

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



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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 ÷ 7 o.e.	M1	
	621	A1	ww2
(e)	4347 ÷ 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 $\frac{2}{3}$	B1	
			[16]

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

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

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

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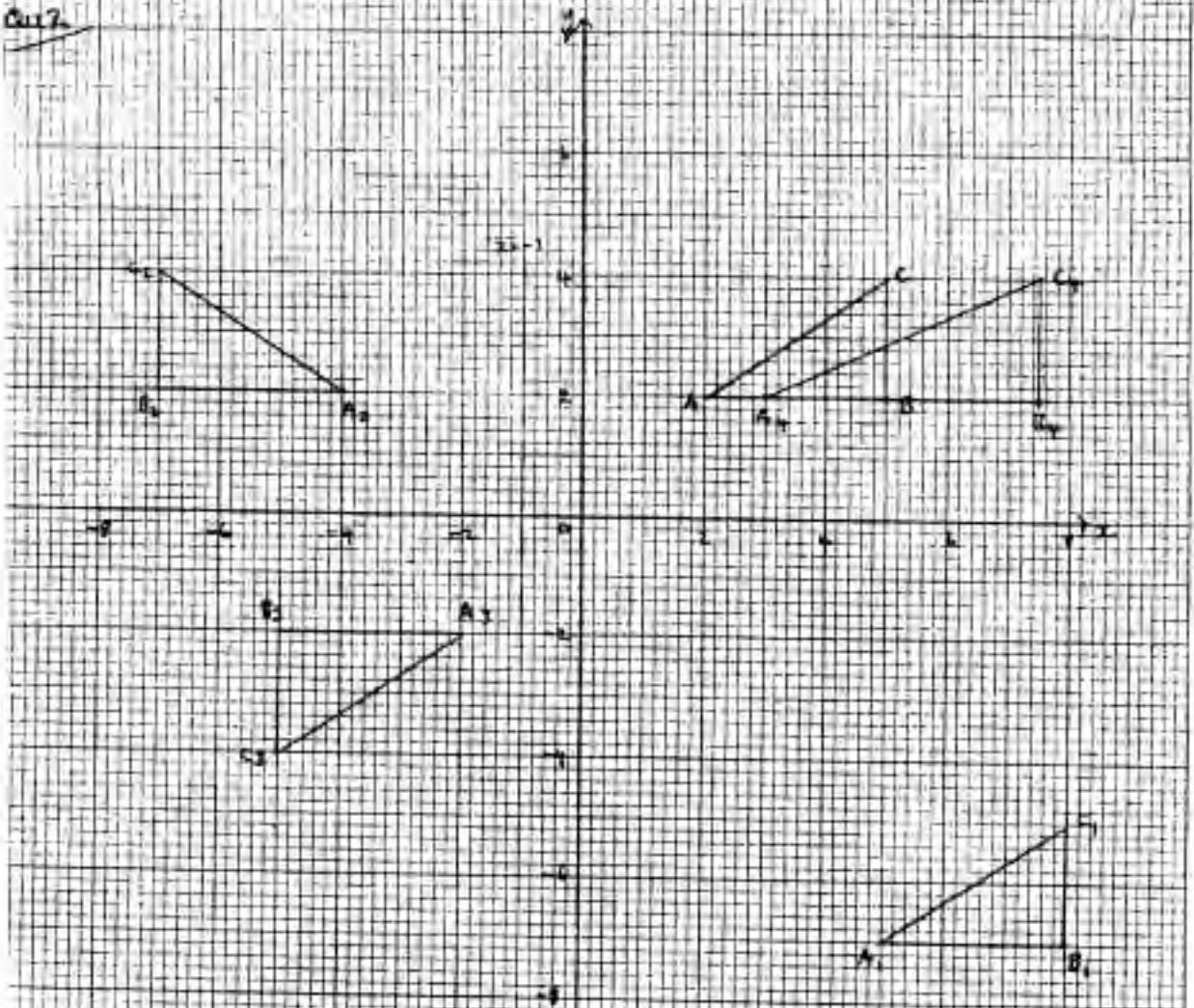
9 (a)	$160 < h \leq 170$	B1	
(b)(i)	Mid values 125, 135, 145, 155, 165, 175, 185, 195 $(15 \times 125 + 24 \times 135 + 36 \times 145 + 45 \times 155 + 50 \times 165 + 43 \times 175 + 37 \times 185 + 20 \times 195)$ $\div 270$ 162 or better	M1	Allow 1 slip
		M1	Dep on mid values ± 0.5 , allow 1 slip in mid-values (43830)
		M1	Dep on previous method
		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 9 points correctly plotted ft Curve or line through 9 points	S1	
		P3ft	P2ft for 7 or 8 correct acc. 1 mm P1ft for 5 or 6 correct
		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 186.5 to 188	M1	e.g. annotates graph or shows values in working
		A1	ww2

