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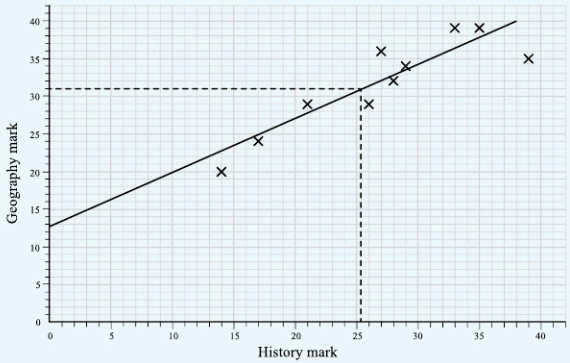
# Mathematics Paper 2 (Calculator) Higher Tier Mark Scheme

## Edexcel GCSE

SET 5

| Question | Working | Answer | Notes |
|---|---|---|---|
| **Q1** | $\tan(x) = \frac{6}{11}$<br>$x = \tan^{-1}(\frac{6}{11})$<br>$x = 28.61045967$ | $x = 28.6°$ | M1 $\tan(x) = \frac{6}{11}$ or $x = \tan^{-1}(\frac{6}{11})$<br>A1 Correct answer, rounded to 3sf |
| **Q2a** | $\frac{1}{0.4} = 2.5$ | 2.5 | |
| **Q2b** | | $5.25 \leq x < 5.35$ | B1 5.25<br>B1 5.35 |
| **Q3a** | Those with higher marks in history also had higher marks in geography | | Accept positive correlation |
| **Q3b** |  | 31 | M1 For method to read off<br>(e.g. line of best fit or a line up from 25)<br>A1 for an answer in the range 26 - 36 |
| **Q3c** | | Geography seems easier as the marks are generally higher | B1 ‘Geography seems easier’<br>B1 ‘Because the marks are generally higher’ oe |

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| **Q4** | Co-interior angle = 180 − 121 = 59<br>Bearing = 360 − 59 = 301° | 301° | M1 Correct sketch with bearing labelled or correct first step<br>A1 cao |
| **Q5** | Try different values:<br>$7000 \times 1.06^4 = 8837.34$<br>$7000 \times 1.06^5 = 9367.58$<br>$7000 \times 1.06^6 = 9929.63$ | $n = 5$ | M1 Tries at least 1 value for $n$<br>A1 cao |
| **Q6a** | | 1.498828982 | M1 $\sqrt[3]{1.4_2 + \tan(30)} = 1.363934374$ correctly calculated for numerator (can be implied by correct final answer)<br>A1 cao |
| **Q6b** | | 1.50 | |
| **Q7** | $A$ to $B = \begin{pmatrix} 4 \\ 6 \end{pmatrix}$<br>$B$ to $C = \begin{pmatrix} 10 \\ 15 \end{pmatrix}$<br>$C = (16, 24)$ | (16, 24) | M1 $A$ to $B$ 4 along and 6 up stated<br>M1 Divides by 2 and multiplies by 5 to find $BC$ or by 7 to find $AC$<br>M1 ft Adds their $BC$ onto $B$ or their $AC$ onto $A$<br>A1 cao |

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| **Q8** | Scale factor: $18 \div 12 = 1.5$<br>$1.5(2x + 10) = 5x + 9$<br>$3x + 15 = 5x + 9$<br>$15 = 2x + 9$<br>$6 = 2x$<br>$x = 3$<br>Perimeter $= 5 \times 3 + 9 + 3 \times 3 + 4 + 18$<br>$= 24 + 13 + 18$<br>$= 55$cm | 55cm | B1 Scale factor: $18 \div 12 (= 1.5)$<br>M1 "Their 1.5" $\times (2x + 10) = 5x + 9$<br>A1 $x = 3$<br>M1 (dep at least M1 previously awarded)<br>Substitutes their "$x$" to find perimeter<br>A1 cao |
| **Q9a** | | | |

| Time, $t$ seconds | Cumulative frequency |
|---|---|
| $60 \leq t < 90$ | 7 |
| $60 \leq t < 120$ | 21 |
| $60 \leq t < 150$ | 44 |
| $60 \leq t < 180$ | 71 |
| $60 \leq t < 210$ | 80 |

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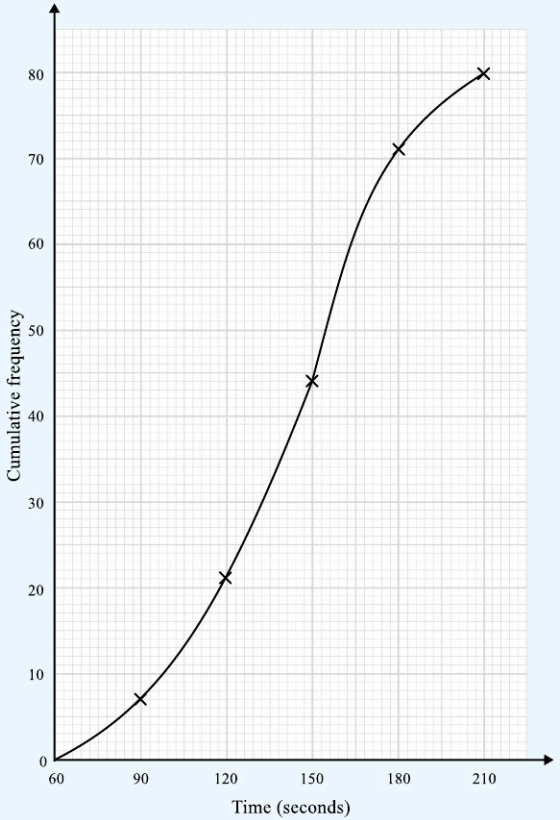
| **Q9b** |  | | M1 All points correctly plotted<br>A1 Joined with a smooth curve |

