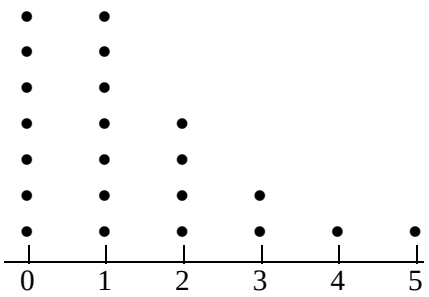
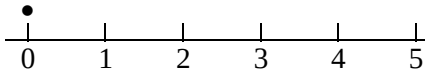
2009 Mathematics

Intermediate 2 – Units 1, 2 and 3 Paper 1

Finalised Marking Instructions

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)	**Ans:**  •[1] process: start to draw dotplot •[2] process: complete dotplot	•[1] evidence (see note 1) •[2] complete dotplot **2 marks**
NOTES: 1. Minimum acceptable evidence for the award of the first mark  		
(b)	**Ans: A** •[1] communicate: state correct letter	•[1] A **1 mark**
NOTES: 1. Accept "skewed to the right".		

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

NOTES:

1. For correct answer without working — award 3/3
2. For $y = 3x$ — 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 $y = -x + 3$ — award 0/3

3	**Ans:** $(x - 8)(x + 3)$ •[1] process: start to factorise •[2] process: complete factorisation	•[1] one correct factor •[2] $(x - 8)(x + 3)$ **2 marks**

NOTES:

1. For the following answers — award 1/2

$(x - 24)(x + 1)$
$(x + 24)(x - 1)$
$(x - 12)(x + 2)$
$(x + 12)(x - 2)$
$(x + 8)(x - 3)$
$(x - 6)(x + 4)$
$(x + 6)(x - 4)$

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
4	**Ans:** $2x^3 + 7x^2 - 16x - 5$ •[1] process: start to multiply out brackets •[2] process: complete the process of multiplying out brackets correctly •[3] process: collect like terms which must include x^3 term	•[1] evidence of 3 correct terms (eg $2x^3 - 3x^2 - x$) •[2] $2x^3 - 3x^2 - x + 10x^2 - 15x - 5$ •[3] $2x^3 + 7x^2 - 16x - 5$ **3 marks**
NOTES: 1. Where candidates have attempted to 'simplify' beyond the correct answer, the 3rd mark is not available.		
5 (a)	**Ans: (i) 58·5 (ii) 11** **(i)** •[1] process: calculate median **(ii)** •[1] process: calculate lower quartile •[2] process: calculate upper quartile •[3] process: calculate SIQR	•[1] 58·5 **1 mark** •[1] 45 •[2] 67 •[3] 11 **3 marks**
NOTES: 1. An incorrect answer for the median must be followed through with the possibility of awarding full marks for part (ii).		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
(b)	**Ans: In December, the marks (on average) are better and less spread out.** •[1] communicate: make a valid comment •[2] communicate: make a second valid comment	•[1] comment •[2] comment **2 marks**

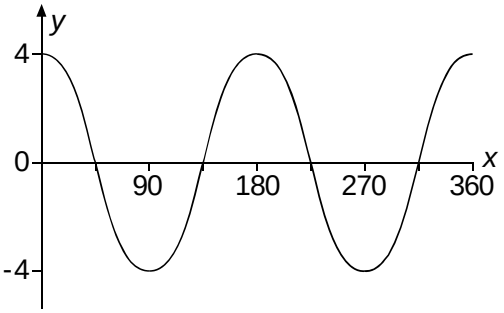
NOTES:

1. For an answer like "marks are better and less spread out" award 0/2

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
6	**Ans: Any value for *a* such that 270 < *a* < 360.** •[1] communicate: state possible size of *a*	•[1] any size between 270 and 360 **1 mark**
NOTES:		
7	**Ans: -1** •[1] strategy: know how to find gradient •[2] communicate: state gradient	•[1] $y = -x + 5$ or correct graph •[2] -1 **2 marks**

NOTES:

