2011 Mathematics

Intermediate 2 – Units 1, 2 and Applications Paper 2

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 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.

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

12 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 lower mark.

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 2, Units 1, 2 and Applications

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
1.	**Ans: -9/10** •[1] process: calculate gradient	•[1] -9/10 **1 mark**
NOTES:		
2.	**Ans: £147 900** •[1] strategy: know how to increase by 3.15% •[2] strategy: know how to calculate expected value •[3] process: carry out all calculations correctly within a valid strategy •[4] process: round answer to 4 significant figures	•[1] × 1·0315 •[2] $134\,750 \times 1{\cdot}0315^3$ •[3] 147 889·2038 •[4] 147 900 **4 marks**

NOTES:

1. For an answer of £147 900, with or without working (✓✓✓✓) award 4/4
2. For an answer of £147 900·00, with or without working, (✓✓✓✗) award 3/4
3. For an answer of £147 889·2, with or without working (✓✓✓✗) award 3/4
4. Where an incorrect percentage has been used, the working must be followed through to give the possibility of awarding 3/4
   eg for an answer of £122 400 ($134\,750 \times 0{\cdot}9685^3$), with working (✗✓✓✓) award 3/4
5. For an answer of £417 000 ($134\,750 \times 1{\cdot}0315 \times 3$), with working (✓✗✗✓) award 2/4
6. For an answer of £147 500 ($134\,750 + 3 \times 0{\cdot}0315 \times 134\,750$), with working (✓✗✗✓) award 2/4
7. For an answer of £12 730 ($134\,750 \times 0{\cdot}0315 \times 3$), with working (✗✗✗✓) award 1/4

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
3. (a)	**Ans: 106 cubic metres** •[1] process: substitute correctly into volume formula for cylinder •[2] process: calculate volume of cylinder	•[1] $\pi \times 1{\cdot}5^2 \times 15$ •[2] 106 (m^3) **2 marks**
NOTES: 1. Accept variations in volume due to variations in the value of π		
(b)	**Ans: 17·4 metres** •[1] strategy: know how to find expression for volume of cone •[2] strategy: know to equate volume of cone with 5·7 •[3] process: calculate total height of The Pencil	•[1] $\frac{1}{3} \times \pi \times 1{\cdot}5^2 \times h$ •[2] $\frac{1}{3} \times \pi \times 1{\cdot}5^2 \times h = 5{\cdot}7$ •[3] 17·4 (m) **3 marks**
NOTES:		
4.	**Ans: 25·1 square centimetres** •[1] strategy: know to express sector as fraction of circle •[2] strategy: know how to find area of sector •[3] process: correctly calculate area of sector	•[1] $\frac{54}{360}$ •[2] $\frac{54}{360} \times \pi \times 7{\cdot}3^2$ •[3] 25·1 (sq cm) **3 marks**
NOTES: 1. Accept variations in π, disregard premature or incorrect rounding of $\frac{54}{360}$ 2. For $\frac{54}{360} \times \pi \times 2 \times 7{\cdot}3$ leading to 6·9 (✓ ✗ ✓) award 2/3 3. For the award of the final mark, calculations must involve a fraction and π		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
5. (a)	**(i) Ans: $\bar{x} = 41$ (ii) Ans: $s = 2{\cdot}1$**	
(i)	•[1] process: calculate the mean	•[1] 41 **1 mark**
(ii)	•[1] process: calculate $(x - \bar{x})^2$	•[1] 4, 4, 0, 1, 4, 9
	•[2] process: substitute into formula	•[2] $\sqrt{\frac{22}{5}}$
	•[3] process: calculate standard deviation	•[3] 2·1 (disregard rounding) **3 marks**

NOTES:

1. For use of alternative formula in part (a) (ii), award marks as follows

•[1] process: calculate $\sum x$ and $\sum x^2$	•[1] 246 and 10 108
•[2] process: substitute into formula	•[2] $\sqrt{\frac{10108 - 246^2/6}{5}}$
•[3] process: calculate standard deviation	•[3] 2·1

2. For correct answer, without working award 0/3

5. (b)	**Ans: Yes, with reasons covering both conditions**	
	•[1] communicate: compare mean with the tolerance	•[1] Yes, because 41 is between 38 and 42
	•[2] communicate: compare std dev with tolerance	•[2] Yes, because 2·1 is less than 3 **2 marks**

NOTES:

1. Do <u>not</u> accept:
   "Yes, because the mean is 41 which is in the range 40 ± 2."
   "Yes, because the mean is between 38 and 42."
   "Yes, because the standard deviation is less than 3."

2. 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. (a)	**Ans: $24x + 6y = 60$** •[1] interpret: interpret the text	•[1] $24x + 6y = 60$ **1 mark**
(b)	**Ans: $20x + 10y = 40$** •[1] interpret: interpret the text	•[1] $20x + 10y = 40$ **1 mark**
(c)	**Ans: 25 points** •[1] strategy: know to solve system of equations •[2] process: follow a valid strategy through to produce a value for x and y •[3] process: correct value for x and y •[4] process: calculate $17x + 13y$	•[1] evidence of scaling •[2] a value for x and y •[3] $x = 3, y = -2$ •[4] 25 **4 marks**

NOTES:

1. Incorrect equations in parts (a) and/or (b) must be followed through to give the possibility of awarding 4/4.

2. Any valid strategy must involve the use of two equations.

3. Where a candidate writes
   $24x – 6y = 60$ for part (a),
   $20x – 10y = 40$ for part (b), leading to $x = 3, y = 2$
   and a final answer of 25, award 0/1 for part (a)
   award 1/1 for part (b)
   award 4/4 for part (c).

