2007 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	**Ans: 29/100 (or equivalent)** •[1] process: calculate probability	•[1] 29/100 (or equivalent) **1 mark**
NOTES: Accept variations eg 29 : 100 0·29 29% 29 out of 100, etc		
2	**Ans: $y = 4x - 3$** •[1] process: find gradient •[2] process: state y intercept or c in $y = mx + c$ •[3] communicate: state correct equation of straight line	•[1] m = 4 (or equivalent) •[2] c = –3 •[3] $y = 4x - 3$ **3 marks**
NOTES: 1 For a correct answer without working award 3/3 2 For $y = 4x$ award 1/3 3 Where m and/or c are incorrect, the working must be followed through to give the possibility of awarding 1/3 or 2/3 4 If the equation is stated incorrectly and there is no working, 1/3 can be awarded for correct gradient or correct y-intercept 5 For an incorrect equation (ie both m and c incorrect), without working, eg $y = -3x + 4$ award 0/3		
3	**Ans: 314 cubic cm** •[1] process: substitute correctly into the formula for the volume of a cylinder •[2] process: correct calculation	•[1] $V = 3{\cdot}14 \times 5^2 \times 4$ •[2] $V = 314\text{cm}^3$ **2 marks**
NOTES: The second mark is available for a multiplication involving 3·14 and squaring eg $V = 3{\cdot}14 \times 10^2 \times 4 = 1256$ award 1/2		

Question No	Marking Scheme Give 1 mark for each •		Illustrations of evidence for awarding a mark at each •
4	**Ans: (3, − 4)**		
	$\bullet^1$ strategy:	know to solve system of equations	$\bullet^1$ evidence of valid strategy
	$\bullet^2$ process:	scale system of equations	$\bullet^2$ $x + 2y = -5$ $6x - 2y = 26$ or equivalent
	$\bullet^3$ process:	solve for one variable	$\bullet^3$ $x = 3$ or $y = -4$
	$\bullet^4$ process:	solve for other variable **and** communicate point of intersection	$\bullet^3$ (3, − 4) **4 marks**

NOTES:

1. A valid strategy **must** involve the use of 2 equations, 2 tables of values or 2 straight lines

2. <u>Alternative methods</u>

   Where the point of intersection is obtained from 2 tables of values or solving 2 equations graphically, the criteria for awarding the second, third and fourth mark are as follows:

$\bullet^2$	strategy:	set up table of values correctly or draw correctly the line $x + 2y = -5$	$\bullet^2$	table of values or straight line graph of $x + 2y = -5$
$\bullet^3$	process:	set up table of values correctly or draw correctly the line $3x - y = 13$	$\bullet^3$	table of values or straight line graph of $3x - y = 13$
$\bullet^4$	process:	identify and communicate point of intersection	$\bullet^4$	(3, -4)

3. Where an error occurs in scaling the system of equations, marking must be followed through with the possibility of awarding 3/4 or 2/4

4. Where one or both tables of values are set up incorrectly, marking must be followed through with the possibility of awarding 3/4 or 2/4

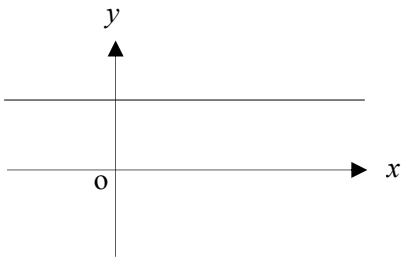
5. Where one or both straight line graphs are drawn incorrectly, marking must be followed through with the possibility of awarding 3/4 or 2/4

6. For 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 •
5	**Ans:** $x^3 + 7x^2 - 36$ •[1] process: start to multiply out brackets •[2] process: complete the process of multiplying out brackets correctly •[3] process: collect like terms which must include x^3	•[1] evidence of 3 correct terms (eg $x^3 + 4x^2 - 12x$) •[2] $x^3 + 4x^2 - 12x + 3x^2 + 12x - 36$ •[3] $x^3 + 7x^2 - 36$ **3 marks**
NOTES:		
6 (a)	**Ans: Proof** •[1] strategy: know how to find $\bar{x}$ and $(x-\bar{x})^2$ •[2] process: substitute into formula •[3] process: complete proof with all calculations correct	•[1] evidence (2 and 1, 1, 1, 0, 9) •[2] evidence $\left(\sqrt{\frac{12}{5-1}}\right)$ •[3] leading to $\sqrt{3}$ **3 marks**
NOTES: For use of alternative formula award marks as follows •[1] strategy: known how to find Σx and Σx^2		•[1] evidence (10 and 32)
(b)	**Ans:** $\sqrt{3}$ •[1] communicate: state standard deviation	•[1] $\sqrt{3}$ **1 mark**
NOTES:		