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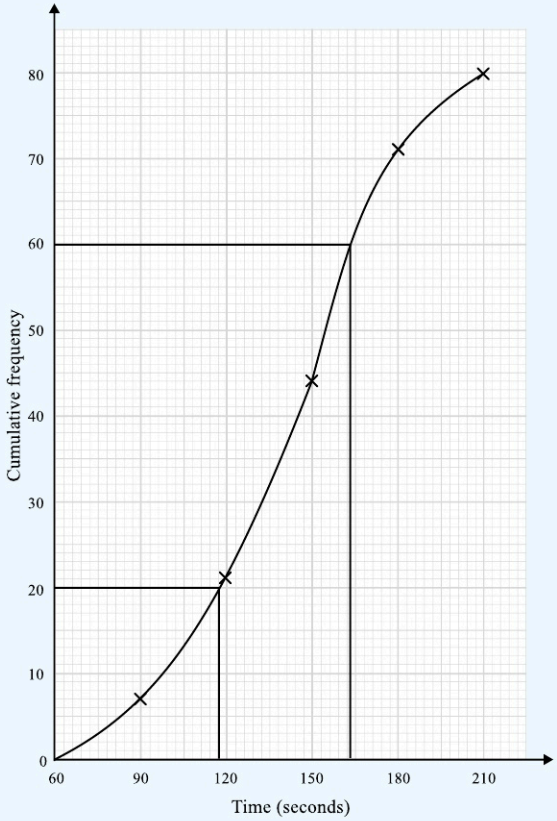
| Question | Working | Answer | Notes |
|---|---|---|---|
| **Q9c** | <br>Lower Quartile = 117<br>Upper Quartile = 164<br>Interquartile range = 164 − 117 | 164 − 117 = 47 | M1 Lower quartile between 114 and 120<br>Upper quartile between 161 and 167<br>**or** ft their graph<br>A1 Answer in the range 41 to 53 or ft their graph |
| **Q10a** | 10 = 0.25<br>40 = 1 | 40 | M1 10 = $\frac{1}{4}$ of cards<br>A1 cao |

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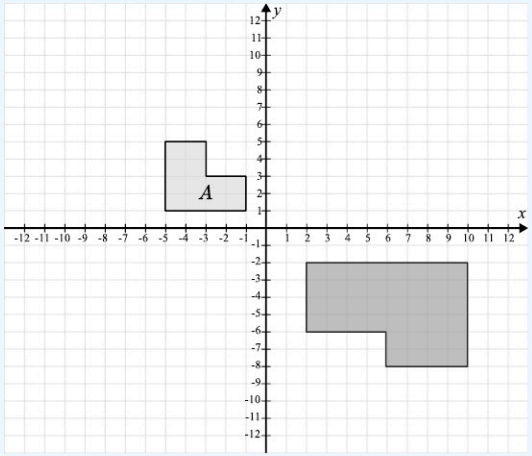
| **Q10b** | Diamond: $\frac{13}{40} = 0.325$<br>Spade: $1 - 0.325 - 0.275 - 0.25 = 0.15$ | 0.325, 0.15 | A1 Diamond correct<br>A1 Spade correct |
| **Q10c** | $\frac{13}{25} = 0.25$ | Yes, because in a full pack of cards the probability would be 0.25 and $0.275 > 0.25$ | M1 0.25 oe seen<br>A1 Correct comparison and conclusion |
| **Q11** | $(2x^2 - 9x - 5)(3x + 2)$<br>$= 6x^3 - 27x^2 - 15x + 4x^2 - 18x - 10$<br>$= 6x^3 - 23x^2 - 33x - 10$ | $6x^3 - 23x^2 - 33x - 10$ | M1 Correctly expands any pair of brackets<br>M1 Attempts to expand third bracket<br>A1 cao |
| **Q12** | $L_2 : y = -\frac{1}{3}x + \frac{1}{3}$<br>$m_1 \times m_2 : 3 \times -\frac{1}{3} = -1$ | Their gradients multiply to make $-1$, therefore perpendicular | M1 Gradient $L_1 = -\frac{1}{3}$<br>A1 Correct conclusion |
| **Q13** |  | | M1 Enlargement scale factor 2<br>A1 cao |