4. Where the correct values for x and y have been obtained without using simultaneous equations, marks are available only if both values have been substituted correctly into **both** equations
   ie $24 \times 3 + 6 \times (-2) = 60$
   $20 \times 3 + 10 \times (-2) = 40$
   leading to $x = 3, y = -2$
   $17x + 13y = 25$ award 4/4

5. For a correct answer, without working award 0/4

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
7.	**Ans: Finesave without payment protection** •[1] process: calculate total amount of repayments •[2] process: calculate monthly repayment •[3] communication: communicate result	•[1] 12339 •[2] 205·65 •[3] Finesave without payment protection **3 marks**
NOTES: 1 For a correct answer, without working, award 0/3. 2 For 205·65 × 60 = 12339, leading to an answer of "Finesave without payment protection" award 3/3. 3 Evidence for the 2nd and 3rd marks must include 12339 ÷ 60 or 205·65 × 60		
8. (a)	**Ans: 4 runners** •[1] communicate: state answer	•[1] 4 **1 mark**
NOTES:		
(b)	**Ans: 6** •[1] interpret: know how to find Q_1 from the diagram •[2] interpret: know how to find Q_3 from the diagram •[3] process: find SIQR	•[1] 58 •[2] 70 •[3] 6 **3 marks**
NOTES:		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
9.	**Ans: £9·36** •[1] strategy: know to calculate number of hours at basic rate •[2] strategy: know how to calculate overtime rate •[3] process: carry out all calculations correctly	 •[1] 35 + 4 × 1·5 •[2] 255·84 ÷ 41 × 1·5 •[3] 9·36 **3 marks**

NOTES:

1. Some common answers (with working)

9·84	(255·84 ÷ 39 × 1·5)	award 2/3	✗ ✓ ✓
10·96	(255·84 ÷ 35 × 1·5)	award 2/3	✗ ✓ ✓
6·24	(255·84 ÷ 41)	award 2/3	✓ ✗ ✓
39·36	(255·84 ÷ 39 × 1·5 × 4)	award 1/3	✗ ✓ ✗
43·86	(255·84 ÷ 35 × 1·5 × 4)	award 1/3	✗ ✓ ✗
6·56	(255·84 ÷ 39)	award 0/3	✗ ✗ ✗
7·31	(255·84 ÷ 35)	award 0/3	✗ ✗ ✗

2. Ignore minor variations due to rounding.

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
10. (a)	**Ans: = B4/12** •[1] communicate: state formula	•[1] = B4/12 **1 mark**
(b)	**Ans: = SUM(D4:D8)** •[1] communicate: state formula	•[1] = SUM(D4:D8) or = E7 + D8 **1 mark**
(c)	**Ans: £87 750** •[1] strategy: know how to calculate E8 •[2] process: calculate value for E8 correctly	•[1] evidence •[2] 87 750 **2 marks**

NOTES:

1. For a correct answer without working award 2/2
2. An incorrect answer for part (b) may be followed through with the possibility of awarding 2/2, eg where a candidate has an answer to part (b) = SUM (B8:D8), and 37 700 for part (c), award 2/2

(d)	**Ans: £50 700, £46 200, so Paywell pays more** •[1] strategy: know to calculate values in cells E6 and E15 •[2] process/communicate: state values in E6 and E15 and state conclusion.	•[1] E5+D6, E14+D15 •[2] 50 700, 46 200, PAYWELL **2 marks**

NOTES:

1. An incorrect answer in part (b) may be followed through with the possibility of awarding 2/2 eg where a candidate has an answer to part (b) =SUM (B8:D8), and 35 100, 35 200, Highpay for part (d), award 2/2
2. Evidence for part (d) may appear in an earlier part of the question

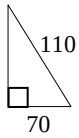
Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
11.	**Ans: 21 centimetres**	
	•[1] process: state the size of $\angle$BOD and recognise isosceles triangle	•[1] 82° plus evidence of isos. triangle
	•[2] process: state the size of $\angle$ADC	•[2] 131°
	•[3] strategy: know to use the cosine rule in triangle ADC	•[3] evidence
	•[4] process: substitute correctly in cosine rule	•[4] $d^2 = 9^2 + 14^2 - 2\times 9\times 14\times \cos 131^\circ$
	•[5] process: calculate AC	•[5] 21 (cm)
		5 marks

NOTES:

3. Angle BOD may not be explicitly stated, it may be marked in a diagram and, when evidence of the isosceles triangle is also present, can be awarded the first mark.

4. Angle ADC may not be explicitly stated. It may be marked in a diagram and can be awarded the second mark.

5. Disregard errors due to premature rounding.

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
12.	**Ans: 25.1 millimetres**	
	•[1] strategy: marshall facts and recognise right-angle	•[1] 
	•[2] strategy: use Pythagoras Theorem or equivalent	•[2] $x^2 = 110^2 - 70^2$
	•[3] process: calculate third side correctly	•[3] 84·9
	•[4] process: state height	•[4] 25·1 (mm) **4 marks**

NOTES:

1. The final mark is for subtracting a calculated value from the radius.
2. Some common answers (with working):

   $\sqrt{110^2 + 70^2} = 130 \cdot 4$

   award 2/4

   $110 - \sqrt{140^2 - 110^2} = 23 \cdot 4$

   award 2/4
3. Where a candidate assumes an angle of 45º in the right-angled triangle, only the first and fourth marks are available.

TOTAL MARKS FOR PAPER 2
50

[END OF MARKING INSTRUCTIONS]