Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Cumulative frequency

Time allowed: 1 hour 40 minutes

Subject code **0580**

Mathematics

Questions from Paper 2 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
You may use a calculator.

Total marks

/ 82

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 82 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

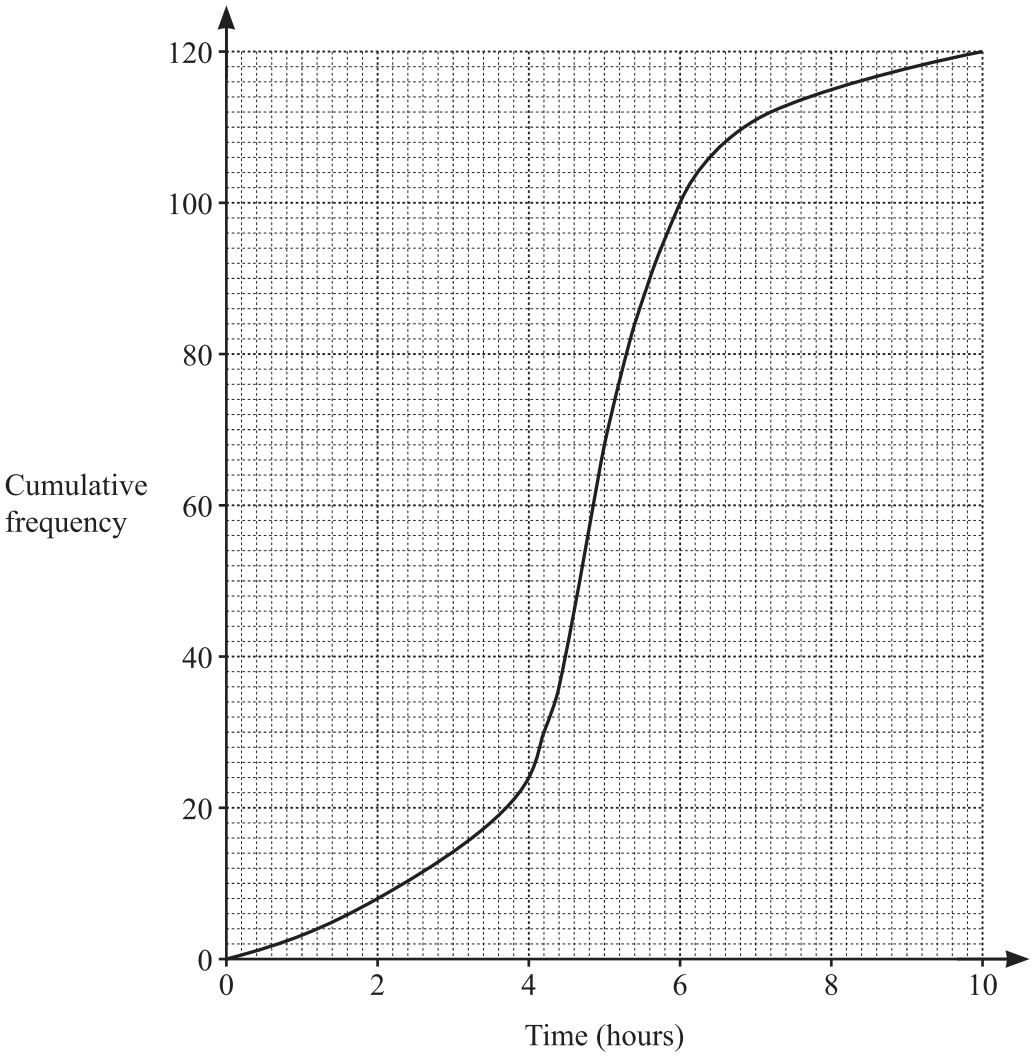
Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 The time spent on the internet by each of 120 adults is recorded for one day.
The cumulative frequency diagram shows this information.



(a) Use the cumulative frequency diagram to find an estimate of the interquartile range.

..... h [2]

(b) 70% of the adults spent less than k hours on the internet.

Use the cumulative frequency diagram to find an estimate of the value of k.

