



2015 Mathematics

Intermediate 2 Units 1, 2 & 3 Paper 2

Finalised Marking Instructions

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This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

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. A transcription error is taken to be the case where the candidate transcribes incorrectly from the examination paper to the answer book. This 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 lowest 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 the marks have been awarded, the following should be used:
 - (a) Correct working should be ticked, ✓.
 - (b) Where working subsequent to an error is followed through 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.**

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

Question			Marking Scheme	Max Mark	Illustrations of evidence
1.			<p>Ans: £253 628 (·16)</p> <ul style="list-style-type: none"> •¹ strategy: know how to increase by 2·8% •² strategy: know how to calculate expected value •³ process: carry out calculations correctly within a valid strategy 	3	<ul style="list-style-type: none"> •¹ $\times 1\cdot028$ •² $240\,000 \times 1\cdot028^2$ •³ $253\,628 (\cdot16)$
<p>Notes:</p> <ol style="list-style-type: none"> For an answer of 253 628 without working award 3/3 ✓✓✓ Where an incorrect percentage is used, the working must be followed through to give the possibility of awarding 2/3 eg for an answer of 393 216 ($240\,000 \times 1\cdot28^2$), with working award 2/3 x✓✓ For an answer of 246 720 ($240\,000 \times 1\cdot028$), no working necessary award 1/3 ✓xx For an answer of 493 440 ($240\,000 \times 1\cdot028 \times 2$), with working award 1/3 ✓xx For an answer of 253 440 ($240\,000 + 240\,000 \times 0\cdot028 \times 2$), with working award 1/3 ✓xx For an answer of 13 440 ($240\,000 \times 0\cdot028 \times 2$) award 0/3 xxx 					

Question			Marking Scheme	Max Mark	Illustrations of evidence
2.	(a)		Ans: 4/21 • ¹ process: find probability	1	• ¹ 4/21 (or equivalent)
2.	(b)	(i) (ii) (iii)	Ans: (i) $Q_2 = 58$ (ii) $Q_1 = 46.5$ (iii) $Q_3 = 69$ • ¹ process: calculate the median • ¹ process: calculate the lower quartile • ¹ process: calculate the upper quartile	3	• ¹ $Q_2 = 58$ • ¹ $Q_1 = 46.5$ • ¹ $Q_3 = 69$
2.	(c)		Ans: The SIQR for the museum was 11.25 so the number of visitors to the museum was more varied. • ¹ strategy: calculate SIQR for the museum • ² communication: valid comment about spread of number of visitors	2	• ¹ $SIQR = 11.25$ • ² comment
Notes: 1. Any comment must be based on a calculation of SIQR for museum					

Question			Marking Scheme	Max Mark	Illustrations of
3.			Ans: 0.78 km • ¹ process: substitute correctly into cosine rule • ² process: calculate AB^2 • ³ process: calculate length of AB	3	• ¹ $c^2 = 1.35^2 + 1.2^2 - 2 \times 1.35 \times 1.2 \times \cos 35^\circ$ • ² 0.608... • ³ 0.78
Notes: 1. For 0.8 with valid working, award 3/3 2. Disregard errors due to premature rounding provided there is evidence. eg $1.35^2 + 1.2^2 - 2 \times 1.35 \times 1.2 \times 0.8 = 0.6705 \Rightarrow$ final answer = 0.82, award 3/3 3. For 2.49 (uses RAD) or 0.71 (uses GRAD), with working award 3/3 4. Correct answer without working, award 0/3					
4.	(a)		Ans: $y = 0.75x + 10$ • ¹ process: find gradient • ² process: state y-intercept or c in $y = mx + c$ • ³ communicate: state equation of line	3	• ¹ 0.75 or equivalent • ² 10 • ³ $y = 0.75x + 10$
4.	(b)		Ans: 70% • ¹ process: calculate Unit 2% using equation	1	• ¹ $y = 0.75 \times 80 + 10 = 70$
Notes: (a) 1. For a correct answer without working award 3/3 2. Where m and/or c are incorrect, the working must be followed through to give the possibility of awarding 1/3 or 2/3 3. For $y = 0.75x$ award 1/3 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 $y = 10x + 0.75$ award 0/3					

Question			Marking Scheme	Max Mark	Illustrations of evidence
5.			<p>Ans: 10s</p> <ul style="list-style-type: none"> •¹ strategy: know how to start division calculation •² process: continue process •³ process: express in simplest form 	3	<ul style="list-style-type: none"> •¹ $\frac{5t}{s} \times \frac{2s^2}{t}$ or equivalent •² evidence of correctly cancelling either variable OR $\frac{10ts^2}{st}$ •³ 10s
<p>Notes:</p> <p>1. Correct answer without working award 3/3</p> <p>2. For $\frac{10s}{1}$ award 2/3 (✓✓x)</p>					