1. Correct answer without working — award 2/2
2. For an answer of m = –1, c = 5, with or without working — award 1/2

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
8	**Ans: The graph of $y = 4\cos 2x^\circ$ drawn from 0° to 360°**  •[1] process: know the max = 4 and min = -4 •[2] process: show that there are 2 cycles in 360° •[3] communicate: curve correctly drawn	•[1] evidence from graph •[2] evidence from graph •[3] evidence **3 marks**

NOTES:

1. For a sketch of the curve $y = 2\cos 4x°$, for $0 \le \times \le 360$ award 2/3
2. Disregard poor draughtsmanship.

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
9 (a)	**Ans:** $x = -3$ •[1] communicate: state equation	•[1] $x = -3$ **1 mark**
NOTES: 1. For an answer of $(=)-3$ award 0/1		
(b)	**Ans:** $y = (x+3)^2 - 4$ •[1] communicate: state equation in correct form, with *a* or *b* correct •[2] communicate: complete equation	•[1] $y = (x+3)^2 + b$ •[2] $y = (x+3)^2 - 4$ **2 marks**
NOTES: 1. For $y = (x+4)^2 - 3$ award 0/2		
(c)	**Ans: (0,5)** •[1] strategy: know to substitute $x = 0$ in equation •[2] communicate: state coordinates of C	•[1] $y = (0+3)^2 - 4$ •[2] (0,5) **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 •
10	**Ans: cos x°** •^{1} strategy: replace $1-\sin^2 x^\circ$ with $\cos^2 x^\circ$ •^{2} process: cancel $\cos^2 x^\circ$	 •^{1} $\dfrac{\cos^3 x^\circ}{\cos^2 x}$ •^{2} $\cos x^\circ$ **2 marks**

NOTES:

1. For a correct answer, without working, award 0/2

TOTAL MARKS FOR PAPER 1
30

[END OF MARKING INSTRUCTIONS]

2009 Mathematics

Intermediate 2 – Units 1, 2 and 3 Paper 2

Finalised Marking Instructions

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
1	**Ans: There were 3 sales fewer in 2008 or There were fewer sales in 2008 because 2997 < 3000** •[1] strategy: know how to increase by 11% •[2] strategy: know how to calculate 2008 sales •[3] process: carry out calculations correctly and state conclusion	•[1] × 1·11 (= 3330) •[2] 3000 × 1·11 × 0·9 (= 2997) •[3] 3 sales less in 2008 **3 marks**

NOTES:

1 For an answer of "There were 3 sales fewer in 2008" without working award 3/3

2 For the third mark candidates must refer to the sales of both 2006 and 2008 or the difference between them.

3 Where a candidate increases 3000 by 11% and then decreases 3000 by 10%, only the first mark is available.

4 Where a candidate calculates 2 increases or 2 decreases, 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 (a)	**Ans: 172 cm** •[1] process: calculate the mean	•[1] 172 **1 mark**
(b)	**Ans: 4·8 cm** •[1] process: calculate $(x-\bar{x})^2$ •[2] process: substitute into formula •[3] process: calculate standard deviation	•[1] 1, 16, 16, 36, 4, 64, 1 •[2] $\sqrt{\frac{138}{6}}$ •[3] 4·8 **3 marks**

NOTES:

1 For use of alternative formula, award marks as follows:

•[1] process: calculate Σx and Σx^2	•[1] 1204, 207226
•[2] process: substitute into formula	•[2] $\sqrt{\frac{207226 - 1204^2/7}{6}}$
•[3] process: calculate standard deviation	•[3] 4·8

2 For 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 •
3	**Ans: 882 000 mm^3**	
	•^{1} strategy: know to subtract the volume of two cylinders	•^{1} evidence
	•^{2} process: correct substitution into formula	•^{2} $\pi \times 41^2 \times 900$
	•^{3} process: correct substitution into formula	•^{3} $\pi \times 37^2 \times 900$
	•^{4} process: calculate volume of aluminium	•^{4} 882 159
	•^{5} process: round volume to 3 significant figures	•^{5} 882 000 **5 marks**

NOTES:

1. The final mark is for rounding an answer correct to three significant figures. Where the answer requires no rounding, the final mark cannot be awarded.

