



2011 Mathematics

Intermediate 2 – Units 1, 2 and 3 Paper 1

Finalised Marking Instructions


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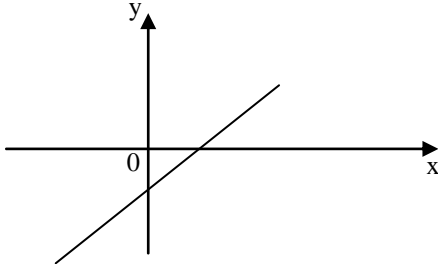
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Mathematics Intermediate 2: Paper 1, Units 1, 2 and 3 (non-calc)

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
1 (a)	<p>Ans: (i) $Q_2 = 6.5$ (ii) $Q_1 = 5$ (iii) $Q_3 = 9$</p> <ul style="list-style-type: none"> •¹ process: calculate the median •² process: calculate the lower quartile •³ process: calculate the upper quartile 	<ul style="list-style-type: none"> •¹ $Q_2 = 6.5$ •² $Q_1 = 5$ •³ $Q_3 = 9$ <p style="text-align: right;">3 marks</p>
<p>NOTES:</p> <p>1. An incorrect answer for the median must be followed through with the possibility of awarding 2/3.</p>		
(b)	<p>Ans: boxplot</p>  <ul style="list-style-type: none"> •¹ communicate: correct endpoints •² communicate: correct box 	<ul style="list-style-type: none"> •¹ endpoints at 0 and 15 •² box showing Q_1, Q_2, Q_3 <p style="text-align: right;">2 marks</p>
<p>NOTES:</p> <p>1. The boxplot must be drawn to a reasonable scale.</p>		
(c)	<p>Ans: The trains are not as late as the buses <u>or</u> the trains are more reliable.</p> <ul style="list-style-type: none"> •¹ communicate: make a valid comment 	<ul style="list-style-type: none"> •¹ a valid comment <p style="text-align: right;">1 mark</p>
<p>NOTES:</p> <p>1. For a statement which is factually incorrect, award 0/1. eg The bus took longer than the train (refers to speed not lateness). The train was late less often than the bus (refers to number of times late rather than number of minutes late).</p> <p>2. A valid statement must mention train(s) and/or bus(es).</p> <p>3. Where two contradictory statements are made, award 0/1.</p>		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
2	<p>Ans: $6x^2 - 12x - 14$</p> <ul style="list-style-type: none"> •¹ process: start to multiply out brackets •² process: complete the process of multiplying out brackets •³ process: collect like terms which must include a term in x^2 	<ul style="list-style-type: none"> •¹ evidence of 2 correct terms (eg $6x^2 + 4x$) •² $6x^2 - 21x + 4x - 14$ •³ $6x^2 - 12x - 14$ <p style="text-align: right;">3 marks</p>
NOTES:		
3	<p>Ans: 138°</p> <ul style="list-style-type: none"> •¹ process: calculate size of angle BEP •² process: calculate size of angle EPC or angle EPB •³ process: calculate size of angle EPR 	<ul style="list-style-type: none"> •¹ 90° •² 42° or 48° •³ 138° <p style="text-align: right;">3 marks</p>
<p>NOTES:</p> <ol style="list-style-type: none"> 1. For a correct answer without working award 0/3 2. For marks 1 and 2 angles need not be stated explicitly. They may be marked on a diagram. 3. Before awarding the second mark, markers must be clear that the 42° and 48° refer to angles EPC and EPB respectively. 4. For the final mark to be awarded the size of angle EPR must be stated explicitly. 		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
4	<p>Ans: $3\sqrt{8}$ with evidence</p> <ul style="list-style-type: none"> •¹ process: manipulate one of the four terms •² process/communicate: manipulate a different term <u>and</u> state conclusion 	<ul style="list-style-type: none"> •¹ evidence (see NOTE 1) •² $3\sqrt{8}$ with evidence <p style="text-align: right;">2 marks</p>