$k =$ ..... [2]

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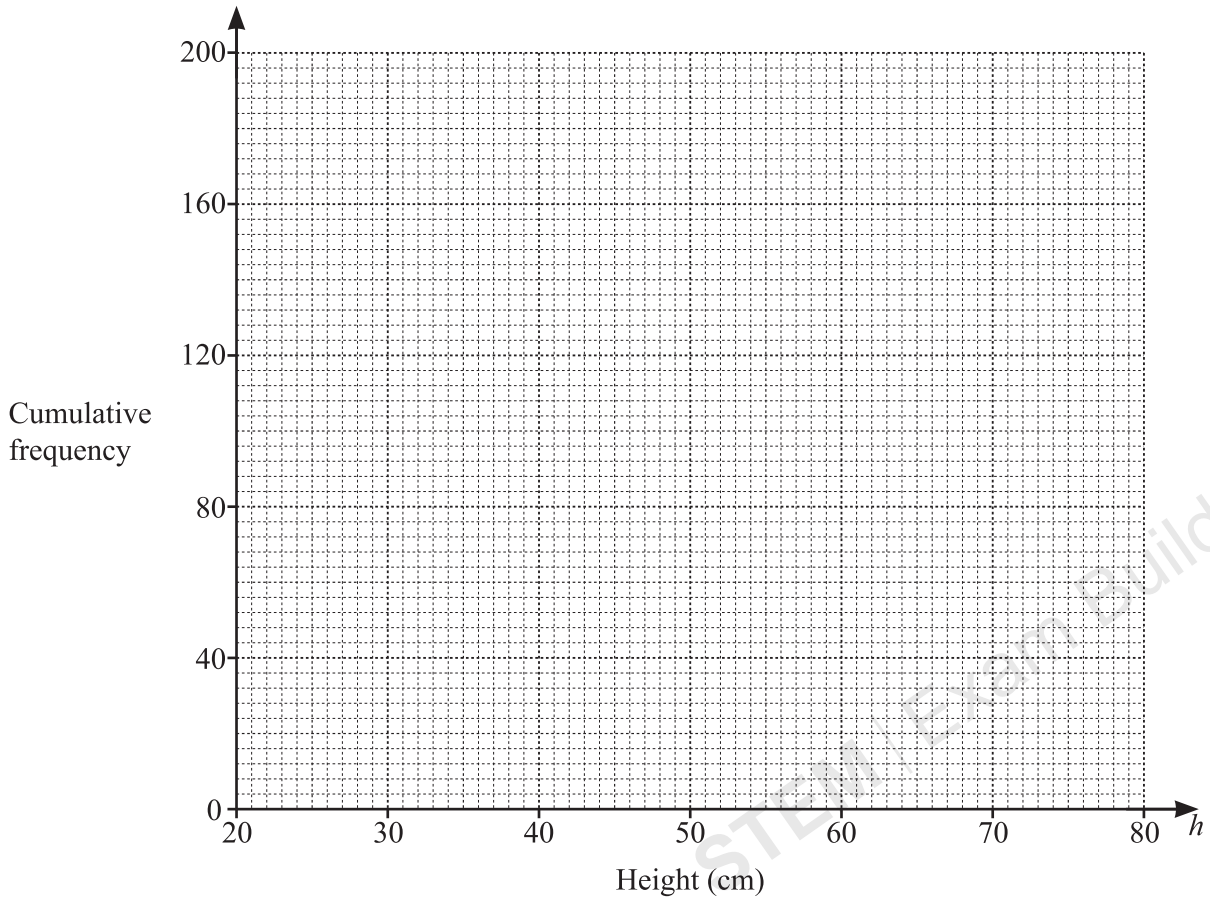
(a) Range and interquartile range (b) Cumulative frequency Click for more variations

1(a)	1.4	**2**	**B1** for [UQ =] 5.6 or for [LQ =] 4.2 or **SC1** for 0.7
1(b)	5.4	**2**	**B1** for 84 seen

2 The table shows some information about the heights of 200 plants.

Height (h cm)	Cumulative frequency
$h \leqslant 30$	6
$h \leqslant 40$	42
$h \leqslant 50$	76
$h \leqslant 60$	170
$h \leqslant 70$	190
$h \leqslant 80$	200

(a) Draw a cumulative frequency diagram to show this information.



[3]

(b) Find an estimate of the 75th percentile.

