2010 Mathematics

Intermediate 2 – Units 1, 2 and 3 Paper 1

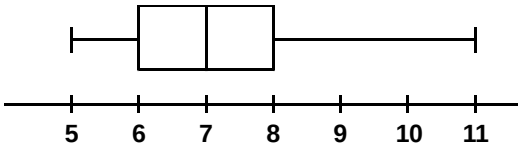
Finalised Marking Instructions

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
1.	**Ans:** $y = -\frac{4}{3}x + 8$	
	•[1] process: find gradient	•[1] $m = -\frac{4}{3}$ (or equivalent)
	•[2] process: state *y*-intercept or c in $y = mx + c$	•[2] $c = 8$
	•[3] process: state correct equation of the line	•[3] $y = -\frac{4}{3}x + 8$ **3 marks**

NOTES:

1. For correct answer without working — award 3/3
2. For $y = -\frac{4}{3}x$ — award 1/3
3. Where m and/or c are incorrect the working must be followed through to give the possibility of awarding 1/3 or 2/3
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 $y = 8x - \frac{4}{3}$ — award 0/3
6. Where a candidate has written the gradient correctly and gone on to 'simplify' it incorrectly, do not penalise eg for $m = -\frac{8}{6} = -1 \cdot 2$
   $y = -1 \cdot 2x + 8$ — award 3/3

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
2. (a)	**Ans:** **Shoe size frequency cumulative frequency** **5 3 3** **6 4 7** **7 7 14** **8 3 17** **9 2 19** **10 0 19** **11 1 20** •[1] communicate: table with frequency column (must include 10 in 'shoe size') •[2] communicate: table with cumulative frequency column	•[1] 3, 4, 7, 3, 2, 0, 1 or correct tally marks •[2] 3, 7, 14, 17, 19, 19, 20 **2 marks**
NOTES:		
(b)	**Ans: (i) 7 (ii) 6 (iii) 8** **(i)** •[1] process: state median **(ii)** •[1] process: state lower quartile **(iii)** •[1] process: state upper quartile	•[1] 7 •[1] 6 •[1] 8 **3 marks**
NOTES: 1. Where the quartiles have been obtained from (a) 'Shoe size' leading to $Q_2 = 8$, $Q_1 = 6$, $Q_3 = 10$ or (b) 'Cumulative frequency' leading to $Q_2 = 17$, $Q_1 = 7$, $Q_3 = 19$ or similar award 0/3		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
(c)	**Ans:**  •[1] communicate: correct end points •[2] communicate: correct box	•[1] end points at 5 and 11 •[2] box showing Q_1, Q_2, Q_3 **2 marks**

NOTES:

1. Where the 5 figure summary is written <u>on</u> the boxplot, the diagram must be drawn to a reasonable scale.

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
3.	**Ans: 113·04 cubic centimetres** •[1] process: substitute correctly into the formula for the volume of a sphere •[2] process: correct calculation	•[1] $V = \frac{4}{3} \times 3 \cdot 14 \times 3^3$ •[2] 113·04 **2 marks**

NOTES:

1. Alternative correct answers with working: $113 \cdot 4 \text{ cm}^3 \left(4 \times 1 \cdot 05 \times 3 \times 3 \times 3\right)$
   $113 \cdot 01 \text{ cm}^3 \left(1 \cdot 333 \times 3 \cdot 14 \times 3 \times 3 \times 3\right)$
2. The 2nd mark is for a calculation involving a fraction, 3·14 and a power,
   eg for $\frac{4}{3} \times 3 \cdot 14 \times 3^2 = 37 \cdot 68$ award 1/2

4. (a)	**Ans:** $\boldsymbol{(x+3)(x-2)}$ •[1] process: start to factorise the trinomial •[2] process: complete factorisation	•[1] one correct factor •[2] $(x+3)(x-2)$ **2 marks**

NOTES:

1. For the following answers award 1/2

   $(x-3)(x+2)$
   $(x+6)(x-1)$
   $(x-6)(x+1)$

(b)	**Ans**: $\boldsymbol{3x^3+17x^2+7x-2}$ •[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^3	•[1] evidence of 3 correct terms (eg $3x^3+15x^2-3x$) •[2] $3x^3+15x^2-3x+2x^2+10x-2$ •[3] $3x^3+17x^2+7x-2$ **3 marks**

NOTES:

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
5.	**Ans: – 9** •[1] process: find the value of k	•[1] -9 **1 mark**
NOTES:		
6.	**Ans: 8 centimetres** •[1] strategy: know to use the sine rule •[2] process: correct substitution into sine rule •[3] process: correct calculation of AC	•[1] $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ •[2] $\frac{b}{\frac{1}{3}} = \frac{12}{\frac{1}{2}}$ •[3] 8 **3 marks**
NOTES: 1. For $\frac{b}{\sin\frac{1}{3}} = \frac{12}{\sin\frac{1}{2}}$ leading to an answer of 8 cm award 2/3		
7.	**Ans: $p^5 - 1$** •[1] process: start to remove brackets •[2] process: complete removal of brackets and simplify	•[1] p^5 •[2] $p^5 - 1$ **2 marks**
NOTES: 1. For an answer of $p^5 - p^0$ award 1/2		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
8. (a)	**Ans: –11** •[1] process: calculate $b^2 - 4ac$	•[1] –11 **1 mark**
NOTES:		
(b)	**Ans: The square root of a negative number does not exist** •[1] communicate: state valid reason	•[1] valid reason **1 mark**
NOTES: 1. Another acceptable answer "Because it is negative"		
9.	**Ans: 45** •[1] communicate: state value of a	•[1] 45 **1 mark**
NOTES: 1. Alternative correct answers: 405, –315		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
10. (a)	**Ans: –5** •[1] communicate: state value of a	•[1] –5 **1 mark**
NOTES:		
(b)	**Ans: (8, 0)** •[1] communicate: state the coordinates of Q	•[1] (8, 0) **1 mark**
NOTES:		
10. (c)	**Ans: –9** •[1] strategy: substitute coordinates of P or Q into equation •[2] process: calculate the value of b	•[1] $0 = (2-5)^2 + b$ •[2] –9 **2 marks**
NOTES: 1. Incorrect answers in parts (a) and (b) must be followed through with the possibility of awarding 2/2.		

TOTAL MARKS FOR PAPER 1
30

[END OF MARKING INSTRUCTIONS]

2010 Mathematics

Intermediate 2 – Units 1, 2 and 3 Paper 2

Finalised Marking Instructions

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 at each •
1.	**Ans: £155 000**	
	•[1] strategy: know how to decrease by 4·25%	•[1] × 0·9575
	•[2] strategy: know how to calculate expected value	•[2] $176\,500 \times 0{\cdot}9575^3$
	•[3] process: carry out all calculations correctly within a valid strategy	•[3] 154 939·1102
	•[4] process: round answer to 3 significant figures	•[4] 155 000 **4 marks**

NOTES:

1.	For an answer of £155 000, with or without working	award 4/4	✓✓✓✓
2.	For an answer of £154 939·11, with or without working	award 3/4	✓✓✓✗
3.	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 £200 000 ($176\,500 \times 1{\cdot}0425^3$), with working	award 3/4	✗✓✓✓
4.	For an answer of £507 000 (176 500 × 0·9575 × 3), with working	award 2/4	✓✗✗✓
5.	For an answer of £154 000 (176 500 – 3 × 0·0425 × 176 500), with working	award 2/4	✓✗✗✓
6.	For an answer of £22 500 (176 500 × 0·0425 × 3), with working	award 1/4	✗✗✗✓
7.	For an answer of 155 000·00 the final mark is not available		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
2.	**Ans: 150º, 200º, 10º** •[1] strategy: know how to calculate angles in a pie chart •[2] process: calculate angles in a pie chart correctly	•[1] any 2 of $\frac{30}{72}\times 360$, $\frac{40}{72}\times 360$ $\frac{2}{72}\times 360$ •[2] 150, 200, 10 **2 marks**

NOTES:

1. For a correct answer without working award 2/2
2. COMMON ANSWERS

   For 41·7 $\left(\frac{30}{72}\times 100\right)$, 55·6 $\left(\frac{40}{72}\times 100\right)$, 2·8 $\left(\frac{2}{72}\times 100\right)$, with working, award 1/2

   For 6 $\left(\frac{72}{360}\times 30\right)$, 8 $\left(\frac{72}{360}\times 40\right)$, 0·4 $\left(\frac{72}{360}\times 2\right)$, with working, award 1/2

   For 108 (30% of 360), 144 (40% of 360), 7·2 (2% of 360), with working, award 1/2

3.	**Ans: £11** •[1] process: calculate fare using equation	•[1] 11 **1 mark**

NOTES:

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

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
4. (a)	**Ans: (i) 7 (ii) 3·958** **(i)** •[1] process: calculate the mean	•[1] 7 **1 mark**
	(ii) •[1] process: calculate $\left(x-\bar{x}\right)^2$ •[2] process: substitute into formula •[3] process: calculate standard deviation	•[1] 36, 0, 49, 4, 0, 1, 4 •[2] $\sqrt{\frac{94}{6}}$ •[3] 3·958 (disregard rounding) **3 marks**