<p>NOTES:</p> <p>1. The first mark may be awarded for one of the following:</p> $2\sqrt{6} = \sqrt{4} \times \sqrt{6} = \sqrt{24}$ $\sqrt{2} \times \sqrt{12} = \sqrt{24}$ $\sqrt{2} \times \sqrt{12} = \sqrt{2} \times \sqrt{4 \times 3} = 2\sqrt{6}$ $3\sqrt{8} = \sqrt{9} \times \sqrt{8} = \sqrt{72}$ $3\sqrt{8} = 3\sqrt{4 \times 2} = 6\sqrt{2}$ $\sqrt{24} = \sqrt{2} \times \sqrt{12}$ $\sqrt{24} = \sqrt{4 \times 6} = 2\sqrt{6}$ <p>2. For an answer of “$3\sqrt{8}$ because the other three are equal”, without working, award 0/2</p>		
5	<p>Ans: Proof</p> <ul style="list-style-type: none"> •¹ strategy: know to use cosine rule •² process: substitute correctly into formula •³ process: complete proof 	<ul style="list-style-type: none"> •¹ evidence •² $\cos B = \frac{6^2 + 3^2 - 5^2}{2 \times 6 \times 3}$ •³ $\cos B = \frac{5}{9}$ <p style="text-align: right;">3 marks</p>
<p>NOTES:</p> <p>1. The third mark can only be awarded if it has been shown that $\cos B = \frac{20}{36}$.</p>		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
6.	Ans: 27 • ¹ process: start to evaluate • ² process: complete evaluation	• ¹ $\sqrt{9^3}$ • ² 27 <div style="text-align: right;">2 marks</div>
NOTES: 1. For a correct answer without working, award 2/2.		
7	Ans: $a = 5, b = 4$ • ¹ communicate: state value of a • ² communicate: state value of b	• ¹ $a = 5$ • ² $b = 4$ <div style="text-align: right;">2 marks</div>
NOTES: 1. Accept $y = 5 \cos 4x^\circ$ 2. For $a = 4, b = 5$ award 1/2		
8	Ans: <div style="text-align: center;">  </div> • ¹ interpret: realise $m > 0$ represents an upward sloping line • ² interpret: realise $c < 0$ represents a y-intercept below origin	• ¹ line with upward slope drawn on graph • ² line drawn with y-intercept below origin <div style="text-align: right;">2 marks</div>
NOTES:		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
9 (a)	Ans: $(x - 7)(x + 3)$ • ¹ process: factorise trinomial expression • ² process: complete factorisation	• ¹ one correct factor • ² second correct factor <p style="text-align: right;">2 marks</p>
NOTES: 1. For the following answers award 1/2: $(x + 7)(x - 3)$ $(x + 21)(x - 1)$ $(x - 21)(x + 1)$		
(b)	Ans: 7, -3 • ¹ communicate: state roots of equation	• ¹ 7, -3 <p style="text-align: right;">1 mark</p>
NOTES: 1. Where a candidate uses the quadratic formula, this mark is not available.		
(c)	Ans: (2, -25) • ¹ strategy: find x -coordinate of turning point • ² process: replace $x = 2$ into $y = x^2 - 4x - 21$ • ³ process: complete coordinates of turning point	• ¹ $x = 2$ • ² $y = 2^2 - 4 \times 2 - 21$ • ³ (2, -25) <p style="text-align: right;">3 marks</p>
NOTES: 1. Incorrect roots in part (b) must be followed through to give the possibility of awarding full credit in part (c). 2. Where the x coordinate of the turning point has been calculated incorrectly, the second and third marks are still available only where full working has been shown eg for an answer of (4, -21), without working, award 0/3.		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
10	Ans: $\frac{4}{5}$ • ¹ communicate: state value of $\cos a^\circ$	• ¹ $\frac{4}{5}$ 1 mark
NOTES:		