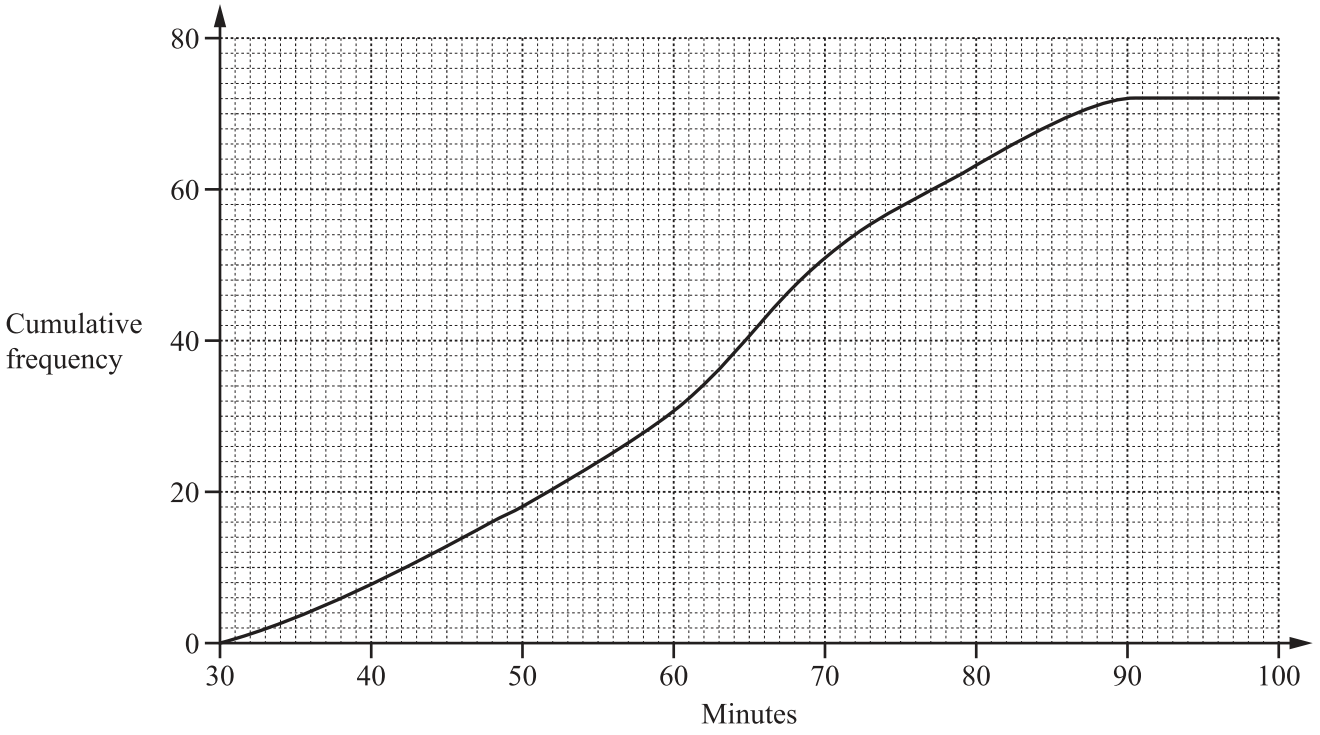
.....cm [1]

(a) Cumulative frequency (b) Cumulative frequency Click for more variations

2(a)	A correct cumulative frequency curve through [(20, 0)], (30, 6) (40, 42), (50, 76), (60, 170), (70, 190) and (80, 200)	**3**	**B1** for correct horizontal placement for 6 plots **B1** for correct vertical placement for 6 plots **B1FT** dep on at least B1 for reasonable increasing curve or polygon through *their* 6 points If 0 scored, **SC1FT** for 5 out of 6 points correctly plotted
2(b)	Reading at 150 FT *their* increasing curve	**1**	

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3 72 students are given homework one evening.
They are told to spend no more than 100 minutes completing their homework.
The cumulative frequency diagram shows the number of minutes they spend.



(a) How many students spent more than 48 minutes completing their homework?

Answer(a) ..... [2]

(b) Find

(i) the median,

Answer(b)(i) ..... [1]

(ii) the inter-quartile range.