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Q17



(i) $\begin{pmatrix} 1.5 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 \\ 2 & 2 & 4 \end{pmatrix} = \begin{pmatrix} 1.5 & 3 & 4.5 \\ 2 & 2 & 4 \end{pmatrix}$

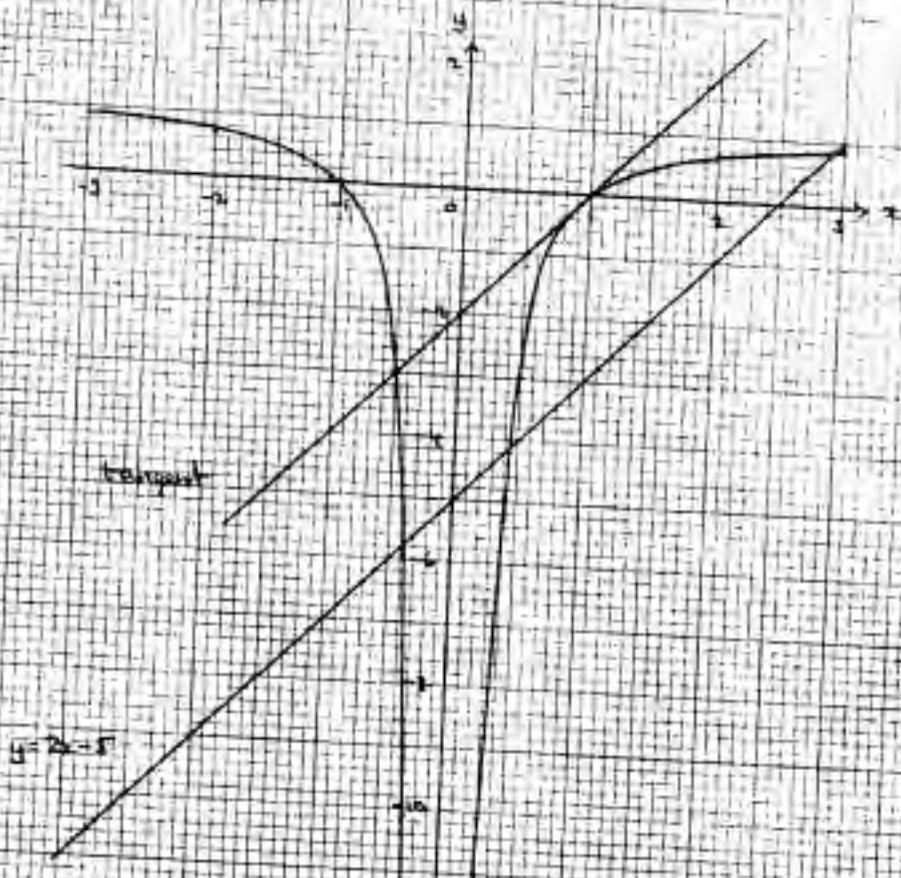
(ii) stretch, y-axis invariant, scale factor 1.5

(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 2/3

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Q15 (a) $p = 0.89$, $q = -10.11$