TOTAL MARKS FOR PAPER 1 30

[END OF MARKING INSTRUCTIONS]



2011 Mathematics

Intermediate 2 – Units 1, 2 and 3 Paper 2

Finalised Marking Instructions

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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 •
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 $\times 1.0315$ • ² $134\,750 \times 1.0315^3$ • 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,	(✓✓✓X) award 3/4
3.	For an answer of £147 889.2, with or without working	(✓✓✓X) 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 ($134\,750 \times 0.9685^3$), with working	(X✓✓✓) award 3/4
5.	For an answer of £417 000 ($134\,750 \times 1.0315 \times 3$), with working	(✓X X ✓) award 2/4
6.	For an answer of £147 500 ($134\,750 + 3 \times 0.0315 \times 134\,750$), with working	(✓X X ✓) award 2/4
7.	For an answer of £12 730 ($134\,750 \times 0.0315 \times 3$), with working	(X X X ✓) award 1/4

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
3.	<p>Ans: $r = \sqrt{\frac{A}{4\pi}}$</p> <ul style="list-style-type: none"> •¹ process: start to rearrange formula •² process: make r the subject 	<ul style="list-style-type: none"> •¹ $r^2 = \frac{A}{4\pi}$ •² $r = \sqrt{\frac{A}{4\pi}}$ <p style="text-align: right;">2 marks</p>
<p>NOTES:</p> <ol style="list-style-type: none"> 1. For a correct answer without working award 2/2 2. The second mark is available for taking the square root of an expression for r^2 3. For an answer of $r = \frac{\sqrt{A}}{4\pi}$, with or without working, award 1/2 4. For answers such as <ul style="list-style-type: none"> $r = \sqrt{\frac{A}{4\pi}}$ $r = \sqrt{\frac{A \div 4}{\pi}}$ $r = \sqrt{A \div 4 \div \pi}$ award 1/2 		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
4. (a)	Ans: 106 cubic metres <ul style="list-style-type: none"> •¹ process: substitute correctly into volume formula for cylinder •² process: calculate volume of cylinder 	<ul style="list-style-type: none"> •¹ $\pi \times 1.5^2 \times 15$ •² $106 \text{ (m}^3\text{)}$ <p style="text-align: right;">2 marks</p>
NOTES: <p style="text-align: center;">1. Accept variations in volume due to variations in the value of π</p>		
(b)	Ans: 17.4 metres <ul style="list-style-type: none"> •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 	<ul style="list-style-type: none"> •¹ $\frac{1}{3} \times \pi \times 1.5^2 \times h$ •² $\frac{1}{3} \times \pi \times 1.5^2 \times h = 5.7$ •³ 17.4 (m) <p style="text-align: right;">3 marks</p>
NOTES:		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
5.	<p>Ans: 25.1 square centimetres</p> <ul style="list-style-type: none"> •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 	<ul style="list-style-type: none"> •¹ $\frac{54}{360}$ •² $\frac{54}{360} \times \pi \times 7.3^2$ •³ 25.1 (sq cm) <p style="text-align: right;">3 marks</p>

NOTES:

1. Accept variations in π , disregard premature or incorrect rounding of $\frac{54}{360}$
2. For $\frac{54}{360} \times \pi \times 2 \times 7.3$ leading to 6.9 (✓ X ✓) 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 •
6. (a)	<p>(i) Ans: $\bar{x} = 41$ (ii) Ans: $s = 2.1$</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 41</p> <p>•¹ 4, 4, 0, 1, 4, 9</p> <p>•² $\sqrt{\frac{22}{5}}$</p> <p>•³ 2.1 (disregard rounding)</p> <p style="text-align: right;">1 mark</p> <p style="text-align: right;">3 marks</p>
<p>NOTES:</p> <p>1. For use of alternative formula in part (a) (ii), award marks as follows</p> <p>•¹ process: calculate $\sum x$ and $\sum x^2$ •¹ 246 and 10 108</p> <p>•² process: substitute into formula •² $\sqrt{\frac{10108 - 246^2 / 6}{5}}$</p> <p>•³ process: calculate standard deviation •³ 2.1</p> <p>2. For correct answer, without working award 0/3</p>		
6. (b)	<p>Ans: Yes, with reasons covering both conditions</p> <p>•¹ communicate: compare mean with the tolerance</p> <p>•² communicate: compare std dev with tolerance</p>	<p>•¹ Yes, because 41 is between 38 and 42</p> <p>•² Yes, because 2.1 is less than 3</p> <p style="text-align: right;">2 marks</p>
<p>NOTES:</p> <p>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.”</p> <p>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</p>		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
7. (a)	Ans: $24x + 6y = 60$ • ¹ interpret: interpret the text	• ¹ $24x + 6y = 60$ <p style="text-align: right;">1 mark</p>
(b)	Ans: $20x + 10y = 40$ • ¹ interpret: interpret the text	• ¹ $20x + 10y = 40$ <p style="text-align: right;">1 mark</p>
(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 <p style="text-align: right;">4 marks</p>

