(\frac{1}{2} \times 12 \times 10 \times 0 \cdot 67\right)$ award 2/2 39·6 cm^2 $\left(\frac{1}{2} \times 12 \times 10 \times 0 \cdot 66\right)$ award 2/2 2 $\left(\frac{1}{2} \times 12 \times 10 \times \sin \frac{2}{3}\right)$ leading to an answer of 40cm^2 award 1/2 3 For an answer of 40cm^2 without working award 1/2 4 For an answer of 60cm^2 $\left(\frac{1}{2} \times 12 \times 10\right)$ award 0/2		
5 (a)	**Ans: $-\frac{1}{2}$** •[1] strategy: know how to find gradient •[2] communicate: state gradient	•[1] from diagram or $y = -\frac{1}{2}x + 3$ •[2] $-\frac{1}{2}$ **2 marks**
NOTE: Correct answer without working		award 2/2
(b)	**Ans: 3** •[1] communicate: state y-intercept	•[1] 3 **1 mark**
NOTE: For an answer of (0,3)		award 1/1
6	**Ans: sin 200°, sin 0°, sin 30°** •[1] communicate: state correct order •[2] communicate: state reason	•[1] sin 200°, sin 0°, sin 30° •[2] sin 200° is negative **and** sin 30° is positive (or equivalent) **2 marks**

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
7 (a)	**Ans:** $(3,-4)$ $\bullet^1$ communicate: state clearly first coordinate $\bullet^2$ communicate: state clearly second coordinate	$\bullet^1$ 3 $\bullet^2$ -4 **2 marks**
NOTES: 1 For a correct answer, without working — award 2/2 2 For an answer of $x = 3$, y = -4 — award 1/2 3 For an answer of (-4, 3) — award 0/2		
(b)	**Ans:** $x = 3$ $\bullet^1$ communicate: state equation	$\bullet^1$ $x = 3$ **1 mark**
NOTES: 1 An incorrect answer in part (a) must be followed through 2 For an answer of 3 — award 0/1		
(c)	**Ans:** $(5,0)$ $\bullet^1$ communicate: state coordinates of B	$\bullet^1$ $(5,0)$ **1 mark**
NOTE: An incorrect answer in part (a) or part (b) must be followed through		
8	**Ans: 30** $\bullet^1$ communicate: state the value of a	$\bullet^1$ 30 **1 mark**
NOTE: Alternative correct answers: 390, -330		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
9	**Ans: 8** •[1] process: start to evaluate •[2] process: complete evaluation	•[1] $\sqrt[4]{16^3}$ •[2] 8 **2 marks**
10	**Ans: $6\sqrt{2}$ square centimetres** •[1] process: start to calculate area •[2] process: multiply •[3] process: simplify	•[1] $2\sqrt{3} \times \sqrt{6}$ •[2] $2\sqrt{18}$ •[3] $6\sqrt{2}$ **3 marks**

TOTAL MARKS FOR PAPER 1
30

[END OF MARKING INSTRUCTIONS]

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2006 Mathematics

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(b) Where working subsequent to an error is followed through, if otherwise correct and can be awarded marks, it should be marked with a crossed tick, ✗.

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Mathematics Intermediate 2: Paper 2, Units 1, 2 and 3

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
1 (a)	**Ans: 8%** •[1] process: calculate percentage decrease	•[1] 8% **1 mark**
(b)	**Ans: £25 100** •[1] strategy: know how to decrease by 8% •[2] strategy: know how to calculate the value of boat •[3] process: carry out calculations correctly within a valid strategy	•[1] $0 \cdot 92$ •[2] $32\ 200 \times 0 \cdot 92^3$ •[3] 25 100 **3 marks**

NOTES:

1 For an answer of 25100 with or without working — award 3/3

2 An incorrect answer to part (a) must be followed through with the possibility of awarding 3/3

3 Where an incorrect percentage has been used, the working must be followed through to give the possibility of awarding 2/3
eg for an answer of 40600 ($32200 \times 1 \cdot 08^3$), with working — award 2/3

4 For an answer of 88900 $(32200 \times 0 \cdot 92 \times 3)$ with working — award 1/3

5 For an answer of 24500 $(32200 - 3 \times 0 \cdot 08 \times 32200)$ with working — award 1/3

6 For an answer of 7700 $(32200 \times 0 \cdot 08 \times 3)$ — award 0/3

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
2	**Ans:** $x = 2 \cdot 5, y = 1 \cdot 5$ $\bullet^1$ process: scale system of equations $\bullet^2$ process: solve for x $\bullet^3$ process: solve for y	 $\bullet^1$ $12x + 6y = 39$ $10x + 6y = 34$ $\bullet^2$ $2 \cdot 5$ $\bullet^3$ $1 \cdot 5$ **3 marks**

NOTES:

