



2013 Mathematics

Intermediate 2 Units 1, 2 & 3 Paper 1

Finalised Marking Instructions

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Part One: General Marking Principles for: Mathematics Intermediate 2 Units 1, 2 & 3
Paper 1

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 - 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).
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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.

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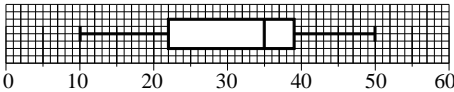
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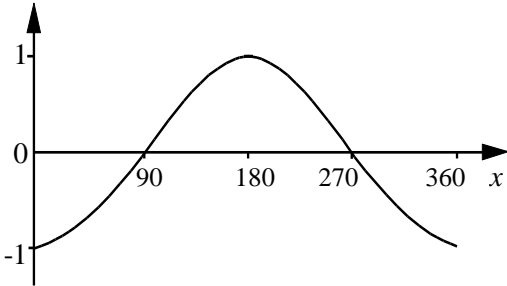
Part Two: Mathematics Intermediate 2: Paper 1, Units 1, 2 and 3

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
1			Ans: $b(6a - 7c)$ • ¹ process: factorise correctly	1	• ¹ $b(6a - 7c)$
2			Ans: $y = -\frac{4}{3}x + 4$ • ¹ process: state y-intercept or c in $y = mx + c$ • ² process: find gradient • ³ process: state correct equation of line	3	• ¹ $c = 4$ • ² $m = -\frac{4}{3}$ • ³ $y = -\frac{4}{3}x + 4$
Notes: <ol style="list-style-type: none"> For a correct answer without working award 3/3 For $y = -\frac{4}{3}x$ award 1/3 Where m and/or c is calculated incorrectly the working must be followed through with a possibility of awarding 1/3 or 2/3 If the equation is stated incorrectly and there is no working, 1/3 can be awarded for correct gradient or correct y-intercept For an incorrect equation (ie both m and c are incorrect) without working eg $y = 4x - \frac{4}{3}$ award 0/3 					

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
3			Ans: 6.28 cm • ¹ strategy: know to express arc as fraction of a circle • ² strategy: know how to find length of arc • ³ process: correctly calculate length of arc	3	• ¹ $\frac{72}{360}$ • ² $\frac{72}{360} \times 3.14 \times 2 \times 5$ • ³ 6.28
Notes: 1. For $\frac{72}{360} \times 3.14 \times 5^2$ leading to 15.7 award 2/3 2. For the award of the final mark, calculations must involve 3.14 and be of equivalent difficulty					
4			Ans: $x = 4, y = -2$ • ¹ process: scale system of equations • ² process: solve for one variable • ³ process: solve for other variable	3	• ¹ $10x - 5y = 50$ $4x + 5y = 6$ • ² $x = 4$ • ³ $y = -2$
Notes: 1. For a correct answer obtained from 2 tables of values or solving 2 equations graphically or trial and improvement award 0/3 2. For a correct answer without working award 0/3 3. Where an error occurs in scaling the system of equations, working must be followed through with the possibility of awarding 2/3 4. An incorrect answer for the first variable must be followed through with the possibility of awarding 2/3					

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
5			Ans: 121° • ¹ process: know that angle QTV is a right angle • ² process: know that angle in a semi-circle is a right angle • ³ process: calculate the size of angle PQR	3	• ¹ angle QTV = 90° or angle RTQ = 22° • ² angle TPQ = 90° or angle TRQ = 90° • ³ 121°
Notes: 1. For correct answer without working award 3/3 2. Angle QTV, angle RTQ, angle TPQ and angle TRQ may not be explicitly stated: they may be marked in a diagram and can be awarded the first and second marks, as appropriate 3. For the final mark to be awarded the size of the angle PQR must be stated explicitly					
6	a	i	Ans: $Q_2 = 35$ • ¹ communicate: state median	1	• ¹ 35
6	a	ii	Ans: $Q_1 = 22$ • ¹ communicate: state lower quartile	1	• ¹ 22
6	a	iii	Ans: $Q_3 = 39$ • ¹ communicate: state upper quartile	1	• ¹ 39