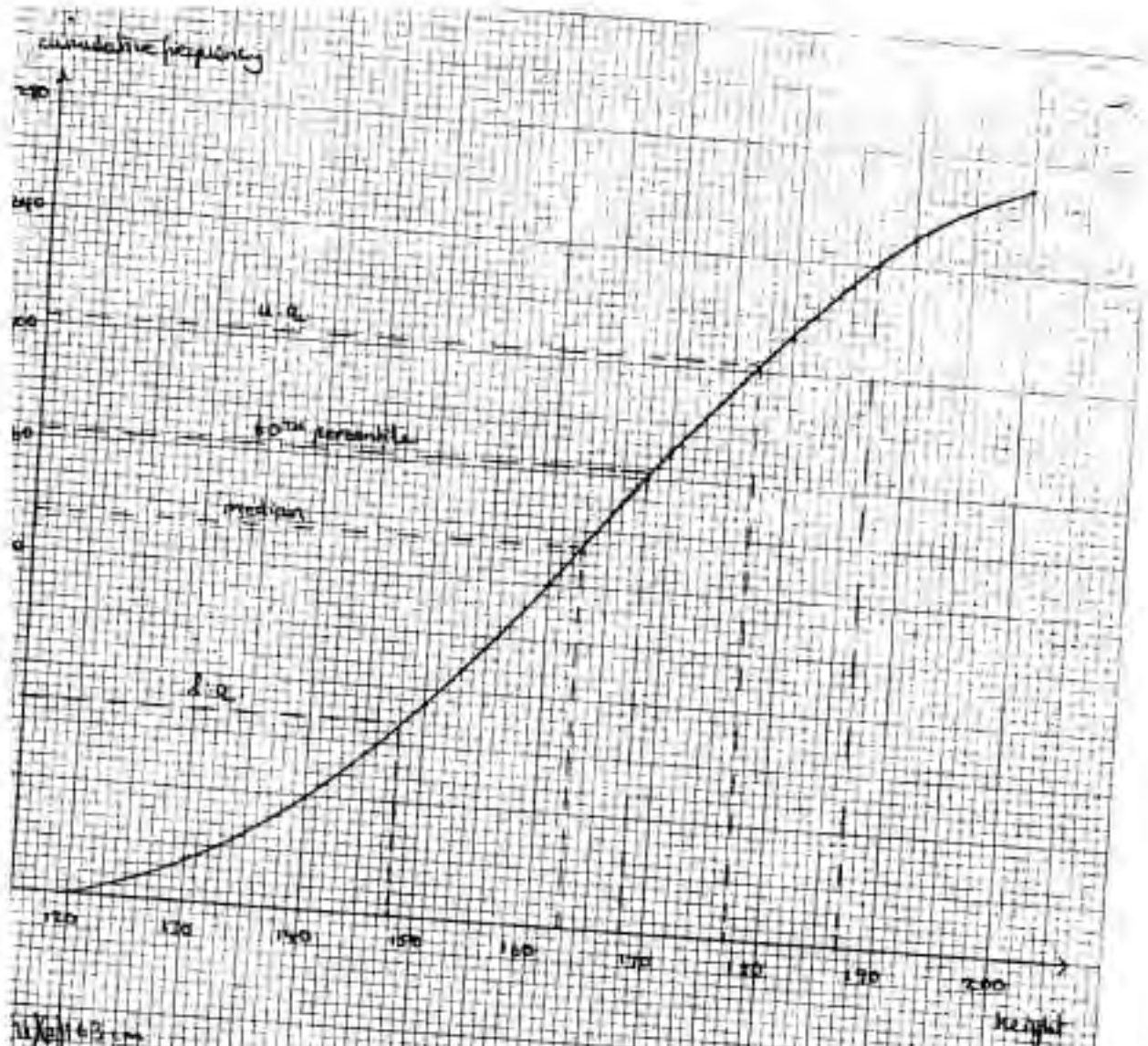
(c) $k=1$

(e)(i) $x = -0.38$ or $x = 2.95$

(ii) $x^2 - 1 + 2x^2 - 5x^3 \Rightarrow 2x^3 - 6x^2 + 1 = 0$

(f)(i) $(1, 0)$

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1) 163 cm

(2) inter-quartile range = $177 - 148 = 29$

(3) 60th percentile = 162 cm

1) Least height = 127 cm