Question No	Marking Scheme Give 1 mark for each •		Illustrations of evidence for awarding a mark at each •
7 (a)	**Ans: $x = 0,\ x = 8$**		
	•[1] process:	correctly factorise $8x - x^2$	•[1] $x(8 - x)$
	•[2] process:	find roots	•[2] 0, 8 **2 marks**
NOTES: For a candidate who finds the correct roots without factorising award 1/2			
(b)	**Ans: $x = 4$**		
	•[1] communicate:	state equation of axis of symmetry	•[1] $x = 4$ **1 mark**
NOTES: An incorrect answer in part (a) must be followed through			
(c)	**Ans: (4, 16)**		
	•[1] process:	substitute $x = 4$ into $y = 8x - x^2$	•[1] $y = 8 \times 4 - 4^2$
	•[2] process:	calculate coordinates of turning point	•[2] (4, 16) **2 marks**
NOTES: An incorrect answer in part (b) must be followed through			

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
8	**Ans: -0.5** •[1] process: calculate cos 240°	•[1] -0.5 **1 mark**
NOTES:		
9	**Ans: $5\sqrt{2}$** •[1] process: correctly use Pythagoras theorem •[2] process: calculate x •[3] process: simplify surd	•[1] $x^2 = 7^2 + 1^2$ •[2] $\sqrt{50}$ •[3] $5\sqrt{2}$ **3 marks**
NOTES:		
10 (a)	**Ans: $a = 4$** •[1] process: find a	•[1] 4 **1 mark**
NOTES:		
(b)	**Ans: $b = 2$** •[1] process: find b	•[1] 2 **1 mark**
NOTES:		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
11	**Ans:**  •[1] interpret: realise a = 0 represents a horizontal line •[2] interpret: realise b > 0 represents a *y*-intercept above origin	•[1] horizontal line drawn on graph •[2] line drawn with *y*-intercept above origin **2 marks**
NOTES:		

TOTAL MARKS FOR PAPER 1
30

[END OF MARKING INSTRUCTIONS]

2007 Mathematics

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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	**Ans: £30 405** •[1] strategy: know how to increase by 2.3% •[2] strategy: know how to calculate expected wage •[3] process: carry out calculations correctly within a valid strategy	•[1] 1·023 •[2] $28\,400 \times 1{\cdot}023^3$ •[3] 30 405 **3 marks**

NOTES:

1 For an answer of 30 405 without working — award 3/3

2 For an answer of 30 405·01 or 30 405·02 with or without working — award 2/3

3 Where an incorrect % is used, the working must be followed through to give the possibility of awarding 2/3
eg an answer of £52 849 (=$28\,400 \times 1{\cdot}23^3$), with working — award 2/3

4 For an answer of 87 160 or 87 159·60 ($28\,400 \times 1{\cdot}023 \times 3$), with working — award 1/3

5 For an answer of 30 360 ($28\,400 + 28\,400 \times 0{\cdot}023 \times 3$), with working — award 1/3

6 For an answer of 1960 ($28\,400 \times 0{\cdot}023 \times 3$) — award 0/3

2	**Ans: 21.6 cm** •[1] strategy: express sector as fraction of a circle •[2] strategy: know how to find length of arc •[3] process: correctly calculate length of arc	•[1] 118/360 •[2] $118/360 \times \pi \times 2 \times 10{\cdot}5$ •[3] 21·6 **3 marks**

NOTES:

