



## **2008 Mathematics**

### **Intermediate 2 – Units 1, 2 and Applications Paper 2**

#### **Finalised Marking Instructions**

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## 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  $\sin x^\circ = 0.5 = 30^\circ$
  - 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 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><b>Ans: £9625.93</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> strategy: know how to increase by 4.5%</li> <li>•<sup>2</sup> strategy: know how to calculate amount</li> <li>•<sup>3</sup> strategy: know how to calculate interest</li> <li>•<sup>4</sup> process: carry out all calculations correctly within a valid strategy and round to nearest penny</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\times 1.045</math></li> <li>•<sup>2</sup> <math>50\,000 \times 1.045^4</math></li> <li>•<sup>3</sup> <math>50\,000 \times 1.045^4 - 50\,000</math></li> <li>•<sup>4</sup> 9625.93</li> </ul> <p style="text-align: right;"><b>4 marks</b></p>

**NOTES:**

- |   |  |           |
|---|--|-----------|
| 1 | For an answer of £9625.93, with or without working   | award 4/4 |
| 2 | For an answer of £59 625.93, with or without working   | award 3/4 |
| 3 | For an answer of £2567.62 (the fourth year's interest), with 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<br>eg for an answer of £171 025.31 ( $50\,000 \times 1.45^4 - 50\,000$ ), with working | award 3/4 |
| 5 | For an answer of £41 589.48 ( $50\,000 \times 0.955^4$ )   | award 2/4 |
| 6 | For an answer of £8410.52 ( $50\,000 - 41\,589.48$ )   | award 2/4 |
| 7 | For an answer of £9000 ( $50\,000 \times 0.045 \times 4$ )   | award 0/4 |

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •																				
2 (a)	<p><b>Ans: 58 600 cubic cm</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> strategy: know how to calculate volume of basket</li> <li>•<sup>2</sup> process: substitute correctly into volume formulae</li> <li>•<sup>3</sup> process: calculate total volume</li> <li>•<sup>4</sup> process: round answer to 3 significant figures</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> volume of cuboid + volume of cylinder</li> <li>•<sup>2</sup> <math>30 \times 24 \times 50 + \pi \times 12^2 \times 50</math></li> <li>•<sup>3</sup> 58 619 cm<sup>3</sup></li> <li>•<sup>4</sup> 58 600 cm<sup>3</sup></li> </ul> <p style="text-align: right;"><b>4 marks</b></p>																				
<p><b>NOTES:</b></p> <ol style="list-style-type: none"> <li>1 Accept variations in volume due to variations in the value of <math>\pi</math></li> <li>2 The fourth mark is available for rounding an answer correct to three significant figures. Where the answer requires no rounding, the fourth mark cannot be awarded.</li> <li>3 Common wrong answers</li> </ol> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">43 200</td> <td style="width: 30%;">(cuboid + sphere)</td> <td style="width: 30%;">with working</td> <td style="width: 20%;">award 3/4</td> </tr> <tr> <td>47 300</td> <td>(cuboid + <math>\frac{1}{2}</math> cylinder)</td> <td>with working</td> <td>award 3/4</td> </tr> <tr> <td>39 800</td> <td>(cuboid + <math>\pi dh</math>)</td> <td>with working</td> <td>award 3/4</td> </tr> <tr> <td>1170</td> <td>(area of cross section)</td> <td>with working</td> <td>award 2/4</td> </tr> <tr> <td>36 500</td> <td>(cuboid + <math>\pi r^2</math>)</td> <td>with working</td> <td>award 2/4</td> </tr> </table>			43 200	(cuboid + sphere)	with working	award 3/4	47 300	(cuboid + $\frac{1}{2}$ cylinder)	with working	award 3/4	39 800	(cuboid + $\pi dh$ )	with working	award 3/4	1170	(area of cross section)	with working	award 2/4	36 500	(cuboid + $\pi r^2$ )	with working	award 2/4
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(b)	<p><b>Ans: 29.9 cm</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> strategy: know how to find expression for volume of box</li> <li>•<sup>2</sup> process: equate volume with <math>\frac{1}{2}</math> of answer to part (a)</li> <li>•<sup>3</sup> communicate: state value for <math>h</math></li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>35 \times 28 \times h</math></li> <li>•<sup>2</sup> <math>35 \times 28 \times h = \frac{1}{2} \times 58\,600</math></li> <li>•<sup>3</sup> <math>h = 29.9</math></li> </ul> <p style="text-align: right;"><b>3 marks</b></p>																				
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Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
(c)	<b>Ans: <math>y = \frac{1}{2}x + 20</math></b>  • <sup>1</sup> process: find gradient  • <sup>2</sup> process: state y-intercept or $c$ in $y = mx + c$  • <sup>3</sup> communicate: state equation of line	• <sup>1</sup> $m = \frac{1}{2}$ (or equivalent)  • <sup>2</sup> $c = 20$  • <sup>3</sup> $y = \frac{1}{2}x + 20$  <p style="text-align: right;"><b>3 marks</b></p>
<b>NOTES:</b>  1 For correct answer without working award 3/3  2 For $p = 0.5m + 20$ award 3/3  3 For $y = 0.5x$ 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 $y = 20x + 0.5$ award 0/3		
(d)	<b>Ans: 58%</b>  • <sup>1</sup> process: calculate physics % <b>using equation</b>	• <sup>1</sup> $y = \frac{1}{2}(76) + 20 = 58$  <p style="text-align: right;"><b>1 mark</b></p>
<b>NOTES:</b>		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
4 (a)	<b>Ans: <math>280x + 70y = 5250</math></b>  • <sup>1</sup> interpret: interpret the text	• <sup>1</sup> $280x + 70y = 5250$  <b>1 mark</b>
<b>NOTES:</b>  1 Accept $280x + 70y = 52\cdot50$		
(b)	<b>Ans: <math>210x + 40y = 3800</math></b>  • <sup>1</sup> interpret: interpret the text	• <sup>1</sup> $210x + 40y = 3800$  <b>1 mark</b>
<b>NOTES:</b>  1 Accept $210x + 40y = 38\cdot00$ when consistent with the answer to part (a)		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
4 (c)	<p><b>Ans: Calls cost 16 pence per minute, texts cost 11 pence each</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> strategy: know to solve system of equations</li> <li>•<sup>2</sup> process: follow a valid strategy through to produce a value for <math>x</math> and <math>y</math></li> <li>•<sup>3</sup> process: correct value for <math>x</math> and <math>y</math></li> <li>•<sup>4</sup> communicate: state result</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> evidence</li> <li>•<sup>2</sup> a value for <math>x</math> and <math>y</math></li> <li>•<sup>3</sup> <math>x = 16, y = 11</math></li> <li>•<sup>4</sup> a call costs 16p per minute a text costs 11 pence</li> </ul> <p style="text-align: right;"><b>4 marks</b></p>