Question		Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
6	b	<p>Ans:</p>  <p>•¹ communicate: correct endpoints</p> <p>•² communicate: correct box</p>	2	<p>•¹ endpoints at 10 and 50</p> <p>•¹ box showing Q_1, Q_2, Q_3</p>
<p>Notes:</p> <p>1. Incorrect answers in part (a) must be followed through to give the possibility of awarding 2/2</p> <p>2. The boxplot must be drawn to a reasonable scale</p>				
6	c	<p>Ans: In general, the fourth year pupils spend more time on homework.</p> <p>There is less variation in the times spent on homework in fourth year than in first year.</p> <p>•¹ communicate: valid comment about the average time</p> <p>•² communicate: valid comment about the spread of times</p>	2	<p>•¹ comment</p> <p>•² comment</p>
<p>Notes:</p> <p>1. Do not accept:</p> <p>“The fourth years had a higher median than the first years”</p> <p>“There was a longer period of time spent on homework in the second boxplot”</p>				

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
9	b		Ans: $x = 4$ • ¹ communicate: state equation	1	• ¹ $x = 4$
Notes: 1. For an answer of (a) $x = 4$ and (b) (4, 20) award 2/2 for (a) award 0/1 for (b) 2. An incorrect answer in part (a) must be followed through 3. For an answer of 4 award 0/1					
10			Ans: The graph of $y = \sin(x - 90)^\circ$ from 0° to 360° 	3	• ¹ evidence from graph • ² evidence from graph eg sine graph from (0, -1) to (90, 0) or sine graph starting at (90, 0) • ³ evidence
Notes: 1. Disregard poor draughtsmanship 2. The 3 rd mark can be awarded for one cycle of any sine or cosine curve being drawn from 0° to 360°					

TOTAL MARKS FOR PAPER 1 30

[END OF MARKING INSTRUCTIONS]



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

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
1			Ans: $x^2 - 12x - 10$ • ¹ process: start to multiply out brackets • ² process: complete the process by multiplying out brackets correctly • ³ process: collect like terms which must include x^2 term	3	• ¹ evidence of any two correct terms eg $x^2 - 5x$ • ² $x^2 - 5x + 2x - 10$ • ³ $x^2 - 12x - 10$
Notes: 1. Where candidates have attempted to “simplify” beyond the correct answer, the 3rd mark is not available					
2			Ans: 4 years because $307\,200 < 375\,000$ • ¹ strategy: know how to decrease 750 000 by 20% • ² strategy: continue strategy until value is below half • ³ process: carry out the calculations correctly, continuing for at least 4 years or until the value is less than half • ⁴ process/ communication: state response which must compare above answer with 375 000	4	• ¹ $\times 0.8$ • ² $750\,000 \times 0.8^4$ • ³ 307 200 • ⁴ 4 years because $307\,200 < 375\,000$
Notes: 1. Where an incorrect percentage has been used, the working must be followed through to give the possibility of awarding 3/4 2. Where a candidate has an answer of 4 years and has calculated 307 200 <u>and</u> 375 000, the 4 th mark is available 3. For a correct answer without working award 0/4					

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
3			Ans: Pie chart • ¹ process: know how to calculate angles in a pie chart • ² process: calculate angles in a pie chart correctly • ³ process: construct pie chart with all sections labelled	3	• ¹ $\frac{35}{100} \times 360$ $\frac{10}{100} \times 360$ $\frac{30}{100} \times 360$ $\frac{15}{100} \times 360$ • ² 126°, 36°, 108°, 54° • ³ diagram (angles $\pm 2^\circ$)
Notes: 1. For a correctly constructed pie chart with all sections labelled with or without working award 3/3 2. The 3 rd mark is available only when there are exactly 5 sectors in the pie chart 3. If 4 sectors are drawn within tolerance then the 3 rd mark can be awarded					
4			Ans: 30·6° • ¹ strategy: know to apply the cosine rule to find angle QPR • ² process: correct substitution into cosine rule • ³ process: correctly calculate the size of angle QPR	3	• ¹ evidence of cosine rule • ² $\cos P = \frac{9 \cdot 3^2 + 14 \cdot 2^2 - 7 \cdot 8^2}{2 \times 9 \cdot 3 \times 14 \cdot 2}$ • ³ 30·6°
Notes: 1. Where an angle other than QPR has been calculated (angle Q = 112°, angle R = 37·4°), 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. 2. 0·53 (RAD), 34 (GRAD), with working award 3/3					