2. SOME COMMON ANSWERS (working must be shown)

3 530 000 mm^3	$\left(\pi \times 82^2 \times 900 - \pi \times 74^2 \times 900\right)$	award 4/5
8 620 000 mm	$\left(\pi \times 41^2 \times 900 + \pi \times 37^2 \times 900\right)$	award 4/5
76 500 mm^3	$\left(\frac{4}{3} \times \pi \times 41^3 - \frac{4}{3} \times \pi \times 37^3\right)$	award 3/5
22 600 mm^3	$\left(\pi \times 82 \times 900 - \pi \times 74 \times 900\right)$	award 3/5
115 000 mm^3	$\left(\pi \times 41^2 \times 82 - \pi \times 37^2 \times 74\right)$	award 3/5
441 000 mm^3	$\left(\pi \times 82 \times 900 + \pi \times 74 \times 900\right)$	award 2/5
45 200 mm^3	$\left(\pi \times (41 - 37)^2 \times 900\right)$	award 2/5
181 000 mm^3	$\left(\pi \times 8^2 \times 900\right)$	award 1/5

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
4 (a)	**Ans: $14x + 60y = 344{\cdot}30$** •[1] interpret: interpret the text	•[1] $14x + 60y = 344{\cdot}30$ **1 mark**
NOTES:		
(b)	**Ans: $21x + 40y = 368{\cdot}95$** •[1] interpret: interpret the text	•[1] $21x + 40y = 368{\cdot}95$ **1 mark**
NOTES:		

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
(c)	**Ans: A car costs £11·95 and a passenger £2·95**	
	•[1] strategy: know to solve system of equations	•[1] evidence
	•[2] process: follow a valid strategy through to produce a value for x and y	•[2] a value for x and y
	•[3] process: correct value for x and y	•[3] $x = 11 \cdot 95, y = 2 \cdot 95$
	•[4] communicate: state result	•[4] car costs £11·95, passenger costs £2·95
		4 marks

NOTES:

1 Incorrect answers in (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 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 $14 \times 11 \cdot 95 + 60 \times 2 \cdot 95 = 344 \cdot 30$
$21 \times 11 \cdot 95 + 40 \times 2 \cdot 95 = 368 \cdot 95$
leading to $x = 11 \cdot 95,\ y = 2 \cdot 95$
a car costs £11·95
a passenger costs £2·95

award 4/4

4 For an answer of $x = 11 \cdot 95, y = 2 \cdot 95$, award 3/4 (lose communication mark)

5 For wrong answer without working or based on an invalid strategy, the final mark cannot be awarded

6 Where a candidate has calculated x or y to be negative, the final mark is not available.

7 For the award of the final mark, the costs must be stated in pounds or pence.

8 For the 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	**Ans: 313 square inches**	
	•[1] strategy: express sector as fraction of circle	•[1] $\frac{160}{360}$
	•[2] process: know how to calculate shaded area	•[2] evidence of difference in area of two sectors
	•[3] process: substitute correctly into formula	•[3] $\frac{160}{360}\times\pi\times\left(18^2-10^2\right)$
	•[4] process: calculate area correctly	•[4] 313 square inches
		4 marks

NOTES:

1 Accept variations in π ; disregard premature or incorrect rounding of 160/360

2 For 160/360 $\times 2\times\pi\times(18-10)$ (leading to 22·3) award 2/4

3 For $\frac{160}{360}\times\pi\times(18-10)^2$ (leading to 89·4) award 2/4

4 Where a candidate works out the area of only one sector, eg $\frac{160}{360}\times\pi\times18^2$ award 1/4

6	**Ans: 68·6º**	
	•[1] strategy: know to use cosine rule	•[1] evidence
	•[2] process: correct substitution	•[2] $\frac{1000^2+950^2-1100^2}{2\times1000\times950}$
	•[3] process: calculate the size of angle BPM	•[3] 68·6º
		3 marks

NOTES:

