UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the November 2005 question paper

0580/0581 MATHEMATICS

0580/04, 0581/04 Paper 4 (Extended), maximum raw mark 130

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the Report on the Examination for this session.

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TYPES OF MARK

Most of the marks (those without prefixes, and 'B' marks) are given for accurate results, drawings or statements.

- **M** marks are given for a correct method.
- **B** marks are given for a correct statement or step.
- **A** marks are given for an accurate answer following a correct method.

ABBREVIATIONS

a.r.t.	Anything rounding to
b.o.d.	Benefit of the doubt has been given to the candidate
c.a.o.	Correct answer **only** (i.e. no 'follow through')
e.e.o.	Each error or omission
f.t	Follow through
i.s.w.	Ignore subsequent working
o.e.	Or equivalent
SC	Special case
s.o.i.	Seen or implied
ww	Without working
www	Without wrong working
√	Work followed through after an error: no further error made

1	**(a)**	1216	**B1**	
	(b)	1.47	**B1**	
	(c)	$\frac{11.5-9.75}{11.5}\times 100$	**M1**	
		15.2	**A1**	ww2 SC1 for 17.9
	(d)	$4347\div 7$ o.e.	**M1**	
		621	**A1**	ww2
	(e)	$4347\div 0.9$ o.e.	**M1**	
		4830	**A1**	ww2
	(f)(i)	$\frac{2350}{3.25}$ o.e.	**M1**	Must deal with the minutes correctly
		723 to 723.1	**A1**	ww2
	(ii)	200.9 to 201	**A1ft**	their **(i)** ÷ 3.6 r.o.t. to 3sf or better
				[11]
2	**(a)**	Correct Scales	**S1**	Accuracy 2 mm throughout question. From –8 to 8 for *x* and *y* possible.
	(b)	Correct triangle ABC	**T1**	
	(c)(i)	Correct translation with vertices at (5, –7), (8, –7), (8, –5)	**TR2ft**	SC1ft for any translation
	(ii)	Correct reflection with vertices at (–4, 2), (–7, 2), (–7, 4)	**FR2ft**	SC1ft for two points correct or reflection in $x = 1$ or $y = -1$
	(iii)	Correct rotation with vertices at (–2, –2), (–5, –2), (–5, –4)	**RN2ft**	SC1ft for 2 points correct
	(d)(i)	Correct image drawn with vertices at (3, 2), (7.5, 2), (7.5, 4)	**B3**	B2 for 3 correct points shown in working. B1 for 2 correct vertices s.o.i.
	(ii)	$\frac{1}{15}\begin{pmatrix}1 & 0\\ 0 & 1.5\end{pmatrix}$ o.e.	**B2**	SC1 for $\frac{1}{1.5}$ or $\begin{pmatrix}1 & 0\\ 0 & 1.5\end{pmatrix}$
	(iii)	Stretch	**B1**	
		y-axis invariant o.e.	**B1**	
		factor $2/3$	**B1**	
				[16]

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3	**(a)(i)**	60	**B1**	
	(ii)	$(RS^2) = 7^2 + 15^2 - 2 \times 7 \times 15 \cos 60$	**M2**	M1 – if one error in formula
		13	**A2**	A1 for $(RS^2) = 169$ www4
	(b)(i)	145	**B1**	
	(ii)	$\frac{\sin Q}{15} = \frac{\sin 55}{14}$ o.e.	**M1**	
		$\sin Q = \frac{15 \sin 55}{14}$	**M1**	Implies previous method
		61.4	**A1**	www3
	(iii)	(R =) 63.6	**B1**	
		$(PQ) = \frac{14 \sin '63.6'}{\sin 55}$	**M1**	their sin(180 – 55 – b**(ii)**). Could be explicit equivalent cosine rule
		15.3	**A1**	www3
	(c)	$\frac{1}{2}7.15 \sin '60' + \frac{1}{2}.15.'15.3'.\sin 55$	**M2**	M1 for one correct triangle area in working (45.466 + 93.998)
		139 or 140 www	**A2**	A1 for 139.4 to 139.5 www4
				[16]
4	**(a)(i)**	12	**B1**	
	(ii)	3	**B1**	
	(iii)	21	**B1**	
	(iv)	2	**B1**	
	(v)	$^{14}/_{24}$ o.e	**B1**	Accept probabilities as fractions/decimals/%
	(vi)	$^{12}/_{19}$ o.e.	**B1**	
	(b)(i)	$^{12}/_{22} \times {}^{11}/_{21}$	**M1**	
		$^{132}/_{462}$ o.e. (0.286)	**A1**	2/7 in simplest form www2
	(ii)	$^{10}/_{22} \times {}^{12}/_{21}$	**M1**	
		their $^{10}/_{22} \times {}^{12}/_{21} \times 2$ o.e.	**M1**	
		$^{240}/_{462}$ o.e.(0.519)	**A1**	40/77 in simplest form www3
				[11]