1 Accept variations in π, disregard premature or incorrect rounding of 118/360

2 For $118/360 \times \pi \times 10{\cdot}5^2$ leading to 113·5 — award 2/3

3 For the award of the final mark, calculations must involve π and be of equivalent difficulty

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
3 (a)	**Ans: Boys' data, with valid reason** •[1] interpret: select correct data set, with valid reason	 •[1] Boys' data, with valid reason **1 mark**
NOTES:		
(b)	**Ans: (i) 58** **(ii) 52** **(iii) 76** •[1] process: state median •[2] process: state lower quartile •[3] process: state upper quartile	 •[1] 58 •[2] 52 •[3] 76 **3 marks**

NOTES:

1 The first mark is available only where the median is consistent with the answer to part (a)
eg

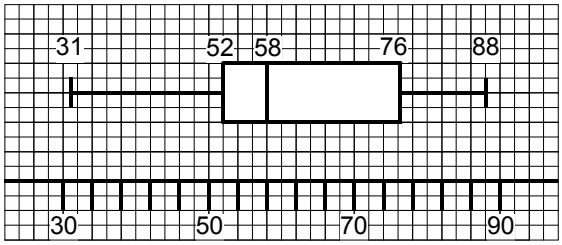
Possible answers

For (a) Girls' data
and (b) 56, 53, 63 — award part (a) 0/1, part (b) 3/3

For (a) Girls' data
and (b) 58, 52, 76 — award part (a) 0/1, part (b) 2/3

For (a) Boys' data (with reason)
and (b) 56, 53, 63 — award part (a) 1/1, part (b) 2/3

2 An incorrect answer for the median must be followed through with the possibility of awarding full marks for parts (ii) and (iii)

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
(c)	**Ans:**  •[1] communicate correct end points •[2] communicate: correct box	•[1] end points at 31and 88 •[2] box showing Q_1, Q_2, Q_3 **2 marks**
NOTES: Incorrect answers in part (b) must be followed through to give the possibility of awarding 2/2		
(d)	**Ans: The girls' results are more widely spread than the boys'** •[1] communicate: valid comment about the spread of data	•[1] comment **1 mark**
NOTES:		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
4 (a)	**Ans: 154°** •[1] process: calculate angle MTO •[2] process: calculate angle MOT	•[1] 13° •[2] 154° **2 marks**

NOTES:

1 Angle MTO may not be explicitly stated; it may be marked in a diagram and can be awarded the first mark

2 A correct answer, without working award 2/2

(b)	**Ans: 15·6 cm** •[1] strategy: know to use cosine rule, sine rule or equivalent •[2] process: correctly apply the cosine rule, sine rule or equivalent •[3] process: calculate MT	•[1] evidence •[2] $MT^2 = 8^2 + 8^2 - 2\times 8\times 8\times \cos 154^\circ$ or $\frac{MT}{\sin 154^\circ} = \frac{8}{\sin 13^\circ}$ •[3] 15·6 cm **3 marks**

NOTES:

1 Disregard errors due to premature rounding

2 Where ∠MOT is found to be 90° leading to an answer of 11·3, with working award 1/3

3 Where ∠MOT is found to be 154º, leading to an answer of 11·3 award 0/3

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
5	**Ans: 5400 cubic centimetres** •[1] strategy: know how to calculate volume •[2] process: substitute correctly into formula •[3] process: substitute correctly into formula •[4] process: calculate volume correctly •[5] process: round answer to 2 significant figures	•[1] evidence of difference in volume of two cones •[2] $\frac{1}{3}\times\pi\times15^2\times24$ (5655) •[3] $\frac{1}{3}\times\pi\times5^2\times8$ (209) •[4] 5445·43 •[5] 5400 **5 marks**

NOTES:

1 Accept variations in π

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

3 For use of $\pi r^2 h$, the second, third and fifth marks are available

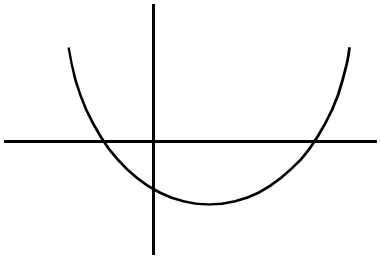
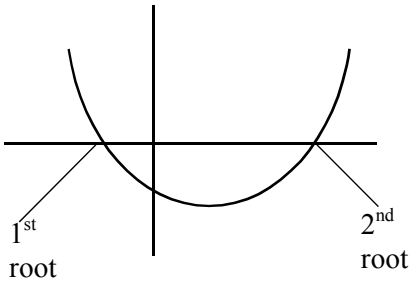
Common wrong answers