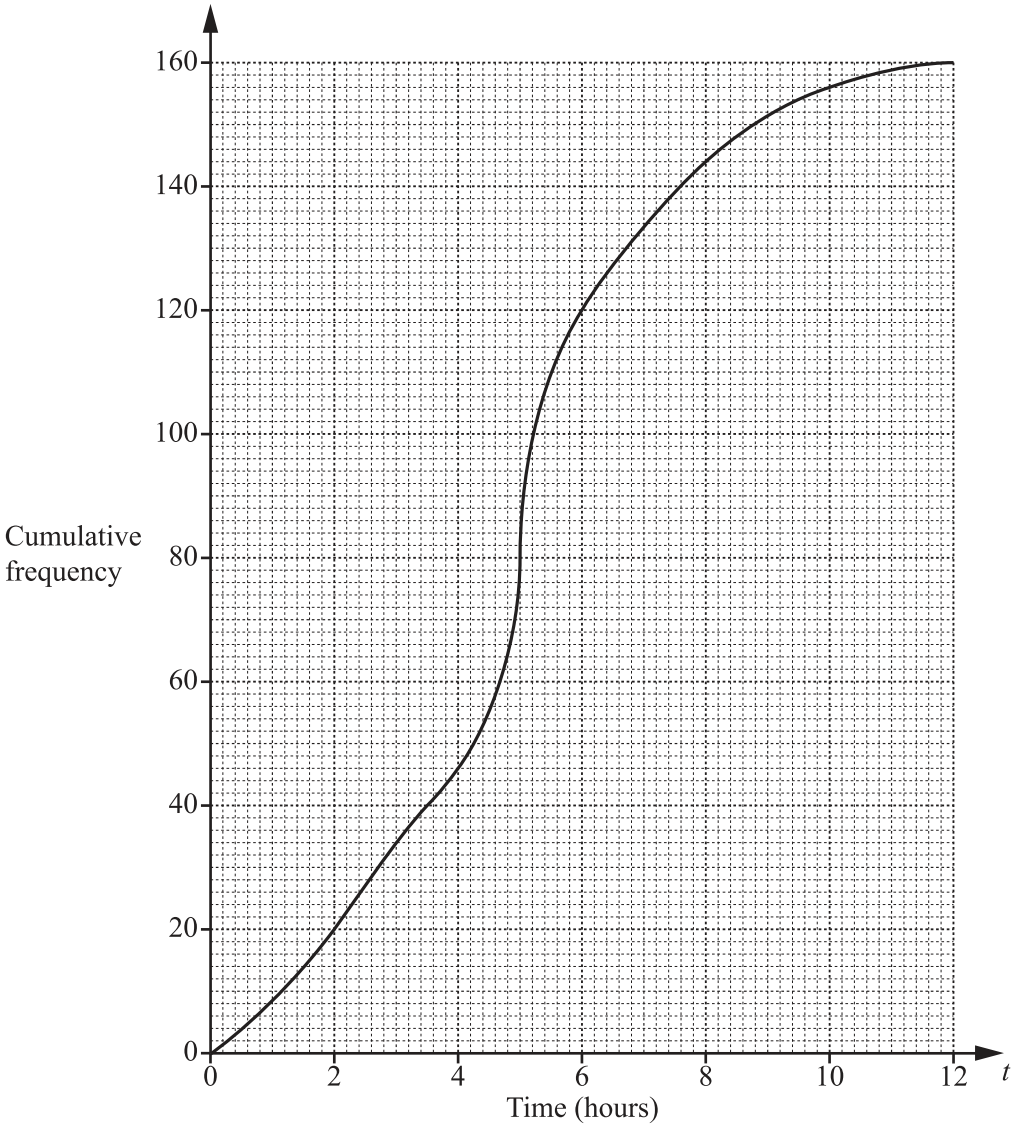
Answer(b)(ii) ..... [2]

(a) Cumulative frequency (b)(i) Cumulative frequency (b)(ii) Range and interquartile range Click for more variations

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3	**(a)**	56	**2**	**B1** for 16 soi or **M1** for 72 – *their* 16
	(b) **(i)**	63 or 63 to 63.5	**1**	
	(ii)	22 or 21.6 to 23 nfww	**2**	**B1** for 49.8 to 50.2 seen or 71.8 to 72.8

4 160 students record the amount of time, t hours, they each spend playing computer games in a week. This information is shown in the cumulative frequency diagram.



(a) Use the diagram to find an estimate of

(i) the median,

..... hours [1]

(ii) the interquartile range.

..... hours [2]

(b) Use the diagram to complete this frequency table.

Time (t hours)	$0 < t \leqslant 2$	$2 < t \leqslant 4$	$4 < t \leqslant 6$	$6 < t \leqslant 8$	$8 < t \leqslant 10$	$10 < t \leqslant 12$
Frequency	20			24	12	4

[2]