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5	**(a)**	0.9 or better	**B1**	(0.8888..)
		–10.1 or better	**B1**	–10.1111..)
	(b)(i)	Correct scales	**S1**	–3 to 3 for *x*, and –11 to 2 for *y* possible
	(ii)	12 points correctly plotted	**P3ft**	P2ft for 10 or 11 correct (acc. is 1 mm)
				P1ft for 8 or 9 correct
		both branches with correct shape	**C1ft**	Acc. $\frac{1}{2}$ small square, correct shape, not ruled
		Graph does not cross the *y*-axis	**B1**	
	(c)	Any integer $\geqslant 1$	**B1**	
	(d)	Correct ruled line from –3 to +3	**B2**	SC1 for line with gradient of 2 or passing through (0, –5) but not $y = -5$.
	(e)(i)	–0.45 to –0.3	**B1**	
		0.4 to 0.49	**B1**	
		2.9 to 2.99	**B1**	
	(ii)	$x^2 - 1 = 2x^3 - 5x^2$	**M1**	i.e. correct multiplication to remove fraction
		$2x^3 - 6x^2 + 1 = 0$	**A1**	www2
	(f) (i)	Tangent drawn with gradient ≈ 2	**B1**	Parallel by eye to $y = 2x - 5$
	(ii)	Linear eqn. in *x* and *y* with gradient 2	**B1**	
		c = their intercept	**B1**	within 1 mm, dep on linear eqn in *x* and *y*
				[19]
6	**(a)**	2	**B1**	
	(b)	$\frac{1}{3} \times 6 \times 5 \times 3$ o.e.	**M1**	
		30	**A1**	
	(c)	Isos. triangle or invtan $\left(\frac{3}{3}\right)$ o.e.	**M1**	
		45	**A1**	www2
	(d)	$(BD) = \sqrt{6^2 + 5^2}$ o.e.	**M1**	
		$BF = \frac{1}{2}BD$	**M1**	Dep. (BF = 3.905….)
		angle = invtan $\frac{3}{\text{their } BF}$	**M1**	Dep on previous method
		37.5 to 37.54	**A1**	www4
	(e)	$(l^2) = 3^2 + (\textit{their } FB)^2$ o.e.	**M1**	Not for FB = 3
		4.92 to 4.93	**A1**	ww2
				[11]

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7	(a)(i)	$\frac{1}{2}(2.5+1.1)\times 35$ o.e.	M1	
		63	A1	
	(ii)	their **(a)** x 24	M1	
		1512	A1ft	
	(iii)	1512000	B1ft	their **(a)(ii)** x 1000
	(b)(i)	35.03 x 24 x 2.25	M1	
		1891.62…	A1	www2
	(ii)	1900	B1ft	their **b(i)** rounded to nearest 100
	(c)(i)	$\pi \times 12.5^2 \times 14$	M1	
		6870 or better	A1	(6872.2339 or 6873.125 (π = 3.142))
	(ii)	[their **(a)(ii)** ÷ their **(c)(i)**]	M1	
		x 1 000 000	A1	o.e. e.g. using litres
		÷(60 x 60 x 24)	M1	Implied by 2.54
		2 days 13 hours	A1	www4
				[14]
8	(a)(i)	$40/x$	B1	
	(ii)	$\frac{40}{x+2}=\frac{40}{x}-1$ o.e.	M2	SC1 for $\frac{40}{x+2}$ seen
		$40x = 40(x + 2) – x(x + 2)$ o.e.	M1	Correctly removes the fraction
		$40x = 40x + 80 – x^2 – 2x$		
		$x^2 + 2x – 80 = 0$	E1	Correct conclusion – no errors
	(iii)	–10	B1	
		8	B1	
	(iv)	8	B1ft	their positive x dep on one of each sign
	(b)(i)	$m = n + 2.55$ o.e.	B1	
		$2m = 5n$ o.e.	B1	
	(ii)	$2(n + 2.55) = 5n$	M1	f.t. their linear equations in n and m any correct method to an equation in one variable
		$m = 4.25$	A1	
		$n = 1.7$	A1	
				[13]