5200	$\left(\frac{1}{3}\times\pi\times15^2\times24-\frac{1}{3}\times\pi\times5^2\times16\right)$	award 4/5 (✓✓×✓✓)
3600	$\left(\frac{1}{3}\times\pi\times15^2\times16-\frac{1}{3}\times\pi\times5^2\times8\right)$	award 4/5 (✓×✓✓✓)
1900	$\left(\frac{1}{3}\times\pi\times15^2\times24-\frac{1}{3}\times\pi\times15^2\times16\right)$	award 4/5 (✓✓×✓✓)
16000	$\left(\pi\times15^2\times24-\pi\times5^2\times8\right)$	award 3/5 (×✓✓×✓)

6	**Ans: D is correct** •[1] process: state the correct letter	•[1] D **1 mark**

NOTES:

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
7 (a)	**Ans:** $\mathbf{2(x+3)(x-3)}$ •[1] process: start to factorise •[2] process: complete factorisation	•[1] $2(x^2-9)$ •[2] $2(x+3)(x-3)$ **2 marks**
NOTES: For the following answers award 1/2 $2(x^2-9)$ $(2x+6)(x-3)$ $(2x-6)(x+3)$		
(b)	Ans: $\dfrac{\mathbf{2x+5}}{\mathbf{2x-1}}$ •[1] process: correctly simplify fraction	•[1] $\dfrac{2x+5}{2x-1}$ **1 mark**
NOTES: 1 For working subsequent to a correct answer award 0/1		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
8	**Ans: $x = -0{\cdot}7,\ x = 3{\cdot}7$**	
	•[1] strategy: know to use quadratic formula	•[1] evidence
	•[2] process: substitute correctly into quadratic formula	•[2] $\dfrac{6 \pm \sqrt{(-6)^2 - 4 \times 2 \times -5}}{2 \times 2}$
	•[3] process: calculate $b^2 - 4ac$	•[3] 76
	•[4] process: state both values of x correct to one decimal place	•[4] $-0{\cdot}7,\ 3{\cdot}7$
	Method 2 – possible graphical solutions	
	•[1] strategy: know to graph $y = 2x^2 - 6x - 5$	•[1] $y = 2x^2 - 6x - 5$ 
	•[2] communicate: indicate position of roots	•[2] $y = 2x^2 - 6x - 5$ 
	•[3] communicate: state first root correct to 1 decimal place	•[3] $-0{\cdot}7$
	•[4] communicate: state second root correct to 1 decimal place	•[4] $3{\cdot}7$
		4 marks

NOTES:

1 Where $b^2 - 4ac$ is calculated incorrectly, the final mark is available only if $b^2 - 4ac > 0$

2 For a correct answer without working award 0/4

3 The final mark is available only when the answer requires rounding

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
9	**Ans: 13.4 metres**	
	•[1] strategy: know to find AC or BC	•[1] evidence of use of sine rule in triangle ABC
	•[2] process: correct application of sine rule in triangle ABC	•[2] $\frac{BC}{\sin 38^\circ} = \frac{30}{\sin 96^\circ}$ or $\frac{AC}{\sin 46^\circ} = \frac{30}{\sin 96^\circ}$
	•[3] process: calculate AC or BC correctly	•[3] BC = 18·6 m or AC = 21·7 m
	•[4] strategy: know to use right-angled trig to calculate height of block of flats or other valid strategy	•[4] $\frac{h}{18\cdot 6} = \sin 46^\circ$ or $\frac{h}{21\cdot 7} = \sin 38^\circ$
	•[5] process: calculate height of block of flats	•[5] 13·4 metres
		5 marks

NOTES:

1 Disregard errors due to premature rounding provided there is evidence

2 Variations in answers for a value of AC or BC or a wrong value of AC or BC must be accepted as a basis of calculating the height of triangle ABC

