

2004 Mathematics

Intermediate 2 – Units 1, 2 and Applications

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.

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

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 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.
- 4 In certain cases an error will ease subsequent working. **Full** credit cannot be given for this subsequent work but **partial** credit may be given.
- 5 Accept answers arrived at by inspection or mentally, where it is possible for the answer to have been so obtained.
- 6 Do not penalise omission or misuse of units unless marks have been specifically allocated to units.

7 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.**

8 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.

9 In general do not penalise the same error twice in the one question.

10 Accept legitimate variations in numerical/algebraic questions.

11 Do not penalise bad form eg $\sin x^\circ = 0.5 = 30^\circ$.

12 A transcription error is not normally penalised except where the question has been simplified as a result.

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

Mathematics – Intermediate 2: Paper 1, Units 1, 2 and Applications

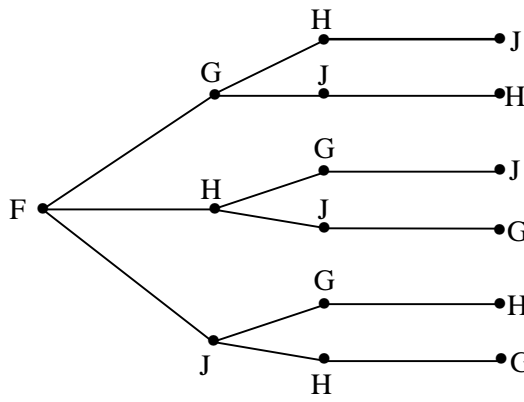
Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •																
1. (a)	<p>Ans:</p> <table style="margin-left: 40px;"> <thead> <tr> <th style="text-align: center;">frequency</th> <th style="text-align: center;">cumulative frequency</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">3</td><td style="text-align: center;">3</td></tr> <tr><td style="text-align: center;">7</td><td style="text-align: center;">10</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">12</td></tr> <tr><td style="text-align: center;">3</td><td style="text-align: center;">15</td></tr> <tr><td style="text-align: center;">1</td><td style="text-align: center;">16</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">18</td></tr> <tr><td style="text-align: center;">2</td><td style="text-align: center;">20</td></tr> </tbody> </table> <p>•¹ communicate: table with frequency column</p> <p>•² communicate: table with cumulative frequency column</p>	frequency	cumulative frequency	3	3	7	10	2	12	3	15	1	16	2	18	2	20	<p>•¹ 3, 7, 2, 3, 1, 2, ,2 or correct tally marks</p> <p>•² 3, 10, 12, 15, 16, 18, 20</p> <p style="text-align: right;">2 marks</p>
frequency	cumulative frequency																	
3	3																	
7	10																	
2	12																	
3	15																	
1	16																	
2	18																	
2	20																	
<p>NOTES:</p> <p>(i) Where the frequency column has been constructed incorrectly, the working must be followed through with the possibility of awarding 1/2.</p> <p>(ii) Where a grouped frequency table has been used, both marks are available.</p>																		
(b)	<p>Ans: $\frac{5}{20}$ or equivalent</p> <p>•¹ process: finds probability</p>	<p>•¹ $\frac{5}{20}$</p> <p style="text-align: right;">1 mark</p>																

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
2.	<p>Ans: $y = 2x + 1$</p> <ul style="list-style-type: none"> •¹ process: find gradient •² process: state y intercept or c in $y = mx + c$ •³ communicate: state correct equation of straight line 	<ul style="list-style-type: none"> •¹ $m = 2$ •² $c = 1$ •³ $y = 2x + 1$ <p style="text-align: right;">3 marks</p>

NOTES:

- (i) For a correct answer without working award 3/3
- (ii) For $y = 2x$ award 1/3
- (iii) Where m and/or c are incorrect, the working must be followed through to give the possibility of awarding 1/3 or 2/3.
- (iv) For an incorrect equation (ie both m and c incorrect), without working eg $y = 1x + 2$ award 0/3