Question			Marking Scheme	Max Mark	Illustrations of evidence
6.			<p>Ans: $b = \frac{2A}{d} - c$</p> <ul style="list-style-type: none"> •¹ process: start to re-arrange formula •² process: continue process •³ process: make b the subject <p>ALTERNATIVE MARKING SCHEME FOR SECOND AND THIRD MARKS</p> <ul style="list-style-type: none"> •² process: continue process •³ process: make b the subject 	3	<ul style="list-style-type: none"> •¹ $2A = (b + c)d$ •² $\frac{2A}{d} = b + c$ •³ $b = \frac{2A}{d} - c$ •² $2A - cd = bd$ •³ $b = \frac{2A - cd}{d}$

Notes:

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

2. For $b + c = \frac{A}{\frac{1}{2}d}$

$$b = \frac{A}{\frac{1}{2}d} - c$$

award 3/3

3. For $\frac{1}{2}b + \frac{1}{2}c = \frac{A}{d}$

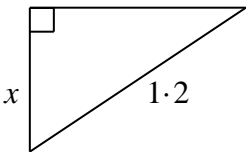
$$\frac{1}{2}b = \frac{A}{d} - \frac{1}{2}c$$

$$b = \frac{\frac{A}{d} - \frac{1}{2}c}{\frac{1}{2}}$$

award 2/3

Question			Marking Scheme	Max Mark	Illustrations of evidence
7.			Ans: $10p^4$ <ul style="list-style-type: none"> •¹ process: simplify powers in numerator •² process: simplify constants •³ process: simplify powers in fraction 	3	<ul style="list-style-type: none"> •¹ $\frac{5 \times 4p^5}{2p}$ •² $\frac{10p^5}{p}$ •³ $10p^4$
Notes: <p>1. For a correct answer without working, award 3/3</p>					
8.			Ans: 120° <ul style="list-style-type: none"> •¹ communicate: state the period 	1	<ul style="list-style-type: none"> •¹ 120
Notes:					
9.			Ans: $x = 63 \cdot 4$ and $x = 243 \cdot 4$ <ul style="list-style-type: none"> •¹ process: solve equation for $\tan x^\circ$ •² process: find one value for x •³ process: find second value for x 	3	<ul style="list-style-type: none"> •¹ $\tan x^\circ = 2$ or equivalent •² $x = 63(\cdot 4)$ •³ $x = 243(\cdot 4)$
Notes: <p>1. Where a graphical solution has been used, the first mark is available for indicating what graph is drawn and where the values occur.</p> <p>2. For a correct answer, without working award 0/3</p>					

Question			Marking Scheme	Max Mark	Illustrations of evidence
10.			Ans: 8.8 centimetres <ul style="list-style-type: none"> •¹ strategy: know how to find expression for volume of mug •² process: equate volume to 400 •³ communicate: state value for height correct to one decimal place 	3	<ul style="list-style-type: none"> •¹ $3.14 \times 3.8^2 \times h$ •² $3.14 \times 3.8^2 \times h = 400$ •³ 8.8 (cm)
Notes: 1. Accept variations in the value of the height due to variations in the value of π . 2. Where a candidate uses $3.14 \times 3.8 \times h$, marks 2 and 3 are still available					
11.	(a)		Ans: – 1.5 (or equivalent) <ul style="list-style-type: none"> •¹ strategy: know how to find gradient •² communicate: state gradient 	2	<ul style="list-style-type: none"> •¹ from diagram or $y = \frac{-3}{2}x + 6$ •² – 1.5 (or equivalent)
	(b)		Ans: 6 <ul style="list-style-type: none"> •¹ communication: state y-intercept 	1	<ul style="list-style-type: none"> •¹ 6
Notes: (a) 1. For a correct answer without working award 2/2 (b) 1. For an answer of (0, 6) award 1/1					

