

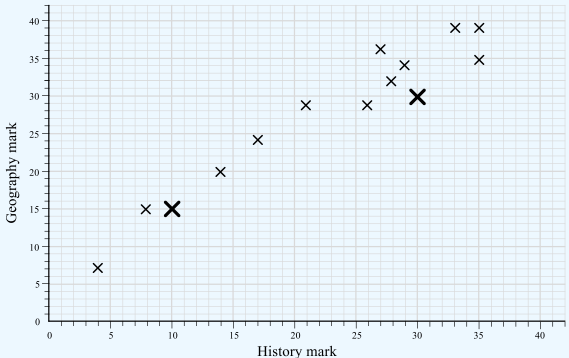


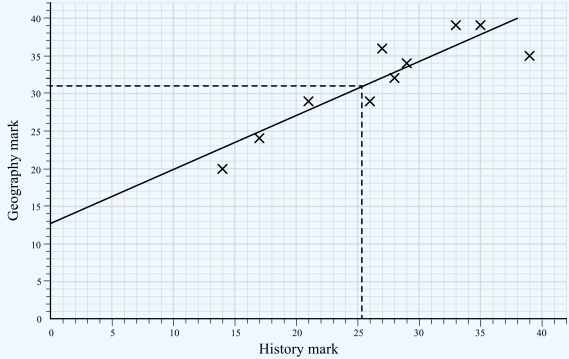
THIRD SPACE
LEARNING

Mathematics
Paper 4
(Calculator)
Higher Tier
Mark Scheme

OCR GCSE

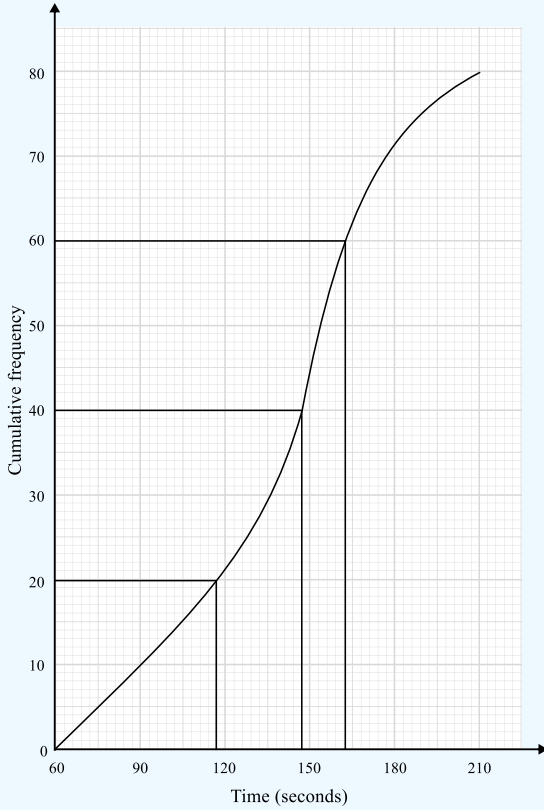
SET 5

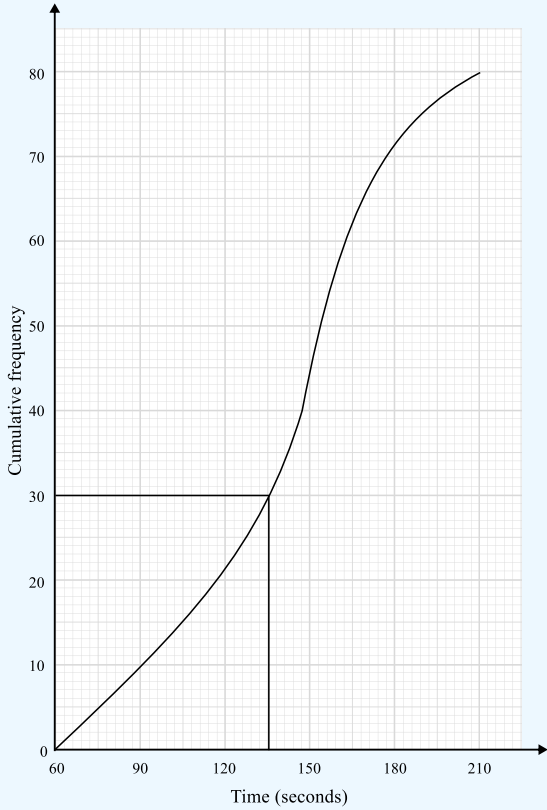
Question	Working	Answer	Notes
Q1	$18.3^3 - 16^2 = 5872.487$ $\frac{18.3^3 - 16^2}{6.32} = 929.190981$ $\frac{\sqrt[3]{18.3^3 - 16}}{6.32} = 9.758168849$	9.758	M1 $18.3^3 - 16^2 (= 5872.487)$ M1 $\frac{\sqrt[3]{18.3^3 - 16}}{6.32} (= 9.758168849)$ A1 Correct rounded answer
Q2	$\frac{1}{2}(6.9 + 8.1) \times 5.4 = 40.5$	40.5cm ²	M1 $\frac{1}{2}(6.9 + 8.1) \times 5.4$ seen or implied A1 cao
Q3	$\tan(x) = \frac{6}{11}$ $x = \tan^{-1}\left(\frac{6}{11}\right)$ $x = 28.61045967$	$x = 28.6^\circ$	M1 $\tan(x) = \frac{6}{11}$ or $x = \tan^{-1}\left(\frac{6}{11}\right)$ A1 Correct answer, rounded to 3sf
Q4a	$\frac{1}{0.4} = 2.5$	2.5	
Q4b		$5.25 \leq x < 5.35$	B1 5.25 B1 5.35
Q5a			