3 For a correct answer without working award 0/5

4 <u>Answer obtained by a scale drawing</u>

•[1] strategy: know to use scale drawing	•[1] evidence of appropriate scale clearly stated
•[2] process: draw AB consistent with chosen scale	
•[3] process: measure angles of $(38 \pm 2)^\circ$ and $(46 \pm 2)^\circ$	
•[4] process: complete triangle ACB and indicate height	
•[5] process: calculate height of triangle ACB correctly	•[5] h = (13·4 ± 0·3) m

Question No	Marking Scheme Give 1 mark for each •		Illustrations of evidence for awarding a mark at each •
10	**Ans:** $\frac{5p}{4}$		
	•[1] strategy:	know how to start the division calculation	•[1] $\frac{5p^2}{8} \times \frac{2}{p}$
	•[2] process:	continue process	•[2] $\frac{10p^2}{8p}$
	•[3] process:	express fraction in simplest form	•[3] $\frac{5p}{4}$ **3 marks**

NOTES:

1 A correct answer, without working — award 3/3

2 An incorrect answer, without working — award 0/3

11	**Ans:** $m = \sqrt{\frac{kp}{n}}$		
	•[1] process:	start to rearrange the formula	•[1] $kp = m^2n$
	•[2] process:	continue the process	•[2] $m^2 = \frac{kp}{n}$
	•[3] process:	make m the subject	•[3] $m = \sqrt{\frac{kp}{n}}$ **3 marks**

NOTES:

1 For a correct answer without working — award 3/3

2 The second mark is available for division by n

3 The third mark is available for taking the square root of an expression for m^2

4 For an answer of $\frac{\sqrt{kp}}{n}$, with or without working — award 2/3

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
12	**Ans: $1/m^3$** •[1] process: simplify expression •[2] process: express with a positive power	•[1] m^{-3} •[2] $1/m^3$ **2 marks**
NOTES:		
13	**Ans: $x = 58$ and 238** •[1] process: solve equation for $\tan x°$ •[2] process: find one value of x •[3] process: find second value of x	•[1] $\tan x° = \frac{8}{5}$ •[2] $x = 58$ •[3] $x = 238$ **3 marks**

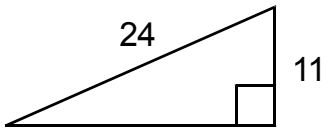
NOTES:

1 Where $\tan x°$ is calculated incorrectly, the working must be followed through with the possibility of awarding 2/3

2 Where a graphical solution has been used, the first mark is available for indicating what graph is drawn and where the values occur

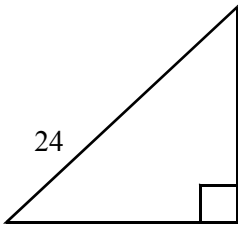
3 For a correct answer arrived at by trial and improvement, only the second and third marks are available

4 For a correct answer without working award 0/3

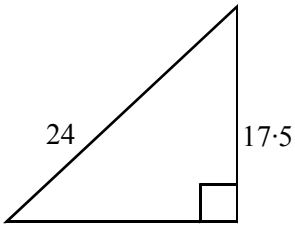
Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
14	**Ans: 42.7 cm** •[1] strategy: marshall facts and recognise right-angle •[2] strategy: use Pythagoras' theorem or equivalent •[3] process: all calculations correct, within a valid strategy	 •[1] •[2] $x^2 = 24^2 - 11^2$ •[3] 42·7 **3 marks**

NOTES:

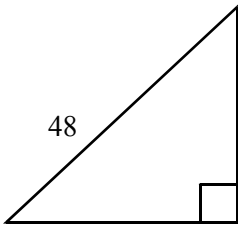
Common answers



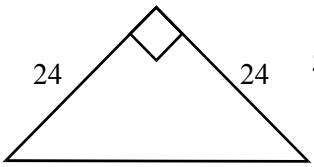
giving $x^2 = 24^2 - 13^2$
leading to AB = 40·3 award 2/3



giving $x^2 = 24^2 - 17 \cdot 5^2$
leading to AB = 32·8 award 2/3



giving $x^2 = 48^2 - 35^2$
leading to AB = 32·8 award 2/3



giving $x^2 = 24^2 + 24^2$
leading to AB = 33·9 award 0/3

TOTAL MARKS FOR PAPER 2
50

[END OF MARKING INSTRUCTIONS]