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9	**(a)**	$160 < h \leqslant 170$	**B1**	
	(b)(i)	Mid values 125, 135, 145, 155, 165, 175, 185, 195	**M1**	Allow 1 slip
		(15 x 125 + 24 x 135 + 36 x 145 + 45 x 155 + 50 x 165 + 43 x 175 + 37 x 185 + 20 x 195)	**M1**	Dep on mid values $\pm$ 0.5, allow 1 slip in mid-values (43830)
		$\div 270$	**M1**	Dep on previous method
		162 or better	**A1**	(162.333..) www4
	(ii)	Mid-values are an estimate of each interval o.e.	**B1**	e.g. exact values not given
	(c)	$p = 15$, $q = 39$, $r = 75$	**B2**	B1 for 2 correct. If no labels, take in order given
	(d)	Correct scales	**S1**	
		9 points correctly plotted ft	**P3ft**	P2ft for 7 or 8 correct acc. 1 mm P1ft for 5 or 6 correct
		Curve or line through 9 points	**C1ft**	Dep on 'S' shape within $\frac{1}{2}$ small square of points
	(e)(i)	162 to 164	**B1**	
	(ii)	176 to 178	**B1**	
	(iii)	28 to 30	**B1**	
	(iv)	167.5 to 168.5	**B1**	
	(f)	Uses 240 or 241 on cumul, freq. axis	**M1**	e.g. annotates graph or shows values in working
		186.5 to 188	**A1**	ww2
				[19]

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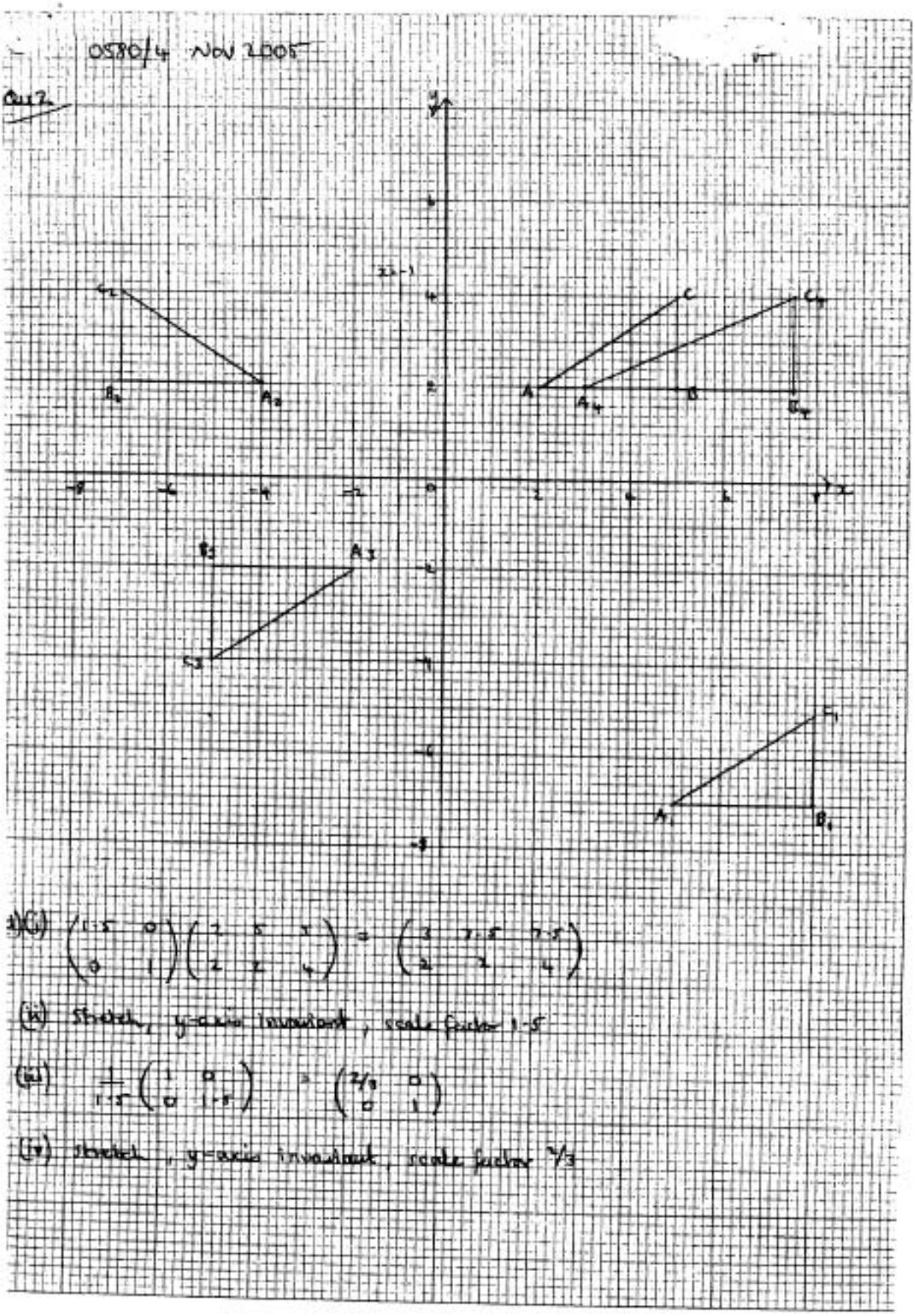