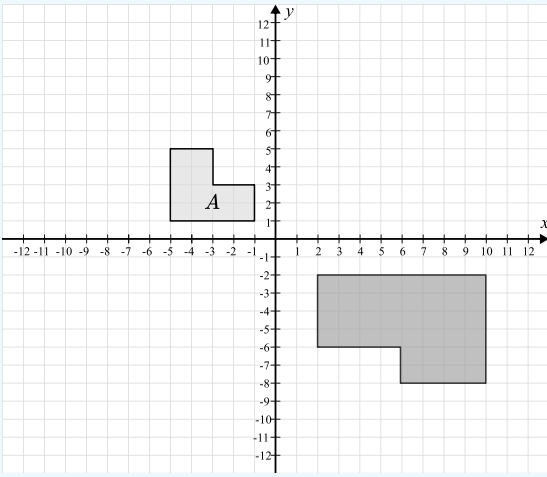
Question	Working	Answer	Notes
Q5b		Positive correlation	
Q5c		31	<p>M1 For method to read off (e.g. line of best fit or a line up from 25) A1 for an answer in the range 26 - 36</p>
Q5d		Geography seems easier as the marks are generally higher	<p>B1 'Geography seems easier' B1 'Because the marks are generally higher' oe</p>
Q6	<p>Co-interior angle = $180 - 121 = 59$ Bearing = $360 - 59 = 301^\circ$</p>	301°	<p>M1 Correct sketch with bearing labelled or correct first step A1 cao</p>

Question	Working	Answer	Notes
Q7	24, 48, 72, 96, 120 40, 80, 120 LCM = 120 minutes = 2 hours 13:18 + 2 hours = 15:18	15:18	M1 Begins method to find the LCM of 24 and 40, e.g. by writing correct product of primes for one bus ($24 = 2^3 \times 3$ or $40 = 2^3 \times 5$) or writing down at least the first 3 multiples for one bus M1 Writes both $24 = 2^3 \times 3$ and $40 = 2^3 \times 5$ or lists at least first 3 multiples for both 24 and 40 or LCM = 120k M1 LCM = 120 or 13:18 + 120n A1 cao
Q8	Try different values: $7000 \times 1.06^4 = 8837.34$ $7000 \times 1.06^5 = 9367.58$ $7000 \times 1.06^6 = 9929.63$	$n = 5$	M1 Tries at least 1 value for n A1 cao
Q9	$A \text{ to } B = \binom{4}{6}$ $B \text{ to } C = \binom{10}{15}$ $C = (16, 24)$	(16, 24)	M1 A to B 4 along and 6 up stated M1 Divides by 2 and multiplies by 5 to find BC or by 7 to find AC M1 ft Adds their BC onto B or their AC onto A A1 cao
Q10	$(10^3)^a \times (10^5)^b = 10^{3a} \times 10^{5b}$ $= 10^{3a+5b}$		M1 $(10^3)^a \times (10^5)^b$ A1 Correct working to reach $3a + 5b$