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
3.	<p>Ans: 42°</p> <ul style="list-style-type: none"> •¹ process: calculate the size of angle OTQ •² process: calculate the size of angle TOQ or TQP •³ process: calculate the size of angle OPT 	<ul style="list-style-type: none"> •¹ 66° •² 48° or 114° •³ 42° <p style="text-align: right;">3 marks</p>
<p>NOTES:</p> <p>(i) Angle OTQ, angle TOQ and angle TQP may not be explicitly stated, they may be marked in a diagram and can be awarded the first and second marks.</p> <p>(ii) A correct answer, without working. award 3/3</p>		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark •
4. (a)	<p>Ans:</p>  <p>•¹•²•³ communication: show all possible routes</p>	<p>•¹ for any 2 correct routes •² for any further 2 correct •³ for completing diagram correctly</p> <p style="text-align: right;">3 marks</p>

NOTES:

(i) Where the final town has been omitted from each route, a maximum of 2 marks is available

(b)	<p>Ans: Shortest route is $F \rightarrow J \rightarrow H \rightarrow G$</p> <p>•¹ strategy: calculate distance for each route mentioned in part (a)</p> <p>•² communicate: identify shortest route</p>	<p>•¹ 42, 41, 50, 48, 41, 40</p> <p>•² $F \rightarrow J \rightarrow H \rightarrow G$</p> <p style="text-align: right;">2 marks</p>
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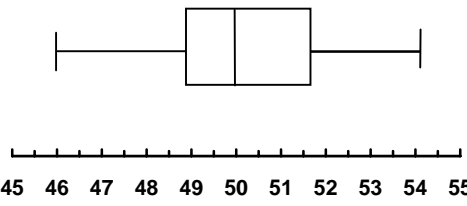
NOTES:

- (i) Correct answer, with no working award 0/2
- (ii) For first mark the number of distances calculated must be greater than or equal to 3.

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
5. (a)	<p>Ans: (i) $Q2 = 50$ (ii) $Q1 = 49$ (iii) $Q3 = 51.5$</p> <p>•¹ communicate: state Q2 •² communicate: state Q1 •³ communicate: state Q3</p>	<p>•¹ 50 •² 49 •³ 51.5</p> <p style="text-align: right;">3 marks</p>

NOTES:

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

(b)	<p>Ans:</p> <div style="text-align: center;">  </div> <p>•¹ communicate: correct end points •² communicate: correct box</p>	<p>•¹ end points at 46 and 54 •² box showing Q1, Q2, Q3</p> <p style="text-align: right;">2 marks</p>
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NOTES:

Incorrect answers in (a) must be followed through to give the possibility of awarding 2/2.

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
(c)	<p>Ans: The SIQR in first sample was 1.25 which is less than 1.5 so number of chocolates in each box in first sample is more consistent (or other valid comment)</p> <p>•¹ strategy: calculate SIQR for first sample</p> <p>•² communicate: valid comment about spread of samples</p>	<p>•¹ SIQR = 1.25</p> <p>•² comment</p> <p style="text-align: right;">2 marks</p>

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
6. (a)	Ans: 670 • ¹ process: substitute correctly into formula • ² process: carry out all calculations correctly	• ¹ $S = \frac{1}{2} \times 20 [2 \times 5 + (20 - 1)3]$ • ² 670 <p style="text-align: right;">2 marks</p>
NOTES:		
(b)	Ans: 5 • ¹ process: substitute correctly into formula • ² process: starts to solve equation • ³ process: completes process correctly	• ¹ $664 = \frac{1}{2} \times 16 [2 \times 4 + (16 - 1)d]$ • ² $664 = 64 + 120d$ • ³ $d = 5$ <p style="text-align: right;">3 marks</p>
NOTES: Where a candidate has changed the subject of the formula incorrectly, has then substituted correctly <u>and</u> followed through correctly award 1/3.		