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 •
8.	Ans: $\frac{3}{x-5}$ • ¹ process: factorise numerator • ² process: simplify expression correctly	• ¹ $3(x-5)$ • ² $\frac{3}{x-5}$ <p style="text-align: right;">2 marks</p>
NOTES: 1. For a correct answer without working, award 2/2		
9.	Ans: $\frac{3-x}{x(x+1)}$ • ¹ process: state a valid common denominator • ² process: find correct numerator of equivalent fraction • ³ process: state answer in simplest form	• ¹ any valid denominator • ² both numerators correct • ³ $\frac{3-x}{x(x+1)}$ <p style="text-align: right;">3 marks</p>
NOTES: 1. In this question working subsequent to a correct answer should be ignored. 2. For $\frac{3(x+1)-4x}{x(x+1)} = \frac{3-x}{x^2+1}$ award 3/3 (✓✓✓) 3. For $\frac{3(x+1)-4x}{x^2+1} = \frac{3-x}{x^2+1}$ award 2/3 (X✓✓)		
10.	Ans: $x = 76$ and $x = 256$ • ¹ process: solve equation for $\tan x^\circ$ • ² process: find one value for x • ³ process: find second value for x	• ¹ $\tan x^\circ = 4$ or equivalent • ² 76 • ³ 256 <p style="text-align: right;">3 marks</p>
NOTES: 1. Where $\tan x^\circ$ is calculated incorrectly, the working must be followed through with the possibility of awarding 2/3 2. 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 •
11.	<p>Ans: 0.2, 1.6</p> <ul style="list-style-type: none"> •¹ strategy: know to use quadratic formula •² process: correct substitution in formula •³ process: calculate $b^2 - 4ac$ correctly •⁴ process: state both values of x correct to one decimal place 	<ul style="list-style-type: none"> •¹ evidence •² $\frac{7 \pm \sqrt{(-7)^2 - 4 \times 4 \times 1}}{2 \times 4}$ •³ 33 •⁴ 0.2, 1.6 <p style="text-align: right;">4 marks</p>

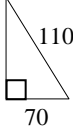
NOTES:

1. Where $b^2 - 4ac$ is calculated incorrectly, the fourth mark is available only if $b^2 - 4ac > 0$.
2. For a correct answer without working award 0/4.

12.	<p>Ans: 21 centimetres</p> <ul style="list-style-type: none"> •¹ process: state the size of $\angle BOD$ and recognise isosceles triangle •² process: state the size of $\angle ADC$ •³ strategy: know to use the cosine rule in triangle ADC •⁴ process: substitute correctly in cosine rule •⁵ process: calculate AC 	<ul style="list-style-type: none"> •¹ 82° plus evidence of isos. triangle •² 131° •³ evidence •⁴ $d^2 = 9^2 + 14^2 - 2 \times 9 \times 14 \times \cos 131^\circ$ •⁵ 21 (cm) <p style="text-align: right;">5 marks</p>
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NOTES:

1. 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.
2. Angle ADC may not be explicitly stated. It may be marked in a diagram and can be awarded the second mark.
3. Disregard errors due to premature rounding.

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
13.	<p>Ans: 25.1 millimetres</p> <ul style="list-style-type: none"> •¹ strategy: recognise right-angle •² strategy: use Pythagoras Theorem or equivalent •³ process: calculate third side correctly •⁴ process: state height 	<ul style="list-style-type: none"> •¹  •² $x^2 = 110^2 - 70^2$ •³ 84.9 •⁴ 25.1 (mm) <p style="text-align: right;">4 marks</p>
<p>NOTES:</p> <ol style="list-style-type: none"> 1. The final mark is for subtracting a calculated value from the radius. 2. Some common answers (with working): <ul style="list-style-type: none"> $\sqrt{110^2 + 70^2} = 130.4$ award 2/4 $110 - \sqrt{140^2 - 110^2} = 23.4$ award 2/4 3. Where a candidate assumes an angle of 45° in the right-angled triangle, only the first and fourth marks are available. 		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
14.	<p>Ans: Complete proof</p> <p>•¹ strategy: know to replace $1 - \sin^2 A$ by $\cos^2 A$</p> <p>•² strategy: know to use $\frac{\sin A}{\cos A} = \tan A$ to complete proof</p>	<p>•¹ $\frac{\sin^2 A}{\cos^2 A}$</p> <p>•² complete proof</p> <p style="text-align: right;">2 marks</p>

NOTES:

1. For $\frac{\sin^2 A}{1 - \sin^2 A} = \tan^2 A$

$$\frac{\sin^2 A}{\cos^2 A} = \tan^2 A$$

$$\tan^2 A = \tan^2 A$$

award 2/2

For $\frac{\sin^2 A}{1 - \sin^2 A} = \tan^2 A$

$$\frac{\sin^2 A}{\cos^2 A} = \tan^2 A$$

award 1/2

TOTAL MARKS FOR PAPER 2

50

[END OF MARKING INSTRUCTIONS]