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| **Q14** | $360 \div 1.16 = £310.34(...)$<br>$385 \div 1.37 = £281.02(...)$ | London | M1 Converts € to £<br>M1 Convert $ to £<br>A1 Correct conclusion from correct working |
| **Q15** | $\pi \times (1.12r)^2 = 1.2544\pi r^2$<br>% increase is 25.44% | 25.44% | M1 $\pi \times (1.12r)^2$<br>M1 $1.2544\pi r^2$<br>A1 cao |
| **Q16a** | $2^3 - 2 \times 2^2 - 1 = -1$<br>$3^3 - 2 \times 3^2 - 1 = 8$ | Change of sign shows root | M1 Substitutes 2 and 3 into $x^3 - 2x^2 - 1$<br>A1 Correct conclusion |
| **Q16b** | $x^3 - 2x^2 - 1 = 0$<br>$x^3 = 2x^2 + 1$<br>$x = \sqrt[3]{2x^2 + 1}$ | | A1 Fully correct with at least 2 steps |
| **Q16c** | $x_1 = \sqrt[3]{2 \times 2.5^2 + 1} = 2.3811$<br>$x_2 = 2.3108$<br>$x_3 = 2.2689$<br>$x_4 = 2.2437$ | | M1 Attempts to substitute 2.5 into<br>$x_{n+1} = \sqrt[3]{2x_n^2 + 1}$<br>A1 $x_1 = \sqrt[3]{2 \times 2.5^2 + 1} = 2.3811(...)$<br>A1 All values correct to 4 decimal places |

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| **Q17a** | $a^2 = 8.1^2 + 11.3^2 - 28.1 \times 11.3cos(72)$<br>$a^2 = 136.731349$<br>$a = 11.69321808$ | 11.7cm | M1 Correct substitution into cosine rule<br>M1 $a^2 = 136.731349$<br>A1 cao |
| **Q17b** | $A = \frac{1}{2} \times 8.1 \times 11.3 \sin(72)$<br>$A = 43.52510147$ | $43.5\text{cm}^2$ | M1 Correct substitution into area formula<br>A1 cao |
| **Q18** | $\overrightarrow{DE} = -\mathbf{a} - 3\mathbf{b} + 3\mathbf{a} + 4\mathbf{b}$<br>$\overrightarrow{DE} = 2\mathbf{a} + \mathbf{b}$<br>$\overrightarrow{DC} = \frac{9}{4}(2\mathbf{a} + \mathbf{b})$<br>$\overrightarrow{DC} = \frac{9}{2}\mathbf{a} + \frac{9}{4}\mathbf{b}$<br>$\overrightarrow{AC} = \mathbf{a} + 3\mathbf{b} + \frac{9}{2}\mathbf{a} + \frac{9}{4}\mathbf{b}$<br>$\overrightarrow{AC} = \frac{11}{2}\mathbf{a} + \frac{21}{4}\mathbf{b}$ | | M1 Correct expression for $DE$<br>M1 Uses ratio to get correct expression for $DE$ or $DC$<br>M1 Adds vectors using a correct pathway<br>A1 cao |

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| Question | Working | Answer | Notes |
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| **Q19a** | $-2x^2 + 12x + 11 = -2[x^2 - 6x] + 11$<br>$= -2[(x-3)^2 - 9] + 11$<br>$= -2(x-3)^2 + 29$ | $29 - 2(x-3)^2$ | M1 Factorises out $-2$<br>M1 Completes square<br>A1 cao |
| **Q19b** | | $(3, 29)$ | |
| **Q20** | $\frac{1+\sqrt{9a}}{b-\sqrt{4a}} \times \frac{b+\sqrt{4a}}{b+\sqrt{4a}}$<br>$= \frac{b+2\sqrt{a}+3b\sqrt{a}+6a}{b^2-4a}$<br>$= \frac{b+6a+(2+3b)\sqrt{a}}{b^2-4a}$ | $m = b + 6a$<br>$n = 2 + 3b$<br>$p = b^2 - 4a$ | M1 Attempts to multiply by $\frac{b+\sqrt{4a}}{b+\sqrt{4a}}$<br>M1 Correctly multiplies (may not be simplified)<br>A1 Reaches $\frac{b+2\sqrt{a}+3b\sqrt{a}+6a}{b^2-4a}$<br>M1 Groups terms<br>A1 cao |
| **Q21** | $x^2 + (2x-5)^2 = 25$<br>$x^2 + 4x^2 - 20x + 25 = 25$<br>$5x^2 - 20x = 0$<br>$5x(x-4) = 0$<br>$x = 0$ or $x = 4$<br>$y = -5$ or $y = 3$<br>$(0, -5)$ and $(4, 3)$<br><br>Length: $\sqrt{4^2+8^2} = \sqrt{80} = 4\sqrt{5}$ | $4\sqrt{5}$ | M1 Substitutes and attempts to solve<br>M1 Reaches $5x^2 - 20x = 0$<br>M1 Solves for $x$<br>M1 Finds values for $y$<br>M1 Use of Pythagoras theorem<br>A1 cao |

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