1 Where an angle other than angle BPM has been calculated ($\angle B = 53{\cdot}5^\circ$, $\angle M = 57{\cdot}8^\circ$), 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 1·2 (RAD), 76·2 (GRAD), with working award 3/3

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
7	**Ans:** $x = -0\cdot7, x = -4\cdot3$	
	$\bullet^1$ strategy: know to use quadratic formula	$\bullet^1$ evidence
	$\bullet^2$ process: substitute correctly into quadratic formula	$\bullet^2$ $\dfrac{-5 \pm \sqrt{(5^2 - 4\times1\times3)}}{2\times1}$
	$\bullet^3$ process: calculate $b^2 - 4ac$	$\bullet^3$ 13
	$\bullet^4$ process: state both values of x correct to 1 decimal place	$\bullet^4$ $-0\cdot7, -4\cdot3$ **4 marks**

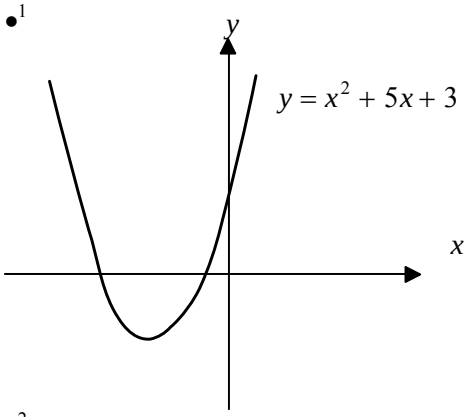
NOTES:

1 Where $b^2 - 4ac$ is calculated incorrectly, the fourth mark is available only if $b^2 - 4ac > 0$

2 Alternative method (graphical solution)

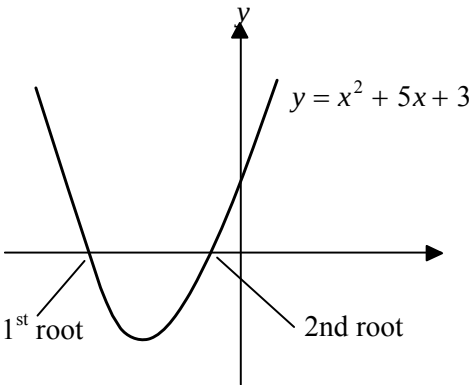
$\bullet^1$ strategy: know to graph $y = x^2 + 5x + 3$

$\bullet^1$



$\bullet^2$ communicate: indicate position of roots

$\bullet^2$



$\bullet^3$ communicate: state first root correct to 1 decimal place

$\bullet^3$ $-0\cdot7$

$\bullet^4$ communicate: state second root correct to 1 decimal place

$\bullet^4$ $-4\cdot3$

3 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:** $\dfrac{\mathbf{6x}}{(\boldsymbol{x}-\mathbf{1})(\boldsymbol{x}+\mathbf{2})}$ •[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] $\dfrac{6x}{(x-1)(x+2)}$ **3 marks**

NOTES:

1 In this question, working subsequent to a correct answer should be ignored

2 For $\dfrac{2(x+2)+4(x-1)}{(x-1)(x+2)}=\dfrac{6x}{x^2-2}$ award 3/3 √√√

$\dfrac{2(x+2)+4(x-1)}{x^2-2}=\dfrac{6x}{x^2-2}$ award 2/3 ×√√

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
9	**Ans:** $\boldsymbol{h = \dfrac{2A}{(a+b)}}$ •[1] process: start to re-arrange the formula •[2] process: make *h* the subject	 •[1] $h(a+b) = 2A$ •[2] $h = \dfrac{2A}{(a+b)}$ **2 marks**

NOTES:

1 For $h(a+b) = 2A$
or $\frac{1}{2}h = \dfrac{A}{a+b}$
or $h(a+b) = \dfrac{A}{1/2}$ the first mark can be awarded

2 For a final answer of
$h = \dfrac{2A}{a+b}$
or $h = \dfrac{A}{\frac{1}{2}(a+b)}$ award 2/2

3 For a final answer of
$h = \dfrac{\frac{A}{1/2}}{a+b}$

or $h = \dfrac{A}{\frac{a+b}{1/2}}$ award 1/2

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
10	**Ans: $x = 239$ and $x = 301$** •[1] process: solve equation for sin x° •[2] process: find one value for x •[3] process: find second value for x	 •[1] $\sin x^\circ = \frac{-6}{7}$ or equivalent •[2] $x = 239$ •[3] $x = 301$ **3 marks**