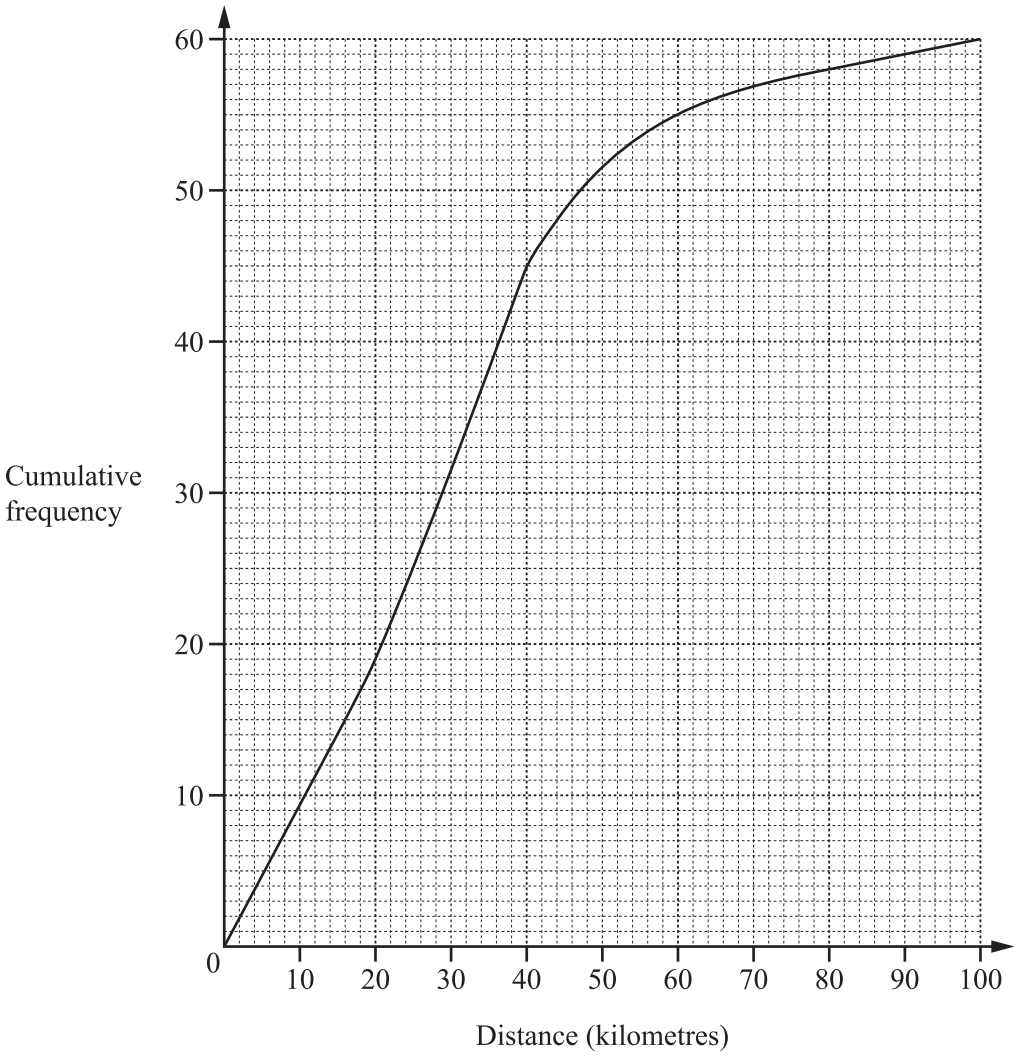
(a)(i) Cumulative frequency (a)(ii) Range and interquartile range (b) Cumulative frequency Click for more variations

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4(a)(i)	5	**1**	
4(a)(ii)	2.4 to 2.6	**2**	**B1** for [LQ=] 3.4 to 3.6 or [UQ=] 6
4(b)	26, 74	**2**	**B1** for each

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5 The cumulative frequency diagram shows information about the distances travelled, in kilometres, by 60 people.



Find

(a) the 80th percentile,

Answer(a) ..... km [2]

(b) the inter-quartile range,

Answer(b) ..... km [2]

(c) the number of people who travelled more than 60 km.

Answer(c) ..... [2]