Question	Working	Answer	Notes
Q11	$13.7^2 = 187.69$ $\sqrt{188} = 13.7113092$ $\sqrt{189} = 13.74772708$ $\sqrt{190} = 13.78404875$	189	M1 Squares 13.7 A1 cao
Q12	Scale factor: $18 \div 12 = 1.5$ $1.5(2x + 10) = 5x + 9$ $3x + 15 = 5x + 9$ $15 = 2x + 9$ $6 = 2x$ $x = 3$ Perimeter = $5 \times 3 + 9 + 3 \times 3 + 4 + 18$ $= 24 + 13 + 18$ $= 55cm$	55cm	B1 Scale factor: $18 \div 12 (= 1.5)$ M1 "Their 1.5" $\times (2x + 10) = 5x + 9$ A1 $x = 3$ M1 (dep at least M1 previously awarded) Substitutes their "x" to find perimeter A1 cao
Q13a	$10 = 0.25$ $40 = 1$	40	M1 $10 = \frac{1}{4}$ of cards A1 cao
Q13b	Diamond: $\frac{13}{40} = 0.325$ Spade: $1 - 0.325 - 0.275 - 0.25 = 0.15$	0.325, 0.15	M1 Diamond = 0.325 oe A1 ft their "0.325"
Q13c	$\frac{13}{25} = 0.25$	Yes, because in a full pack of cards the probability would be 0.25 and $0.275 > 0.25$	M1 0.25 oe seen A1 Correct comparison and conclusion

Question	Working	Answer	Notes
<p>Q14a</p>		<p>147 seconds</p>	
<p>Q14b</p>	<p>Lower Quartile = 117 Upper Quartile = 164 Interquartile range = 164 – 117</p>	<p>$164 - 117 = 47$</p>	<p>M1 Lower quartile between 114 and 120 Upper quartile between 161 and 167 or ft their graph A1 Answer in the range 41 to 53 or ft their graph</p>

Question	Working	Answer	Notes
<p>Q14c</p>	 <p>$\frac{30}{80} \times 100 = 37.5\%$</p>	<p>37.5%</p>	<p>M1 Read 30 from graph M1 $\frac{30}{80}$ seen or implied A1 cao</p>
<p>Q15</p>	<p>$L_2: y = -\frac{1}{3}x + \frac{1}{3}$ $m_1 \times m_2 : 3 \times -\frac{1}{3} = -1$</p>	<p>Their gradients multiply to make -1, therefore perpendicular</p>	<p>M1 Gradient $L_1 = -\frac{1}{3}$ A1 Correct conclusion</p>
<p>Q16</p>	<p>$360 \div 1.16 = \text{£}310.34(\dots)$ $385 \div 1.37 = \text{£}281.02(\dots)$</p>	<p>London</p>	<p>M1 Converts € to £ or Convert \$ to £ A1 Correct conclusion from correct working</p>

Question	Working	Answer	Notes
<p>Q17</p>	$BC = ED$ $AC = DF$ $\text{Angle } ABC = \text{angle } EDF$	<p>Congruent by <i>SAS</i></p>	<p>B1 Correctly compares one of the sides B1 Correctly compare angle B1 Correct conclusion</p>
<p>Q18</p>			<p>M1 Enlargement scale factor 2 A1 cao</p>
<p>Q19a</p>	$3\{2x + 5[4x - 7(x - 2)] - 6\}$ $= 3\{2x + 5[4x - 7x + 14] - 6\}$ $= 3\{2x - 15x + 70 - 6\}$ $= 3\{-13x + 64\}$ $= -39x - 192$	<p>$-39x - 192$</p>	<p>M1 ft Correctly expands any one set of brackets A1 cao</p>
<p>Q19b</p>	$(x + 4)(x + 2)(x - 1)$ $= (x^2 + 6x + 8)(x - 1)$ $= x^3 + 6x^2 + 8x - x^2 - 6x - 8$ $= x^3 + 5x^2 + 2x - 8$	<p>$x^3 + 5x^2 + 2x - 8$</p>	<p>M1 Correctly expands any 2 brackets M1 Attempts to expand third bracket A1 cao</p>