(i) $\begin{pmatrix} 1.5 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 2 & 6 & 4 \\ 2 & 2 & 4 \end{pmatrix} = \begin{pmatrix} 3 & 9 & 6 \\ 2 & 2 & 4 \end{pmatrix}$

(ii) Stretch, y-axis invariant, scale factor 1.5

(iii) $\frac{1}{1.5}\begin{pmatrix} 1 & 0 \\ 0 & 1.5 \end{pmatrix} = \begin{pmatrix} 2/3 & 0 \\ 0 & 1 \end{pmatrix}$

(iv) Stretch, y-axis invariant, scale factor $\frac{2}{3}$

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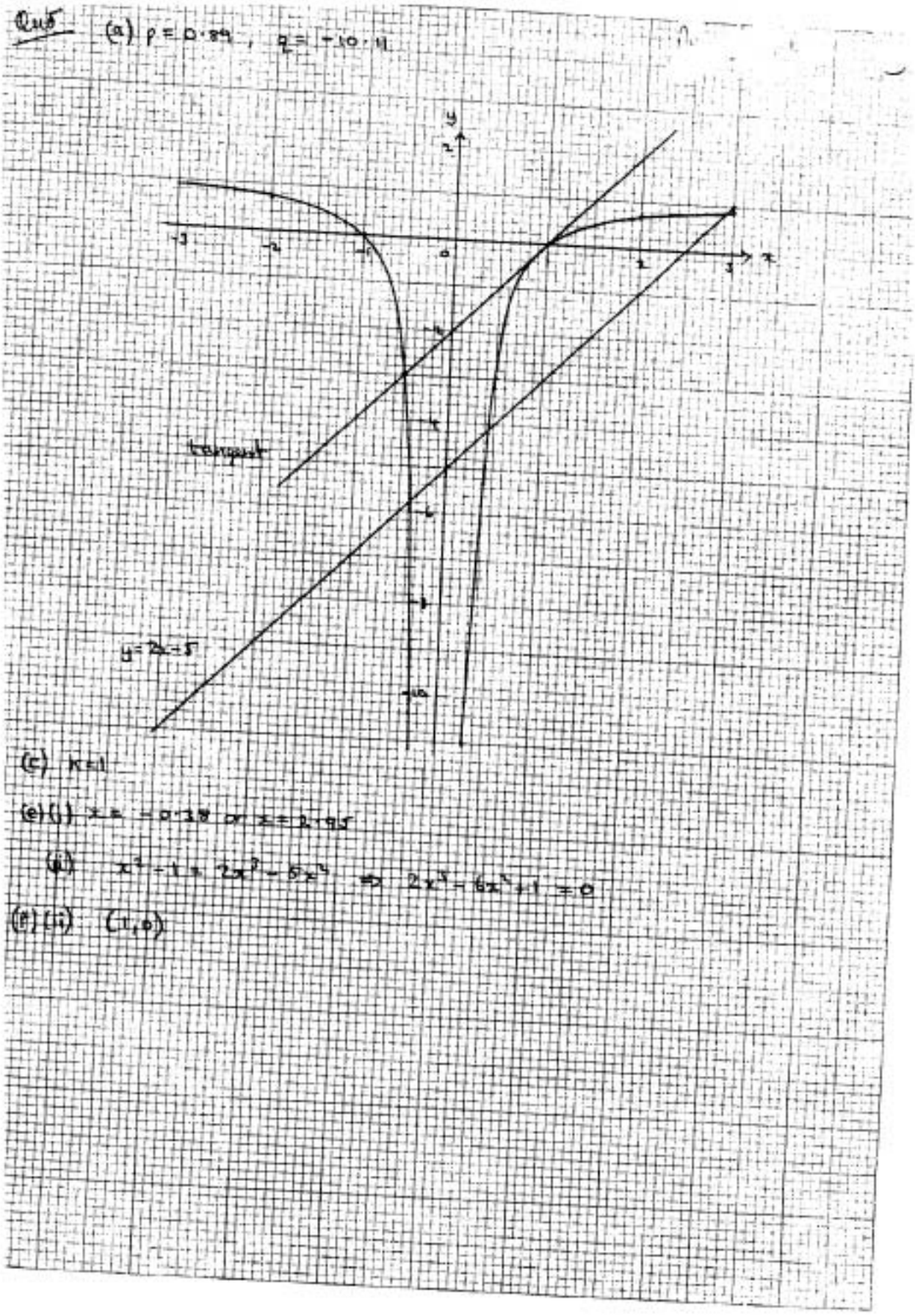