1 For a correct answer obtained from 2 tables of values or solving 2 equations graphically or trial and improvement — award 0/3

2 For a correct answer without working — award 0/3

3 Where an error occurs in scaling the system of equations, working must be followed through with the possibility of awarding 2/3

4 An incorrect answer for the first variable must be followed through with the possibility of awarding 2/3

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
3	**Ans: 550 cubic cm**	
	$\bullet^1$ strategy: know how to calculate volume of toy	$\bullet^1$ addition of volume of cone and volume of hemisphere
	$\bullet^2$ process: substitute correctly into formula	$\bullet^2$ $\frac{1}{2} \times 4/3 \times \pi \times 5^3$ (= 261·8)
	$\bullet^3$ process: substitute correctly into formula	$\bullet^3$ $1/3 \times \pi \times 5^2 \times 11$ (= 287·98)
	$\bullet^4$ process: calculate volume correctly	$\bullet^4$ $549 \cdot 7787 \text{cm}^3$
	$\bullet^5$ process: round to 2 significant figures	$\bullet^5$ $550\,\text{cm}^3$ **5 marks**

NOTES:

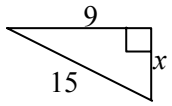
1 Accept variations in π

2 The final mark is available for rounding an answer to 2 significant figures. Where the answer requires no rounding, the final mark cannot be awarded.

3 Where the volume of only 1 shape is calculated, a maximum of 2/5 is available

Common wrong answers:

810	(Cone + Sphere)	with working	award 4/5
340	(Cone + $\frac{1}{2} \times \frac{4}{3}\pi r^2$)	with working	award 4/5
680	(Hemisphere + $\frac{1}{3}\pi \times 5^2 \times 16$)	with working	award 4/5
940	(Sphere + $\frac{1}{3}\pi \times 5^2 \times 16$)	with working	award 3/5

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
4	**Ans: 27 cm** •[1] strategy: marshall facts and recognise right angle •[2] strategy: know how to use Pythagoras •[3] process: correct calculation of x •[4] process: find width of stand	•[1]  •[2] $x^2 = 15^2 - 9^2$ •[3] $x = 12$ •[4] 27 cm **4 marks**

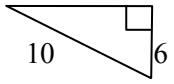
NOTES:

1 The final mark is for adding 15 to a value which has been calculated

2 For an answer of 27 without working award 0/4

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
5 (a)	**Ans: (i) 20 · 5** **(ii) 1 · 52** (i) •[1] process: calculate the mean (ii) •[1] process: calculate $(x - \bar{x})^2$ •[2] process: substitute into formula •[3] process: calculate standard deviation	(i) •[1] $20 \cdot 5$ (ii) •[1] $2 \cdot 25, 0 \cdot 25, 6 \cdot 25, 0 \cdot 25, 2 \cdot 25, 0 \cdot 25$ •[2] $\sqrt{(11 \cdot 5 / 5)}$ •[3] $1 \cdot 52$ **4 marks**
NOTE: For use of alternative formula in part (a) (ii), award marks as follows •[1] $\Sigma x = 123$ and $\Sigma x^2 = 2533$		
(b)	**Ans: Yes, with reasons covering both conditions** •[1] communicate: first condition •[2] communicate: second condition	•[1] Yes, because $x = 20 \cdot 5$ which is between 19·4 and 20·6 •[2] Yes, because SD = 1 · 52 which < 2 **2 marks**
NOTES: 1 For the first mark candidates must include 20·5 < 20·6 **or** 0·5 < 0·6 **or** mean is 0·1 below limit 2 Common answer "Yes because 20·5°C is within 0·6°C of the target temperature and the standard deviation is less than 2" award 0/2 3 If, because of a wrong answer in part (a), the response to part (b) is "No", the candidate must address **both** conditions to access 2 marks		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
6	**Ans:** $\mathbf{(2p-7)(2p+7)}$ •[1] process: start to factorise •[2] process: complete factorisation	•[1] one correct factor •[2] $(2p-7)(2p+7)$ **2 marks**
NOTE: For an answer of: $(2p)^2-(7)^2$ award 1/2		
7	**Ans:** $\dfrac{\mathbf{2x-7}}{\mathbf{(x+1)(x-2)}}$ •[1] process: state a valid common denominator •[2] process: find correct numerator of equivalent fraction •[3] process: state answer in simplest form	•[1] any valid denominator •[2] both numerators correct •[3] $\dfrac{2x-7}{(x+1)(x-2)}$ **3 marks**
NOTES: For an answer of $\dfrac{2x-7}{x^2-x-2}$ award 3/3		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
8 (a)	**Ans: 106 · 3°**	
	•[1] strategy: marshall facts & recognise right angle	•[1] 
	•[2] process: correct use of trigonometry	•[2] $\cos x° = 6/10$
	•[3] process: correct calculation of QPR	•[3] $106 \cdot 3°$ **3 marks**
(b)	**Ans: 18 · 6 yards**	
	•[1] strategy: know how to find arc QR	•[1] $\frac{106 \cdot 3}{360} \times 2 \times \pi \times 10$
	•[2] process: correct calculation	•[2] $18 \cdot 6$ **2 marks**