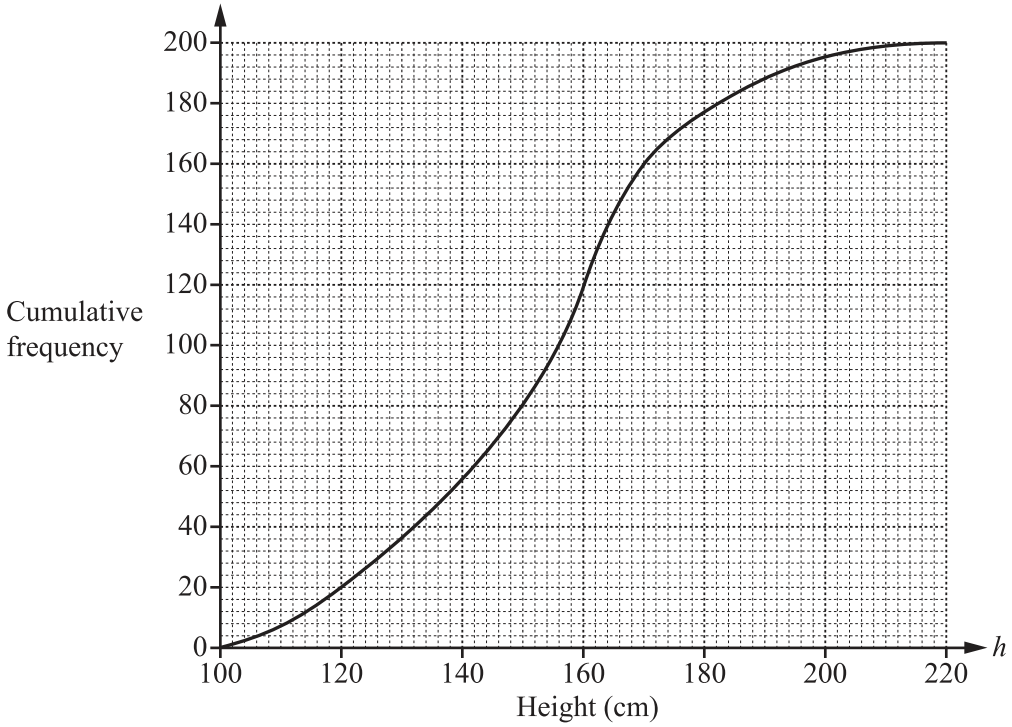
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(a) Cumulative frequency (b) Range and interquartile range (c) Cumulative frequency Click for more variations

5	**(a)**	44	**2**	**M1** for 48 soi
	(b)	24	**2**	**M1** for 40 or 16 or both lines drawn from 15 **and** 45 across and down to the horizontal axis
	(c)	5	**2**	**M1** for answer 55 or line or mark on graph indicating 55

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6 Simon records the heights, h cm, of 200 sunflowers in his garden.
The cumulative frequency diagram shows this information.



(a) Find the number of these sunflowers that have a height of more than 160 cm.

..... [2]

(b) Sue records the heights, h cm, of 200 sunflowers in her garden.
The cumulative frequency table shows this information.

Height (h cm)	Cumulative frequency
$h \leqslant 100$	0
$h \leqslant 110$	20
$h \leqslant 120$	48
$h \leqslant 130$	100
$h \leqslant 140$	140
$h \leqslant 150$	172
$h \leqslant 160$	188
$h \leqslant 170$	200

On the grid above, draw another cumulative frequency diagram to show this information. [3]

(c) Work out the difference between the median heights of Simon's sunflowers and Sue's sunflowers.

..... cm [2]