TOTAL MARKS FOR PAPER 1
26

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.	<p>Ans: £83 900</p> <ul style="list-style-type: none"> •¹ strategy: know how to increase by 2.5% •² strategy: know how to calculate expected price •³ process: carry out calculations within a valid strategy 	<ul style="list-style-type: none"> •¹ 1.025 •² $77\,900 \times 1.025^3$ •³ 83 900 <p style="text-align: right;">3 marks</p>

NOTES:

- (i) For an answer of 83 900 without working award 3/3
- (ii) For an answer of 83 889, 83 890 with or without working award 2/3
(1st and 2nd marks)
- (iii) Where an incorrect % is used, the working must be followed through to give the possibility of awarding 2/3. (For example an answer of £152 000, with working, can be awarded 2/3 – $77\,900 \times 1.25^3$)
- (iv) For an answer of 239 542 or 240 000, with working award 1/3
($1.025 \times 77\,900 \times 3$)
- (v) For an answer of £83 700 [$77900 + (77900 \times 0.025 \times 3)$] award 0/3

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
2. (a)	<p>Ans: (i) $\bar{x} = 16.5$ (ii) $s = 1.87$</p> <p>(i) •¹ process: calculate the mean</p> <p>(ii) •¹ process: calculate $(x - \bar{x})^2$</p> <p>•² process: substitute into formula</p> <p>•³ process: calculate standard deviation</p>	<p>•¹ $\bar{x} = 16.5$</p> <p>•¹ $2.25, 2.25, 6.25, 0.25, 0.25, 6.25$</p> <p>•² $\sqrt{\frac{17.5}{5}}$</p> <p>•³ 1.87</p> <p style="text-align: right;">4 marks</p>
<p>NOTES:</p> <p>Use of the alternative formula in part (ii): the first mark can be awarded for the correct calculation of $\Sigma x^2 = 1651$</p>		
(b)	<p>Ans: (i) $\bar{x} = 20.5$ (ii) $s = 1.87$</p> <p>•¹ process: state new mean</p> <p>•² communicate: state result</p>	<p>•¹ $\bar{x} = 16.5 + 4 = 20.5$</p> <p>•² $s = 1.87$</p> <p style="text-align: right;">2 marks</p>
<p>NOTES:</p> <p>Incorrect answers in part (a) must be followed through with the possibility of awarding 2/2</p>		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
3. (a)	<p>Ans: £24·53</p> <ul style="list-style-type: none"> •¹ process: calculate the number of miles claimed •² interpret: choose correct path •³ communicate: calculate expenses 	<ul style="list-style-type: none"> •¹ 110 •² YES followed by NO •³ £24·53 <p style="text-align: right;">3 marks</p>

NOTES:

(i) Answers with or without working:

$110 \times 22 \cdot 3 = \text{£}24 \cdot 53$ or 2453p	award 3/3
$110 \times 27 \cdot 7 = \text{£}30 \cdot 47$ or 3047p	award 2/3
$110 \times 22 \cdot 3 = (\text{£})2453$	award 2/3
$110 \times 27 \cdot 7 = (\text{£})3047$	award 1/3
$1280 \times 22 \cdot 3 = \text{£}285 \cdot 44$ or 28544p	award 2/3
$1280 \times 27 \cdot 7 = \text{£}354 \cdot 56$ or 35456p	award 1/3
$1280 \times 22 \cdot 3 = (\text{£})28544$	award 1/3
$1280 \times 27 \cdot 7 = (\text{£})35456$	award 0/3

(ii) $110 \times 22 \cdot 3 = 2453\text{p} + 110 = 2563\text{p}$ award 2/3
 (Working subsequent to a correct answer provides firm evidence that the requirements have not been met).

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
4. (a)	Ans: Proof • ¹ strategy: know how to find expression for area • ² process: follow strategy through to produce expression for area	• ¹ $2(x+2)+2x$ or $2x+2x+4$ or equivalent • ² Area = $4x+4$ <p style="text-align: right;">2 marks</p>
NOTES: (i) For $(x+2)^2 = x^2 + 4x + 4$ award 1/2 (ii) Where “L” shaped diagram is divided into 2 or 3 parts and the answer to one part is clearly indicated one mark is available.		
(b)	Ans: $x = 3 \cdot 5$ • ¹ process: calculate value of x	• ¹ $3 \cdot 5$ <p style="text-align: right;">1 mark</p>
NOTES:		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
5.	<p>Ans: 39.1 cm</p> <ul style="list-style-type: none"> •¹ strategy: know to find circumference •² strategy : know how to find length of arc •³ process: calculate perimeter 	<ul style="list-style-type: none"> •¹ $C = 2 \times \pi \times 12$ •² $\frac{1}{5} \times 2 \times \pi \times 12$ •³ 39.1 <p style="text-align: right;">3 marks</p>