NOTES:

1. For use of alternative formula in part (a) (ii), award marks as follows:

•[1] process: calculate $\sum x$ and $\sum x^2$	•[1] 49 and 437
•[2] process: substitute into formula	•[2] $\sqrt{\frac{437-49^2/7}{6}}$
•[3] process: calculate standard deviation	•[3] 3·958

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 •
4. (b)	**Ans: The team scores more points under the new coach.** **The team is more consistent.** •[1] communicate: make valid comment comparing means •[2] communicate: make valid comment comparing standard deviations	 •[1] valid comment •[2] valid comment **2 marks**

NOTES:

1. SOME ACCEPTABLE ANSWERS (Comparing means):
   The average score is higher.
   The average number of points scored is higher.
   The mean is higher so the team has improved.
   The team is playing better.

   SOME UNACCEPTABLE ANSWERS (Comparing means):
   The average is higher.
   The new coach got a higher mean than before.
   The mean score is higher.

2. ACCEPTABLE ANSWERS (Comparing standard deviations):
   There is a smaller range of scores.
   The scores are less spread out.

   UNACCEPTABLE ANSWERS (Comparing standard deviations):
   The standard deviation is lower.

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
5.	**Ans: $x = 7, y = -2$** •[1] process: scale system of equations •[2] process: solve for one variable •[3] process: solve for other variable	•[1] $16x - 40y = 192$ $35x + 40y = 165$ •[2] $x = 7$ •[3] $y = -2$ **3 marks**
NOTES: 1. For a correct answer obtained from two tables of values or solving two 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		
6.	**Ans: $\frac{3s}{2}$** •[1] process: know how to multiply •[2] process: simplify answer	•[1] $\frac{s^2 \times 3t}{t \times 2s}$ •[2] $\frac{3s}{2}$ **2 marks**
NOTES: 1. For a correct answer without working — award 2/2		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
7.	**Ans:** $\boldsymbol{L = \frac{P}{2} - B}$ **or** $\boldsymbol{L = \frac{P - 2B}{2}}$ •[1] process: divide both sides by 2 •[2] process: subtract B from both sides	•[1] $\frac{P}{2} = L + B$ •[2] $L = \frac{P}{2} - B$
	ALTERNATIVE METHOD: •[1] process: remove brackets and subtract $2B$ from both sides •[2] process: divide both sides by 2	•[1] $2L = P - 2B$ •[2] $L = \frac{P - 2B}{2}$ **2 marks**
NOTES: 1. For a correct answer without working award 2/2 2. For incorrect working subsequent to a correct answer, the second mark is not available		
8.	**Ans: $4\sqrt{7}$** •[1] process: simplify surd $\sqrt{63}$ •[2] process: simplify surd $\sqrt{28}$ •[3] process: state answer in simplest form	•[1] $3\sqrt{7}$ •[2] $2\sqrt{7}$ •[3] $4\sqrt{7}$ **3 marks**
NOTES: 1. 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 •
9.	**Ans: 1342·35 square centimetres**	
	•[1] strategy: express sector as a fraction of a circle	•[1] $\frac{65}{360}$
	•[2] strategy: know how to find area of a sector	•[2] $\frac{65}{360}\times\pi\times14^2$
	•[3] process: calculate the area of a sector	•[3] 111·177
	•[4] process: calculate the area of material required	•[4] 1342·35 **4 marks**

NOTES:

1. Accept variations in π. Disregard premature or incorrect rounding of $\frac{65}{360}$.
2. The third mark is for a calculation involving a fraction and π.
3. COMMON ANSWERS (with working)

For $\frac{65}{360}\times\pi\times28$ leading to 15·88 and a final answer of 1151·76 award 3/4

For $\frac{65}{360}\times\pi\times14$ leading to 7·94 and a final answer of 1135·88 award 3/4

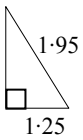
For $\frac{65}{360}\times\pi\times7^2$ leading to 27·79 and a final answer of 1175·59 award 3/4

For $\frac{360}{65}\times\pi\times14^2$ leading to 3410·32 and a final answer of 7940·64 award 3/4

For $\frac{65}{100}\times\pi\times14^2$ leading to 400·24 and a final answer of 1920·48 award 3/4