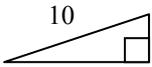
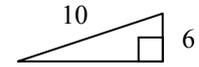
**NOTES:**

- 1 Incorrect equations 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 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  $280 \times 16 + 70 \times 11 = 5250$   
 $210 \times 16 + 40 \times 11 = 3800$   
leading to  $x = 16, y = 11$   
a call costs 16p per minute  
a text costs 11p award 4/4
- 4 For  $x = 16, y = 11$  (with working) award 3/4 (loses communication mark)
- 5 For the award of the final mark the price of a call per minute and the price of a text must be stated in pence or pounds
- 6 For a wrong answer without working, or based on an invalid strategy, the final mark cannot be awarded
- 7 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 •
5	<p><b>Ans: Angle EDF = 111.8°</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> strategy: know to apply cosine rule to find angle EDF</li> <li>•<sup>2</sup> process: correct application of cosine rule</li> <li>•<sup>3</sup> process: calculate angle EDF</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> evidence</li> <li>•<sup>2</sup> <math>\cos D = \frac{10.4^2 + 13.2^2 - 19.6^2}{2 \times 10.4 \times 13.2}</math></li> <li>•<sup>3</sup> 111.8°</li> </ul> <p style="text-align: right;"><b>3 marks</b></p>
<p><b>NOTES:</b></p> <p>1 Where an angle other than angle EDF has been calculated (<math>\angle E = 38.7^\circ</math>, <math>\angle F = 29.5^\circ</math>), a maximum of 2/3 can be awarded provided that the value of the angle calculated is consistent with the application of the cos rule</p> <p>2 1.95 (RAD), 124.2 (GRAD), with working <span style="float: right;">award 3/3</span></p> <p>3 For an answer obtained by scale drawing, <span style="float: right;">award 0/3</span></p>		
6 (a)	<p><b>Ans: A = £75.00, B = £1.20, C = £155.07</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> process: calculate A</li> <li>•<sup>2</sup> process: calculate B (1.6% of A)</li> <li>•<sup>3</sup> process: calculate C</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> 75.00</li> <li>•<sup>2</sup> 1.2(0)</li> <li>•<sup>3</sup> 155.07</li> </ul> <p style="text-align: right;"><b>3 marks</b></p>
<p><b>NOTES:</b></p>		
(b)	<p><b>£5</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> process: calculate 3% of C in part (a)</li> <li>•<sup>2</sup> communicate: state minimum payment</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> 4.65(21)</li> <li>•<sup>2</sup> 5.00</li> </ul> <p style="text-align: right;"><b>2 marks</b></p>
<p><b>NOTES:</b></p> <p>1 For 3% of £155.07 accept £4.7(0)</p> <p>2 For £5, without working, <span style="float: right;">award 0/2</span></p>		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •		
7 (a)	<b>Ans: = C22*1.004</b> • <sup>1</sup> communicate: state formula	• <sup>1</sup> =C22*1.004  <b>1 mark</b>		
<b>NOTES:</b> 1 Formula must begin with = 2 Formula must use * and / for multiplication and division 3 Formula must include C22				
(b)	<b>Ans: =B23 + 250</b> • <sup>1</sup> communicate: state formula	• <sup>1</sup> =B23 + 250  <b>1 mark</b>		
<b>NOTES:</b> 1 Where a candidate has omitted the = sign in both parts (a) and (b), the omission should not be penalised in part (b) 2 For = B23 + £250 <span style="float: right;">award 0/1</span>				
(c)	<b>Ans: £13 557.59</b> • <sup>1</sup> strategy: know to use formulae from (a) and (b) • <sup>2</sup> process: carry out calculations correctly	• <sup>1</sup> 13 254.57 × 1.004 + 250 • <sup>2</sup> 13 557.59 or 13 557.58  <b>2 marks</b>		
<b>NOTES:</b> 1 For an answer of 13 557.59 (or 13 557.58), without working <span style="float: right;">award 2/2</span> 2 SOME COMMON ANSWERS (for information) 13 306.59 (B22 × 1.004 + 250) 14 034.75 (C22 × 1.04 + 250) 13 774.75 (B22 × 1.04 + 250) <table style="display: inline-table; vertical-align: middle; margin-left: 10px;"> <tr> <td style="font-size: 3em; vertical-align: middle;">}</td> <td style="vertical-align: middle;">Marks awarded will depend on candidate's response to part (a) and (b)</td> </tr> </table>			}	Marks awarded will depend on candidate's response to part (a) and (b)
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Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
8	<p><b>Ans: £1976.40</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> strategy: know how to calculate taxable income</li> <li>•<sup>2</sup> strategy: know how to calculate lower rate of tax</li> <li>•<sup>3</sup> strategy: know how to calculate middle rate of tax</li> <li>•<sup>4</sup> process: calculate total tax bill</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> £15 425 – £5225 (= 10 200)</li> <li>•<sup>2</sup> 0.10 × £2230 (= 223)</li> <li>•<sup>3</sup> 0.22 × £ (10 200 – 2230) (=1753.40)</li> <li>•<sup>4</sup> £1976.4(0)</li> </ul> <p style="text-align: right;"><b>4 marks</b></p>
<b>NOTES:</b>		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
9	<p><b>Ans: 16 cm</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> strategy: marshall facts and know to use right-angled triangle</li> <li>•<sup>2</sup> strategy: know that PQ bisects AB</li> <li>•<sup>3</sup> process: use Pythagoras' Theorem</li> <li>•<sup>4</sup> process: calculate length of shorter side</li> <li>•<sup>5</sup> process: calculate PQ</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> </li> <li>•<sup>2</sup> </li> <li>•<sup>3</sup> <math>x^2 = 10^2 - 6^2</math></li> <li>•<sup>4</sup> <math>x = 8</math></li> <li>•<sup>5</sup> 16 cm</li> </ul> <p style="text-align: right;"><b>5 marks</b></p>