NOTES:

- (i) Accept variation in π
- (ii) For $\frac{1}{5} \times \pi \times 12^2$, $\frac{1}{5} \times \pi \times 12$
the second and third marks are available.
- (iii) For the award of the final mark calculations must involve π .

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
6. (a)	Ans: $14x + 4y = 55 \cdot 00$ • ¹ interpret: interpret the text	• ¹ $14x + 4y = 55 \cdot 00$ 1 mark
NOTES:		
(b)	Ans: $13x + 6y = 54 \cdot 50$ • ¹ interpret: interpret the text	• ¹ $13x + 6y = 54 \cdot 50$ 1 mark
NOTES:		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
(c)	<p>Ans: Entrance fee for adult is £3 · 50 Entrance fee for child is £1 · 50</p> <ul style="list-style-type: none"> •¹ strategy: know to solve simultaneous 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 communicate: state result 	<ul style="list-style-type: none"> •¹ evidence •² a value for x and y •³ $x = 3 \cdot 5$ $y = 1 \cdot 5$ •⁴ Entrance fee for adult is £3 · 50 Entrance fee for child is £1 · 50 <p style="text-align: right;">4 marks</p>

NOTES:

- (i) Incorrect answers in parts (a) and (b) must be followed through to give the possibility of awarding 4/4.
- (ii) Any valid strategy must involve the use of 2 equations.
- (iii) If values of x and y are obtained from correctly drawn graphs, accept reasonable variations in these answers.
- (iv) For an answer of $x = 3 \cdot 5$ and $y = 1 \cdot 5$, award 3/4 (loses communication mark).
- (v) For the award of the final mark, the cost of the entrance fee for an adult and the cost of the entrance fee for a child must be clearly stated.
- (vi) For a wrong answer, without working or based on an invalid strategy, the final mark cannot be awarded.
- (vii) For the 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. (a)	<p>Ans: $3x^2 - 6x - 4$</p> <ul style="list-style-type: none"> •¹ process: start to multiply out brackets •² process: complete process of multiplying out brackets •³ process: collect like terms which must include x^2 term 	<ul style="list-style-type: none"> •¹ evidence of 2 correct terms (eg $3x^2 + x$) •² $3x^2 + x - 12x - 4$ •³ $3x^2 - 6x - 4$ <p style="text-align: right;">3 marks</p>					
NOTES:							
(b)	<p>Ans: $(3x - 1)(x - 2)$</p> <ul style="list-style-type: none"> •¹ process: start to factorise trinomial •² process: complete factorisation 	<ul style="list-style-type: none"> •¹ one correct factor •² $(3x - 1)(x - 2)$ <p style="text-align: right;">2 marks</p>					
<p>NOTES:</p> <p>For an answer of</p> <table style="margin-left: 100px; border-collapse: collapse;"> <tr> <td style="text-align: center; padding-right: 10px;">$(3x - 2)(x - 1)$</td> <td rowspan="3" style="font-size: 3em; vertical-align: middle;">}</td> <td rowspan="3" style="vertical-align: middle;">award 1/2</td> </tr> <tr> <td style="text-align: center; padding-right: 10px;">$(3x + 2)(x + 1)$</td> </tr> <tr> <td style="text-align: center; padding-right: 10px;">$(3x + 1)(x + 2)$</td> </tr> </table>			$(3x - 2)(x - 1)$	}	award 1/2	$(3x + 2)(x + 1)$	$(3x + 1)(x + 2)$
$(3x - 2)(x - 1)$	}	award 1/2					
$(3x + 2)(x + 1)$							
$(3x + 1)(x + 2)$							