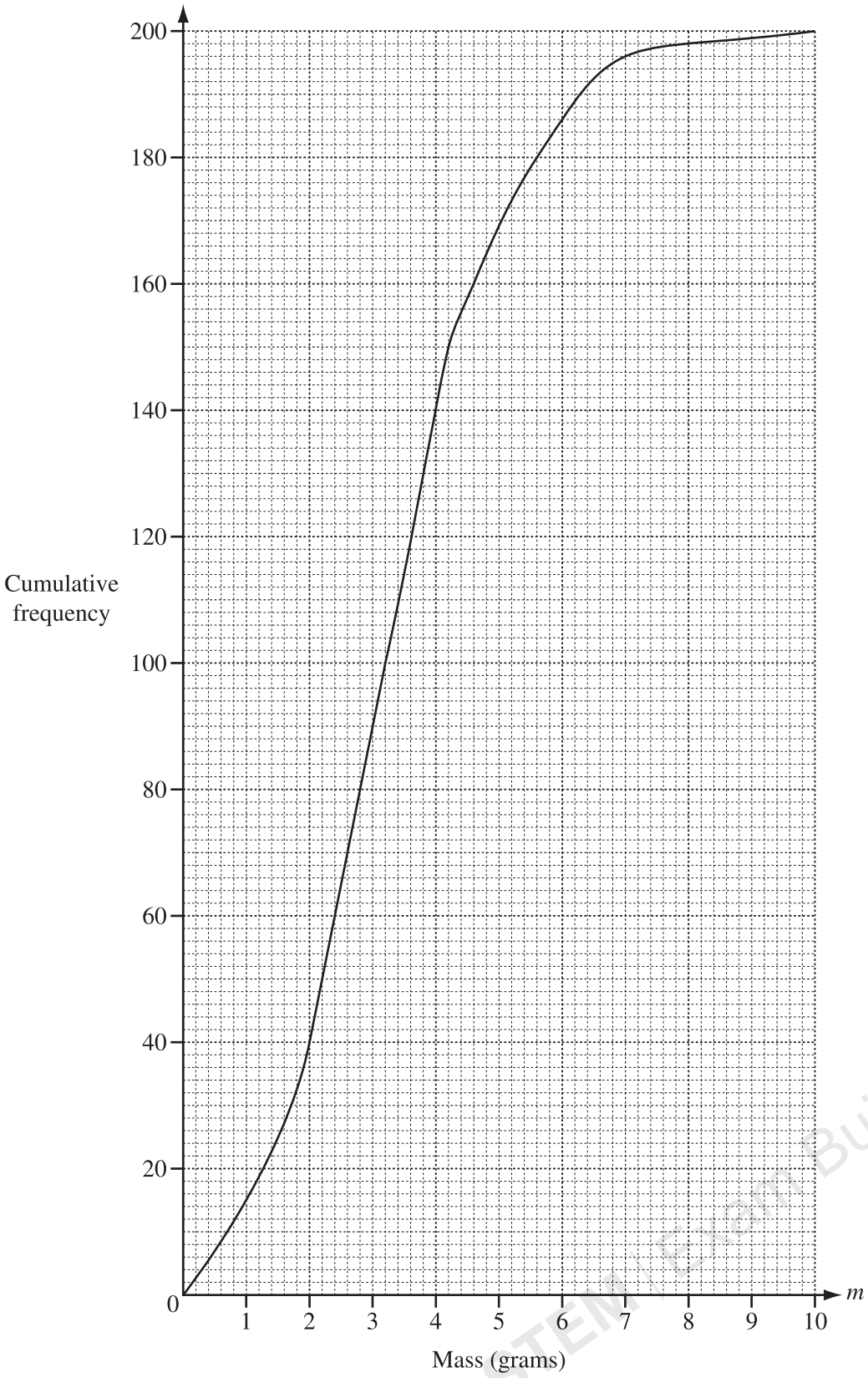
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(a) Cumulative frequency (b) Cumulative frequency (c) Cumulative frequency Click for more variations

6(a)	80 to 84	**2**	**M1** for 116 to 120
6(b)	Correct curve or ruled lines	**3**	**B2** for 7 or 8 correct points **B1** for 5 or 6 correct points
6(c)	26	**2**	**B1** for 156 or 130 or for *their* 130 from *their* **increasing** curve (or lines)

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7 200 students estimate the mass (m grams) of a coin.
The cumulative frequency diagram shows the results.



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(a) Find

(i) the median,

Answer(a)(i) ..... g [1]

(ii) the upper quartile,

Answer(a)(ii) ..... g [1]

(iii) the 80th percentile,

Answer(a)(iii) ..... g [1]

(iv) the number of students whose estimate is 7 g or less.

Answer(a)(iv) ..... [1]

(b) **(i)** Use the cumulative frequency diagram to complete the frequency table.

Mass (m grams)	$0 < m \leqslant 2$	$2 < m \leqslant 4$	$4 < m \leqslant 6$	$6 < m \leqslant 8$	$8 < m \leqslant 10$
Frequency	40				2

[2]

(ii) A student is chosen at random.
The probability that the student estimates that the mass is greater than M grams is 0.3.

Find the value of M.

Answer(b)(ii) M = ... [2]