**NOTES:**

1 SPECIAL CASE:

Where  $\angle PAQ = 90^\circ$  or  $\angle APQ = \angle AQP = 45^\circ$  are assumed, only the 3<sup>rd</sup> and 4<sup>th</sup> marks are available for correct Pythagoras or Trigonometric calculations

2 SOME COMMON ANSWERS (with working)

Answer

Maximum mark available

$$2 \times \sqrt{10^2 + 6^2} = 23.32$$

4/5

$$\sqrt{10^2 + 6^2} = 11.66$$

3/5

$$2 \times \sqrt{12^2 - 10^2} = 13.27$$

3/5

$$\sqrt{12^2 - 10^2} = 6.63$$

2/5

$$\sqrt{12^2 + 10^2} = 15.62$$

2/5

$$\sqrt{10^2 + 10^2} = 14.14$$

2/5

(see note 1)

3 For a correct answer, without working

award 0/5

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
10	<p><b>Ans: £5.20</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> strategy: know how to calculate number of hours at basic rate</li> <li>•<sup>2</sup> strategy: know how to calculate basic pay</li> <li>•<sup>3</sup> process: carry out all calculations correctly</li> </ul>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>40 + 3 \times 2</math></li> <li>•<sup>2</sup> <math>239.20 \div 46</math></li> <li>•<sup>3</sup> <math>5.2(0)</math></li> </ul> <p style="text-align: right;"><b>3 marks</b></p>

**NOTES:**

1 For an answer of 5.2(0), without working, award 3/3

2 ALTERNATIVE METHOD (trial and improvement)

For the 1<sup>st</sup> mark, try any hourly rate eg  $5.98 \times (40 + 3 \times 2)$

For the 2<sup>nd</sup> mark, try any other hourly rate

3 SOME COMMON ANSWERS (working must be shown)

5.37 (or 5.38)  $(239.20 \div (40 + 3 \times 1.5))$  award 2/3

7.03 (or 7.04)  $(239.20 \div (40 - 3 \times 2))$  award 1/3

5.56 (or 5.57)  $(239.20 \div (40 + 3))$  award 1/3

5.98  $(239.20 \div 40)$  award 0/3

6.46  $(239.20 \div (40 - 3))$  award 0/3

<b>TOTAL MARKS FOR PAPER 2</b>
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<b>50</b>
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[END OF MARKING INSTRUCTIONS]