NOTES:

1 Accept variations in π

2 Disregard premature rounding

3 An incorrect answer in part (a) must be followed through with the possibility of gaining 2/2 in part (b)

4 For $\frac{106 \cdot 3}{360} \times \pi \times 10$ **or** $\frac{106 \cdot 3}{360} \times \pi \times 10^2$ the second mark is available

9	**Ans: $\mathbf{x = c(b - a)}$**	
	•[1] process: start to re-arrange formula	•[1] $\frac{x}{c} = b - a$
	•[2] process: continue process	•[2] $x = c(b - a)$ **2 marks**

NOTES:

1 For a correct answer, with or without working award 2/2

2 For answers of
$x = bc - a$ **or** $x = b - a \times c$
with or without working award 1/2

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
10	**Ans: Bob has the faster average speed by $0 \cdot 3$ kph**	
	•[1] interpret: find angle BAC	•[1] $80°$
	•[2] strategy: know to apply sine rule	•[2] evidence
	•[3] process: correct application of sine rule	•[3] $\frac{a}{\sin 80°} = \frac{16 \cdot 8}{\sin 70°}$ **or** $\frac{a}{\sin 80°} = \frac{5 \cdot 6}{\sin 70°}$
	•[4] process: correct calculation of BC	•[4] $17 \cdot 6$ km **or** $5 \cdot 9$ km
	•[5] communication: state conclusion with valid reason	•[5] conclusion with reason **5 marks**

NOTES:

1 For the first mark $\angle$BAC need not be explicitly stated.
It may be marked in a diagram or stated within the use of the sine rule.

2 An incorrect value for $\angle$ BAC must be followed through.

3 For a correct answer without working award 0/5

4 The final mark is available only when the conclusion is based on a calculation using trigonometry

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
11 (a)	**Ans: Proof** •[1] strategy: know how to start •[2] process: follow strategy through to complete proof	•[1] $1x(x+5)=24$ •[2] $x^2+5x-24=0$ **2 marks**
NOTE: Where the solution to part (a) appears in part (b), and vice versa, full marks are available for both parts.		
(b)	**Ans: breadth is 3 metres** •[1] strategy: know to solve quadratic equation •[2] process: solve quadratic equation •[3] communicate: know to discard –8	•[1] $(x+8)(x-3)=0$ •[2] $x=-8$ or $x=3$ •[3] $x=3$ metres **3 marks**
NOTES: 1 For the award of the 3rd mark, the breadth must be explicitly stated. 2 For a correct result arrived at using a trial and improvement method. award 1/3 3 Where the quadratic formula is used, the first mark is available for substituting correctly $x=\frac{-5\pm\sqrt{5^2-4\times1\times(-24)}}{2\times1}$		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
12 (a)	**Ans: 10 metres**	
	$\bullet^1$ process: substitute correctly	$\bullet^1$ $h = 8 + 4\sin 30$
	$\bullet^2$ process: calculate height correctly	$\bullet^2$ $h = 10$ **2 marks**

NOTES:

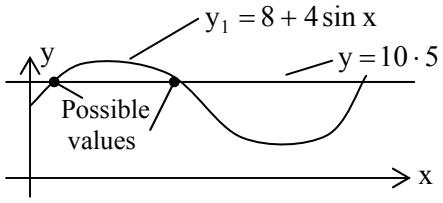
1 For a correct answer, without working — award 2/2

2 For an answer of 4·05 (RADS) or 9·82 (GRADS) and follow through — award 2/2

(b)	**Ans: 38 · 7s, 141 · 3s**	
	$\bullet^1$ process: substitute correctly	$\bullet^1$ $8 + 4\sin t = 10 \cdot 5$
	$\bullet^2$ process: rearrange correctly	$\bullet^2$ $\sin t = 2 \cdot 5 / 4$
	$\bullet^3$ process: calculate one angle	$\bullet^3$ $t = 38 \cdot 7$
	$\bullet^4$ process: calculate second angle	$\bullet^4$ $t = 141 \cdot 3$ **4 marks**

NOTES:

1 Where a graphical solution is used the second mark is available for indicating what graph(s) is (are) drawn and where the values occur



2 For a correct answer arrived at by trial and improvement, only the first, third and fourth marks are available.

3 For a correct answer without working — award 0/4

TOTAL MARKS FOR PAPER 2
50

[END OF MARKING INSTRUCTIONS]