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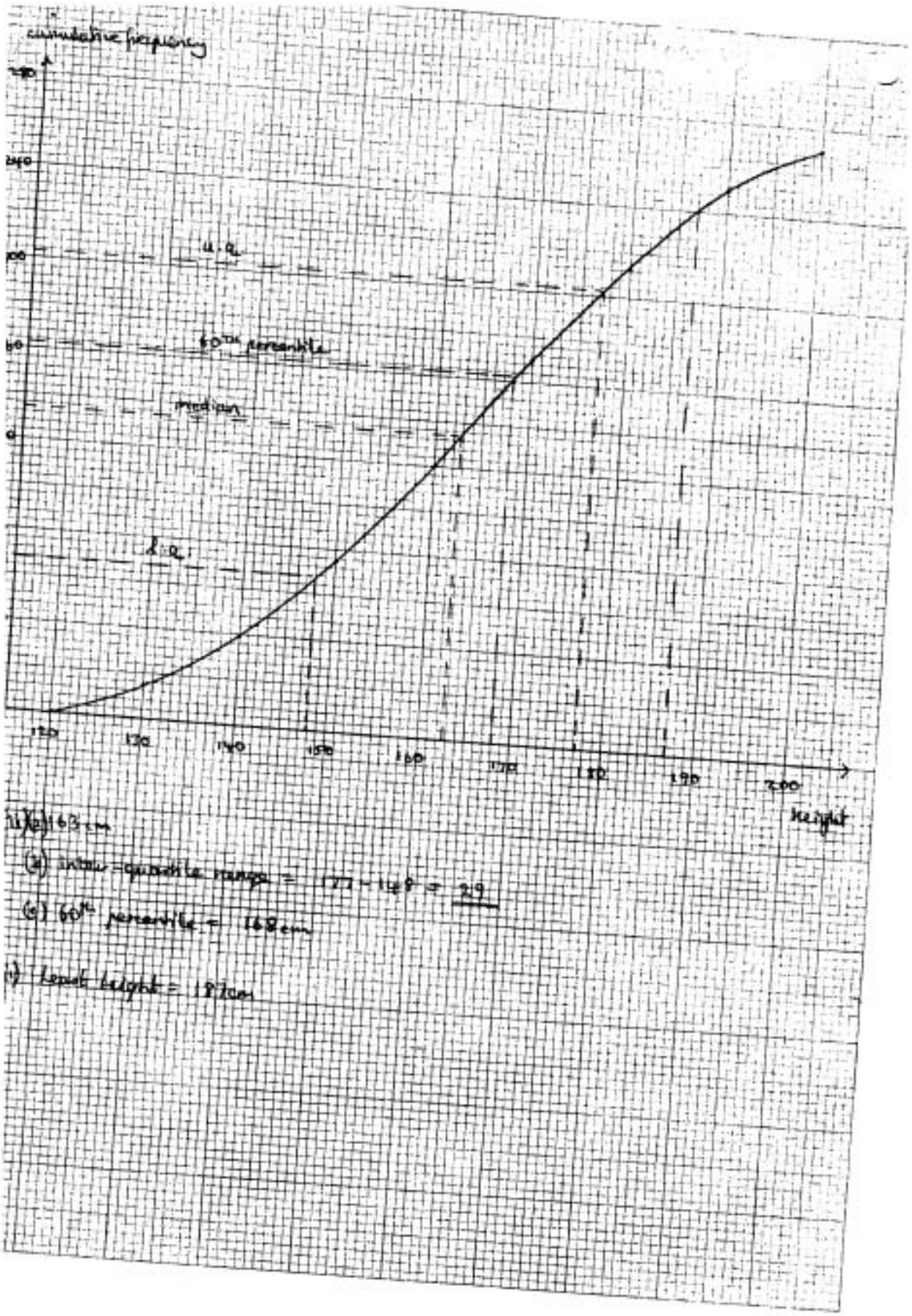

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