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
5			<p>Ans: $x = -0.4, x = 5.4$</p> <p>•¹ strategy: know to use quadratic formula</p> <p>•² process: substitute correctly into quadratic formula</p> <p>•³ process: calculate $b^2 - 4ac$</p> <p>•⁴ process: state both values of x correct to one decimal place</p>	4	<p>•¹ evidence</p> <p>•² $\frac{5 \pm \sqrt{(-5)^2 - 4 \times 1 \times -2}}{2 \times 1}$</p> <p>•³ 33</p> <p>•⁴ $-0.4, 5.4$</p>
<p>Notes:</p> <p>1. Where $b^2 - 4ac$ is calculated incorrectly, the final mark is only available if $b^2 - 4ac > 0$</p> <p>2. For a correct answer without working award 0/4</p>					

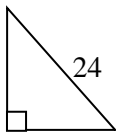
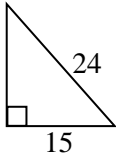
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6	a	i	Ans: $\bar{x} = 82$ • ¹ process: calculate mean	1	• ¹ $\bar{x} = 82$
6	a	ii	Ans: $s = 3.54$ • ¹ process: $(x - \bar{x})^2$ • ² process: substitute into formula • ³ process: calculate standard deviation	3	• ¹ 4, 16, 25, 4, 1 • ² $\sqrt{\frac{50}{4}}$ • ³ 3.54
Notes: 1. For use of alternative formula in part (a) (ii), award marks as follows: • ¹ process: calculate Σx and Σx^2 • ² process: substitute into formula • ³ process: calculate standard deviation 2. For a correct answer without working in part (a) (ii)					
6	b		Ans: mean = 102 standard deviation = 3.54 • ¹ process: state mean • ² process: state standard deviation	2	• ¹ 102 • ² 3.54

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
7			<p>Ans: 14 cm</p> <p>•¹ strategy: know how to calculate volume of remaining metal</p> <p>•² strategy: know how to find expression for volume of cone</p> <p>•³ process: equate above volumes</p> <p>•⁴ process: calculate height</p> <p>•⁵ process: round answer to 2 significant figures</p>	5	<p>•¹ 0.92×10^3</p> <p>•² $\frac{1}{3} \times \pi \times 8^2 \times h$</p> <p>•³ $\frac{1}{3} \times \pi \times 8^2 \times h = 0.92 \times 10^3$</p> <p>•⁴ 13.72711384</p> <p>•⁵ 14</p>
<p>Notes:</p> <p>1. Accept variations in π</p> <p>2. The fifth mark is available for rounding an answer correct to two significant figures</p> <p>3. Where the answer requires no rounding, the fifth mark cannot be awarded</p>					

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
8			<p>Ans: $b = \sqrt{\frac{a-c}{3}}$</p> <p>•¹ process: start to re-arrange formula</p> <p>•² process: continue process</p> <p>•³ process: make b the subject</p>	3	<p>•¹ $3b^2 = a - c$</p> <p>•² $b^2 = \frac{a-c}{3}$</p> <p>•³ $b = \sqrt{\frac{a-c}{3}}$</p>
<p>Notes:</p> <p>1. For a correct answer without working award 0/3</p> <p>2. The second mark is available for division by 3</p> <p>3. The third mark is available for taking the square root of an expression for b^2</p>					
9			<p>Ans: x^3y</p> <p>•¹ process: start to simplify</p> <p>•² process: fully simplify</p>	2	<p>•¹ x^3 or y^1</p> <p>•² x^3y</p>
<p>Notes:</p> <p>1. For the following answers</p> <p>$\frac{x^3}{y^{-1}}$</p> <p>$\frac{x^3y}{1}$</p> <p>$x^3 \times y$</p> <p>award 1/2</p>					