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
10. (a)	**Ans: Proof** •[1] strategy: know how to find area •[2] process: complete proof	•[1] $(x+7)(x+3)$ •[2] evidence of four correct terms $x^2+7x+3x+21$ leading to $x^2+10x+21$ **2 marks**
NOTES: 1. Where a candidate starts from $x^2+10x+21$ and factorises, the two marks are available as above.		
(b)	**Ans: $x = 2$** •[1] strategy: equate area formula to 45 •[2] process: use factorisation to solve equation or equivalent •[3] process: solve for x •[4] process: choose positive value for x	•[1] $x^2+10x+21=45$ •[2] $(x-2)(x+12)=0$ •[3] $2, -12$ •[4] 2 **4 marks**
NOTES: 1. Where a candidate states that $x=2$ and checks by substitution — award 2/4 2. For the case in NOTE 1, if $x=2$ is not stated explicitly — award 1/4 3. For an answer of $x=2$, without working, — award 0/4		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
11.	**Ans: 25·3 centimetres**	
	•[1] strategy: know how to find expression for volume of cylinder	•[1] $\pi \times 6 \cdot 4^2 \times h$
	•[2] process: equate volume with 3260	•[2] $\pi \times 6 \cdot 4^2 \times h = 3260$
	•[3] communicate: state value for h	•[3] 25·3 **3 marks**
NOTES: 1. Accept variations in π. Disregard premature or incorrect rounding		
12.	**Ans: 126·5 metres**	
	•[1] strategy: know to find QR or PR	•[1] evidence of use of sine rule in triangle PQR
	•[2] process: correct application of sine rule in triangle PQR	•[2] $\frac{350}{\sin 111^\circ} = \frac{QR}{\sin 27^\circ}$ or $\frac{PR}{\sin 42^\circ} = \frac{350}{\sin 111^\circ}$
	•[3] process: calculate QR or PR correctly	•[3] QR = 170·2 m or PR = 250·9m
	•[4] strategy: know to use right-angled trig to calculate QS or PS	•[4] $\cos 42^\circ = \frac{QS}{170 \cdot 2}$ or $\cos 27^\circ = \frac{PS}{250 \cdot 9}$
	•[5] process: calculate QS	•[5] 126·5 (metres) **5 marks**
NOTES: 1. Disregard errors due to premature rounding provided there is evidence. 2. Variations in answers for a value of QR or PR, or a wrong value for QR or PR must be accepted as a basis for calculating the length of QS. 3. Where a candidate assumes that angle PRQ = 90º, the first three marks are not available. 4. 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 •
13.	**Ans: 3·45 metres**	
	•[1] strategy: marshall facts and recognise right-angle	•[1] 
	•[2] strategy: use Pythagoras Theorem or equivalent	•[2] $x^2 = 1{\cdot}95^2 - 1{\cdot}25^2$
	•[3] process: calculate third side correctly	•[3] 1·496
	•[4] process: state height	•[4] 3·45 m
		4 marks

NOTES:

1. The final mark is for adding 1·95 to a value which has been calculated.
2. SOME COMMON ANSWERS (with working):

   $\sqrt{1{\cdot}95^2 + 1{\cdot}25^2} + 1{\cdot}95 = 4{\cdot}27$ award 3/4

   $\sqrt{1{\cdot}95^2 + 2{\cdot}5^2} + 1{\cdot}95 = 5{\cdot}12$ award 2/4

   $\sqrt{2{\cdot}5^2 - 1{\cdot}95^2} + 1{\cdot}95 = 3{\cdot}51$ award 2/4

   $\sqrt{3{\cdot}9^2 - 2{\cdot}5^2} = 2{\cdot}99$ award 1/4
3. Where a candidate assumes an angle of 45º 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. (a)	**Ans: 8·69 metres** •[1] process: substitute into formula •[2] process: calculate height correctly	•[1] $h = 15 \tan 25^\circ + 1{\cdot}7$ •[2] $h = 8{\cdot}69$ **2 marks**

NOTES:

1. For a correct answer, without working — award 2/2
2. For an answer of –0·303 (Rads) or 7·91 (Grads) — award 2/2
3. Where a candidate correctly uses the sine rule (or SOHCAHTOA) but forgets to add 1·7. — award 1/2

14. (b)	**Ans: 48°** •[1] process: substitute correctly •[2] process: rearrange correctly •[3] process: calculate angle	•[1] $15 \tan x^\circ + 1{\cdot}7 = 18{\cdot}4$ •[2] $\tan x^\circ = 16{\cdot}7/15$ •[3] $x = 48$ **3 marks**

NOTES:

1. For a correct answer, arrived at by trial and improvement, only the first and third marks are available, eg for $15 \tan 48 + 1{\cdot}7 = 18{\cdot}4$ — award 2/3
2. Where a candidate works out two values for x, the third mark is not available.

TOTAL MARKS FOR PAPER 2
50

[END OF MARKING INSTRUCTIONS]