Question	Working	Answer	Notes
Q19c	$5x^2 + 2x - 3 = 5x^2 + 5x - 3x - 3$ $= 5x(x + 1) - 3(x + 1)$ $= (5x - 3)(x + 1)$	$(5x - 3)(x + 1)$	M1 $(5x + a)(x + b)$ or $(ax - 3)(bx + 1)$ A1 cao
Q20	$\pi \times (1.12r)^2 = 1.2544\pi r^2$ % increase is 25.44%	25.44%	M1 $\pi \times (1.12r)^2$ M1 $1.2544\pi r^2$ A1 cao
Q21a	$2^3 - 2 \times 2^2 - 1 = -1$ $3^3 - 2 \times 3^2 - 1 = 8$	Change of sign shows root	M1 Substitutes 2 and 3 into $x^3 - 2x^2 - 1$ A1 Correct conclusion
Q21b	$x^3 - 2x^2 - 1 = 0$ $x^3 = 2x^2 + 1$ $x = \sqrt[3]{2x^2 + 1}$		B1 Fully correct with at least 2 steps
Q21c	$x_1 = \sqrt[3]{2 \times 2.5^2 + 1} = 2.3811$ $x_2 = 2.3108$ $x_3 = 2.2689$ $x_4 = 2.2437$		M1 Attempts to substitute 2.5 into $x_{n+1} = \sqrt[3]{2x_n^2 + 1}$ A1 $x_1 = \sqrt[3]{2 \times 2.5^2 + 1} = 2.3811(\dots)$ A1 All values correct to 4 decimal places
Q22a	$a^2 = 8.1^2 + 11.3^2 - 28.1 \times 11.3 \cos(72)$ $a^2 = 136.731349$ $a = 11.69321808$	11.7cm	M1 Correct substitution into cosine rule M1 $a^2 = 136.731349$ A1 cao

Question	Working	Answer	Notes
Q22b	$A = \frac{1}{2} \times 8.1 \times 11.3 \sin(72)$ $A = 43.52510147$	43.5cm ²	M1 Correct substitution into area formula A1 cao
Q23	$\vec{DE} = -\mathbf{a} - 3\mathbf{b} + 3\mathbf{a} + 4\mathbf{b}$ $\vec{DE} = 2\mathbf{a} + \mathbf{b}$ $\vec{DC} = \frac{9}{4} (2\mathbf{a} + \mathbf{b})$ $\vec{DC} = \frac{9}{2} \mathbf{a} + \frac{9}{4} \mathbf{b}$ $\vec{AC} = \mathbf{a} + 3\mathbf{b} + \frac{9}{2} \mathbf{a} + \frac{9}{4} \mathbf{b}$ $\vec{AC} = \frac{11}{2} \mathbf{a} + \frac{21}{4} \mathbf{b}$		M1 Correct expression for DE M1 Uses ratio to get correct expression for DE or DC M1 Adds vectors using a correct pathway A1 cao
Q24a	$-2x^2 + 12x + 11 = -2[x^2 - 6x] + 11$ $= -2[(x - 3)^2 - 9] + 11$ $= -2(x - 3)^2 + 29$	$29 - 2(x - 3)^2$	M1 Factorises out -2 M1 Completes square A1 cao
Q24b		(3, 29)	


Question	Working	Answer	Notes
Q25	$\frac{1 + \sqrt{9a}}{b - \sqrt{4a}} \times \frac{b + \sqrt{4a}}{b + \sqrt{4a}}$ $= \frac{b + 2\sqrt{a} + 3b\sqrt{a} + 6a}{b^2 - 4a}$ $= \frac{b + 6a + (2 + 3b)\sqrt{a}}{b^2 - 4a}$	$m = b + 6a$ $n = 2 + 3b$ $p = b^2 - 4a$	M1 Attempts to multiply by $\frac{b + \sqrt{4a}}{b + \sqrt{4a}}$ M1 Correctly multiplies (may not be simplified) A1 Reaches $\frac{b + 2\sqrt{a} + 3b\sqrt{a} + 6a}{b^2 - 4a}$ M1 Groups terms A1 cao
Q26	$x^2 + (2x - 5)^2 = 25$ $x^2 + 4x^2 - 20x + 25 = 25$ $5x^2 - 20x = 0$ $5x(x - 4) = 0$ $x = 0 \text{ or } x = 4$ $y = -5 \text{ or } y = 3$ $(0, -5) \text{ and } (4, 3)$ $\text{Length: } \sqrt{4^2 + 8^2} = \sqrt{80} = 4\sqrt{5}$	$4\sqrt{5}$	M1 Substitutes and attempts to solve M1 Reaches $5x^2 - 20x = 0$ M1 Solves for x M1 Finds values for y M1 Use of Pythagoras theorem A1 cao

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