NOTES:

1 Where sin $x°$ is calculated incorrectly, the second and third marks are available only when sin $x° < 0$. Where sin $x° > 0$, 1/3 can be awarded when two values of x are calculated consistent with the incorrect value for sin $x°$ (working eased).

2 Where a graphical solution has been used, the first mark is available for indicating what graph is drawn and where the values occur.

3 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	**Ans: $6\sqrt{2}$** •[1] strategy: know how to rationalise denominator •[2] process: simplify answer	 •[1] $\frac{12}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ •[2] $6\sqrt{2}$ **2 marks**

NOTES:

1 For an answer of $\frac{6\sqrt{2}}{1}$, with working award 2/2

Question No	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
12	**Ans:** $\mathbf{a^{-2}\ b^4}$ or $\mathbf{\frac{b^4}{a^2}}$ •[1] process: simplify one variable •[2] process: simplify fully **with no subsequent errors**	 •[1] a^{-2} or b^4 •[2] $a^{-2}\ b^4$ **2 marks**
NOTES:		
13	**Ans: 8·6 metres** •[1] strategy: know to apply sine rule in Δ BCD to find BD or other valid strategy •[2] process: correct application of the sine rule or other valid strategy •[3] process: calculate BD •[4] strategy: know to use right-angled trig to find height of building •[5] process: correct calculation of AD	 •[1] evidence •[2] $\frac{BD}{\sin 38^\circ} = \frac{5}{\sin 17^\circ}$ or $\frac{DC}{\sin 125^\circ} = \frac{5}{\sin 17^\circ}$ •[3] BD = 10·5 or DC = 14·0 •[4] $\sin 55° = \frac{AD}{10\cdot 5}$ or $\sin 38^\circ = \frac{AD}{14\cdot 0}$ •[5] 8·6 **5 marks**

NOTES:

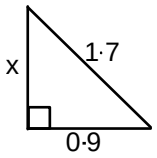
1 Disregard any errors due to premature rounding provided there is evidence.

2 Variations in answers for BD (or DC) or a wrong value for BD (or DC) must be accepted as a basis for calculating the height.

3 Where a candidate assumes that B is the midpoint of AC, the last two marks are available for a correct trig calculation.

4 Where an incorrect trig ratio is used to find the height, the fifth mark is still available.

5 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 •
14	**Ans: 3·14 metres** •[1] strategy: marshall facts and recognise right angle •[2] strategy: know how to use Pythagoras •[3] process: correct calculation of x •[4] process: find height of tunnel	•[1]  •[2] $x^2 = 1{\cdot}7^2 - 0{\cdot}9^2$ •[3] $x = 1{\cdot}44$ •[4] 3·14 metres **4 marks**

NOTES:

1 The final mark is for adding 1·7 to a value which has been calculated.

2 SOME COMMON ANSWERS (with working):

$\sqrt{1{\cdot}7^2 + 0{\cdot}9^2} + 1{\cdot}7 = 3{\cdot}62$ award 3/4

$\sqrt{1{\cdot}7^2 + 1{\cdot}8^2} + 1{\cdot}7 = 4{\cdot}18$ award 2/4

$\sqrt{1{\cdot}8^2 - 1{\cdot}7^2} + 1{\cdot}7 = 2{\cdot}29$ award 2/4

$\sqrt{3{\cdot}4^2 - 1{\cdot}8^2} = 2{\cdot}88$ award 1/4

3 Where a candidate assumes angle XYO = angle OXY = 45°, only the final mark is available.

4 For an answer of 3·14, without working award 0/4

TOTAL MARKS FOR PAPER 2
50

[END OF MARKING INSTRUCTIONS]