Question			Marking Scheme	Max Mark	Illustrations of evidence
12.			<p>Ans: 1.99 metres</p> <ul style="list-style-type: none"> •¹ strategy: marshal facts and recognise right-angle •² strategy: know how to use Pythagoras •³ process: correct calculation of x •⁴ process: find depth of milk 	4	<ul style="list-style-type: none"> •¹  •² $x^2 = 1.2^2 - 0.9^2$ •³ 0.79 •⁴ 1.99
<p>Notes:</p> <ol style="list-style-type: none"> $x = 0.8$ and depth = 2 are acceptable in awarding the third and fourth marks The final mark is for adding 1.2 to a value which has been calculated In the absence of a diagram accept $x^2 = 1.2^2 - 0.9^2$ as evidence for the award of the first 2 marks For $x^2 = 1.2^2 + 0.9^2 \rightarrow$ depth = 2.7 <ul style="list-style-type: none"> (a) with correct diagram award 3/4 (✓×✓✓) (b) without correct diagram award 2/4 (××✓✓) Where a candidate assumes angle MLO = angle OML = 45°, only the 1st and 4th marks are available For an answer of 1.99 without working award 0/4 					

Question			Marking Scheme	Max Mark	Illustrations of evidence
13.			<p>Ans: 23·8 kilometres</p> <ul style="list-style-type: none"> •¹ process: calculate the size of angle PQR •² process: correct substitution into sine rule •³ strategy: know how to solve equation •⁴ process: calculate PR correctly 	4	<ul style="list-style-type: none"> •¹ 52° •² $\frac{q}{\sin 52^\circ} = \frac{25}{\sin 56^\circ}$ •³ $q = \frac{25 \sin 52^\circ}{\sin 56^\circ}$ •⁴ 23·8

Notes:

1. Disregard errors due to premature rounding provided there is evidence
2. Where incorrect sizes are used for angles, marks 3 and 4 are still available for rearranging and processing a sine rule calculation
eg $\frac{25}{\sin 160} = \frac{q}{\sin 128} \rightarrow q = 57 \cdot 6$ award 2/4 (××✓✓)
3. $\frac{q}{52} = \frac{25}{56} \rightarrow q = 23 \cdot 2$ award 1/4 (×××✓)
4. For a correct answer without working award 0/4
5. Use of RAD or GRAD (working must be shown)
 - (a) For 23·7 (uses GRAD) award 4/4
 - (b) For -47·3 or 47·3 (uses RAD) award 3/4

Question			Marking Scheme	Max Mark	Illustrations of evidence
14.			<p>Ans: $x = -5, x = 0.5$</p> <ul style="list-style-type: none"> •¹ strategy: know to factorise $2x^2 + 9x - 5$ •² process: factorise correctly •³ process: find roots <p><u>ALTERNATIVE STRATEGY</u></p> <ul style="list-style-type: none"> •¹ strategy: know to use quadratic formula •² process: substitute correctly in formula •³ process: find roots 	3	<ul style="list-style-type: none"> •¹ evidence •² $(2x - 1)(x + 5)$ •³ $-5, 0.5$ <ul style="list-style-type: none"> •¹ evidence •² $x = \frac{-9 \pm \sqrt{9^2 - 4 \times 2 \times (-5)}}{2 \times 2}$ •³ $-5, 0.5$
<p>Notes:</p> <p>1. For $(2x + 5)(x - 1)$ leading to $x = -\frac{5}{2}, x = 1$ or $(2x - 5)(x + 1)$ leading to $x = \frac{5}{2}, x = -1$ or $(2x + 1)(x - 5)$ leading to $x = -\frac{1}{2}, x = 5$</p> <p style="text-align: right;">award 2/3 (✓ x ✓)</p>					

Question			Marking Scheme	Max Mark	Illustrations of evidence
15.			<p>Ans: 310°</p> <ul style="list-style-type: none"> •¹ strategy: marshal facts and recognise link with circumference •² process: express arc as ratio of circumference •³ strategy: know how to find angle •⁴ process: calculate angle 	4	<ul style="list-style-type: none"> •¹ $\frac{\text{arc}}{\text{circumference}} = \frac{\text{angle}}{360}$ or equivalent •² $\frac{34 \cdot 6}{\pi \times 12 \cdot 8}$ or equivalent •³ $\frac{34 \cdot 6 \times 360}{\pi \times 12 \cdot 8}$ •⁴ 310

Notes:

1. Accept variations in π ; disregard premature or incorrect rounding of $\frac{34 \cdot 6}{\pi \times 12 \cdot 8}$
2. For $\frac{34 \cdot 6 \times 360}{\pi \times 6 \cdot 4}$, leading to an answer of 620, award 3/4 provided the criteria for the other marks are met.
3. Where the candidate has correctly calculated the acute angle AOB, with working award 3/4
4. For the use of πr^2 , the third and fourth marks are available.

TOTAL MARKS FOR PAPER 2
50

TOTAL MARKS FOR
PAPER 1 & 2
80

[END OF MARKING INSTRUCTIONS]