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
8. (a)	Ans: (i) £106·61 (ii) £213·22 • ¹ communicate: state <u>both</u> amounts	• ¹ 106·61 213·22 <p style="text-align: right;">1 mark</p>
NOTES:		
(b)	Ans: £436·80 <u>Method 1</u> • ¹ process: identify monthly costs • ² process: identify monthly savings • ³ process: calculate total savings <u>Method 2</u> • ¹ process: calculate total paid for £15000 loan • ² process: calculate total paid for £10000 and £5000 loans • ³ process: calculate total savings	• ¹ £312·55 and £319·83 • ² £7·28 • ³ £436·80 • ¹ £18753·00 • ² £19189·80 • ³ £436·80 <p style="text-align: right;">3 marks</p>
NOTES: (i) An incorrect answer in part (a) must be followed through to give the possibility of awarding 3/3. (ii) For an answer, with working, of £667·57 (9·9% / 8·9% added to payments), award 2/3		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
9.	<p>Ans: The cone is better value because it contains more ice cream.</p> <ul style="list-style-type: none"> •¹ strategy: know to calculate both volumes and compare •² process: substitute correctly into formula for one container •³ process: substitute correctly into formula for second container •⁴ process: calculate both volumes correctly •⁵ communicate: state conclusion 	<ul style="list-style-type: none"> •¹ evidence •² $V = \frac{1}{3} \times \pi \times 5 \cdot 2^2 \times 20$ •³ $V = \pi \times 5 \cdot 5^2 \times 5 \cdot 8$ •⁴ $566 \cdot 3\text{cm}^3$ $551 \cdot 2\text{cm}^3$ •⁵ The cone is better value <p style="text-align: right;">5 marks</p>
<p>NOTES:</p> <p>(i) Accept variations in the volume due to variations in the value of π , or premature rounding.</p> <p>(ii) Mark 5 is available for comparing two volumes.</p>		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
11. (a)	<p>Ans: 15.6 metres</p> <ul style="list-style-type: none"> •¹ strategy: know to apply cosine rule to find BD •² process: correct application of cosine rule •³ process: calculate BD 	<ul style="list-style-type: none"> •¹ evidence •² $11 \cdot 1^2 + 7 \cdot 8^2 - 2 \times 11 \cdot 1 \times 7 \cdot 8 \times \cos 110$ •³ 15.6 <p style="text-align: right;">3 marks</p>
NOTES:		
(b)	<p>Ans: 111.6 square metres</p> <ul style="list-style-type: none"> •¹ strategy: know to calculate area of ΔABD and area of ΔBDC and add together •² process: substitute correctly for ΔBAD •³ process: substitute correctly for ΔBDC •⁴ process: correctly calculate total area 	<ul style="list-style-type: none"> •¹ evidence •² $\frac{1}{2} \times 11 \cdot 1 \times 7 \cdot 8 \times \sin 110$ •³ $\frac{1}{2} \times 9 \cdot 3 \times \text{answer to part (a)} \times \sin 78$ •⁴ 111.6 sq m <p style="text-align: right;">4 marks</p>
<p>NOTES:</p> <p>(i) An incorrect answer for part (a) must be followed through to give the possibility of awarding 4/4.</p> <p>(ii) Disregard errors due to premature rounding provided there is evidence.</p>		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
12. (a)	<p>Ans: 7.9 days</p> <ul style="list-style-type: none"> •¹ process: know to calculate mid-points •² process: know to calculate mid-points × frequency •³ process: know to calculate Σf and Σfx •⁴ strategy: know how to calculate mean •⁵ process: calculate mean 	<ul style="list-style-type: none"> •¹ 2, 7, 12, 17, 22 •² 28, 119, 96, 68, 44 •³ 45, 355 •⁴ $\frac{\Sigma fx}{\Sigma f}$ •⁵ 7.9 (disregard rounding) <p style="text-align: right;">5 marks</p>

NOTES:

- (i) An arithmetic error must be followed through with possibility of awarding 4/5.
- (ii) For an answer of 9 $[45 \div 5]$ the last mark is not available.

TOTAL MARKS FOR PAPER 2
54

[END OF MARKING INSTRUCTIONS]