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
10			<p>Ans: 7.6 metres</p> <p>•¹ strategy: know to apply the sine rule in ΔTSC</p> <p>•² process: correct application of the sine rule or other valid strategy</p> <p>•³ process: calculate SC or ST</p> <p>•⁴ strategy: know to use right angled trig to find height of tree</p> <p>•⁵ process: correct calculation of CB</p>	5	<p>•¹ evidence of sine rule</p> <p>•² $\frac{SC}{\sin 40^\circ} = \frac{4}{\sin 12^\circ}$ OR $\frac{ST}{\sin 128^\circ} = \frac{4}{\sin 12^\circ}$</p> <p>•³ SC = 12.4 OR ST = 15.2</p> <p>•⁴ $\sin 38^\circ = \frac{CB}{12.4}$ OR $\sin 50^\circ = \frac{TB}{15.2}$</p> <p>•⁵ 7.6 (m)</p>
<p>Notes:</p> <ol style="list-style-type: none"> 1. Disregard any errors due to premature rounding provided there is evidence 2. Variations in answers for SC (or ST) or a wrong value for SC (or ST) must be accepted as a basis for calculating the new height 3. Where an incorrect trig ratio is used to find the new height, the fifth mark is still available 4. For a correct answer without working award 0/5 					

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
11			<p>Ans: $\frac{8x+7}{(x+2)(x-1)}$</p> <p>•¹ process: state a valid denominator</p> <p>•² process: find correct numerator of equivalent fraction</p> <p>•³ process: state answer in simplest form</p>	3	<p>•¹ any valid denominator</p> <p>•² both numerators correct</p> <p>•³ $\frac{8x+7}{(x+2)(x-1)}$</p>
<p>Notes:</p> <p>1. In this question, working subsequent to a correct answer should be ignored</p> <p>2. For $\frac{3(x-1)+5(x+2)}{(x+2)(x-1)} = \frac{8x+7}{x^2+x-2}$ award 3/3 ✓✓✓</p> <p>$\frac{3(x-1)+5(x+2)}{x^2-2} = \frac{8x+7}{x^2-2}$ award 2/3 ✗✓✓</p>					

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
12			<p>Ans: 85.4 cm</p> <p>•¹ strategy: marshall facts and recognise right angle</p> <p>•² strategy: know that PQ bisects AB</p> <p>•³ strategy: know how to use Pythagoras'</p> <p>•⁴ process: calculate length of 3rd side</p> <p>•⁵ process: calculate height</p>	5	<p>•¹ </p> <p>•² </p> <p>•³ $x^2 = 24^2 - 15^2$</p> <p>•⁴ $x = 18.7$</p> <p>•⁵ 85.4 (cm)</p>
<p>Notes:</p> <ol style="list-style-type: none"> 1. Disregard any errors due to premature rounding 2. The final mark is for doubling a calculated value and adding 48 3. Where a candidate assumes an angle of 45° in the right-angled triangle, only the first, second and fifth marks are available 4. For an answer of 104.6 coming from $\sqrt{(15^2+24^2)} \times 2 + 48$ award 4/5 where a <u>correct</u> diagram is shown (✓✓×✓✓) Award 3/5 where a correct diagram is not shown (×✓×✓✓) 					

Question			Marking Scheme Give 1 mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
13			Ans: 49s, 131s • ¹ process: substitute correctly • ² process: rearrange correctly • ³ process: calculate one angle • ⁴ process: calculate second angle	4	• ¹ $7 + 5 \sin t^\circ = 10.8$ • ² $\sin t^\circ = 3.8/5$ • ³ $t = 49$ • ⁴ $t = 131$

Notes:

- For a correct answer arrived at by trial and improvement, only the first, third and fourth marks are available
- For the third mark to be awarded in a trial and improvement method, the candidate must
 - substitute into the expression a minimum of two values in the range 49-50, where one gives a height <10.8 and the other a height >10.8
 - and**
 - select the value giving a height closer to 10.8
- For a correct answer without working award 1/4 (xxx✓)
- Where a graphical solution is used, the second mark is available for indicating what graph(s) is (are) drawn and where the values occur

TOTAL MARKS FOR PAPER 2 50

[END OF MARKING INSTRUCTIONS]