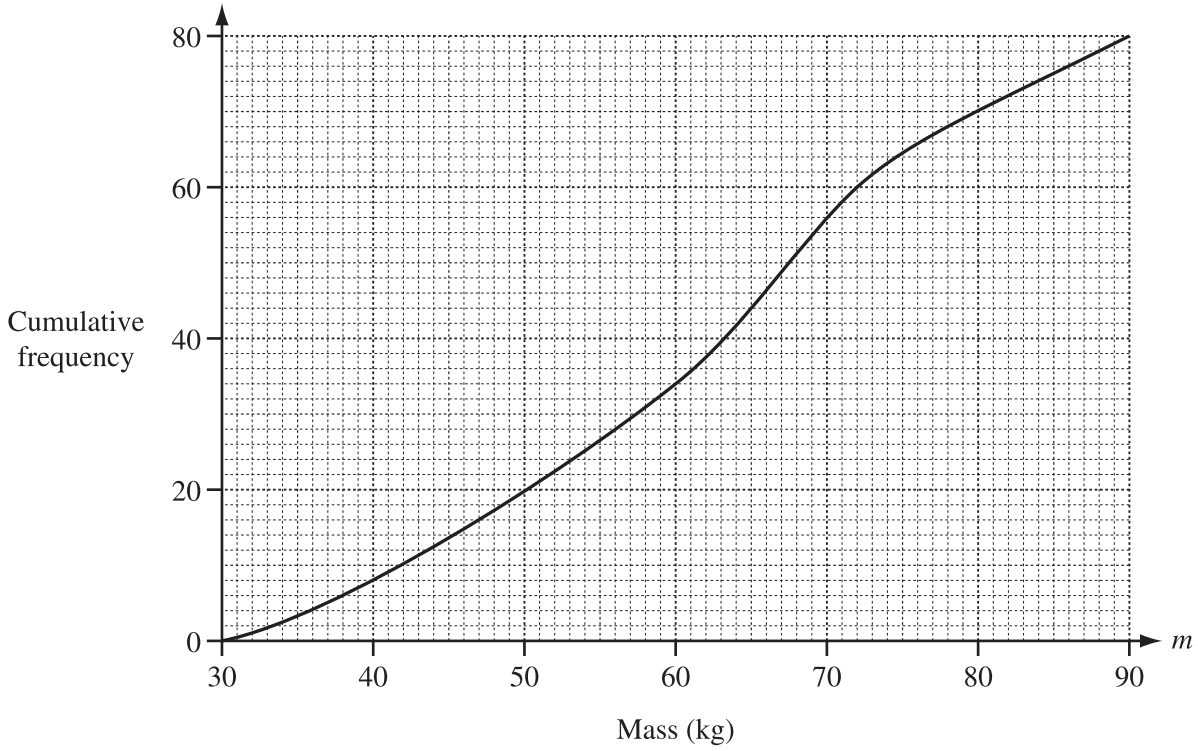
(a)(i) Cumulative frequency (a)(ii) Cumulative frequency (a)(iii) Cumulative frequency
(a)(iv) Cumulative frequency (b)(i) Cumulative frequency (b)(ii) Cumulative frequency Click for more variations

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7 (a) (i)	3.2	**1**	
(ii)	4.2	**1**	
(iii)	4.6	**1**	
(iv)	196	**1**	
(b) (i)	100, 46, 12	**2**	**B1** for 2 correct
(ii)	4	**2**	**M1** for frequency of 60 or 140 seen in workspace

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8 80 boys each had their mass, m kilograms, recorded.
The cumulative frequency diagram shows the results.



(a) Find

(i) the median,

Answer(a)(i) ..... kg [1]

(ii) the lower quartile,

Answer(a)(ii) ..... kg [1]

(iii) the interquartile range.

Answer(a)(iii) ..... kg [1]

(b) How many boys had a mass greater than 60kg?

Answer(b) ..... [2]

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(c) (i) Use the cumulative frequency graph to complete this frequency table.

Mass, m	Frequency
$30 < m \leqslant 40$	8
$40 < m \leqslant 50$	
$50 < m \leqslant 60$	14
$60 < m \leqslant 70$	22
$70 < m \leqslant 80$	
$80 < m \leqslant 90$	10

[2]

(ii) Calculate an estimate of the mean mass.

Answer(c)(ii) ..... kg [4]

(a)(i) Cumulative frequency (a)(ii) Cumulative frequency (a)(iii) Range and interquartile range
(b) Cumulative frequency (c)(i) Cumulative frequency (c)(ii) Averages from grouped data
Click for more variations

8	**(a) (i)** 63 to 63.5 **(ii)** 50 to 50.5 **(iii)** 21.5 to 22.5	1 1 1	
	(b) 46	2	**B1** for 34 seen (could be on graph)
	(c) (i) 12, 14 **(ii)** {35 × 8 + 45 × their 12 + 55 × 14 + 65 × 22 + 75 × their 14 + 85 × 10} ÷ their 80 (or 80)	1, 1 M3	**M1** for mid-values soi (allow 1 error/omit) and **M1** for use of $\sum fx$ with x in correct boundary including both ends (at least 4 products) (4920 seen implies M2) and **M1** depend on 2nd M for dividing by their 80 (or 80) (not 54 or less)
	61.5 cao	A1	www4

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9 100 students were each asked how much money, $\$m$, they spent in one week.
The frequency table shows the results.

Amount ($\$m$)	$0 < m \leqslant 5$	$5 < m \leqslant 10$	$10 < m \leqslant 20$	$20 < m \leqslant 30$	$30 < m \leqslant 50$
Frequency	16	38	30	9	7

(a) Calculate an estimate of the mean.

$ ..... [4]

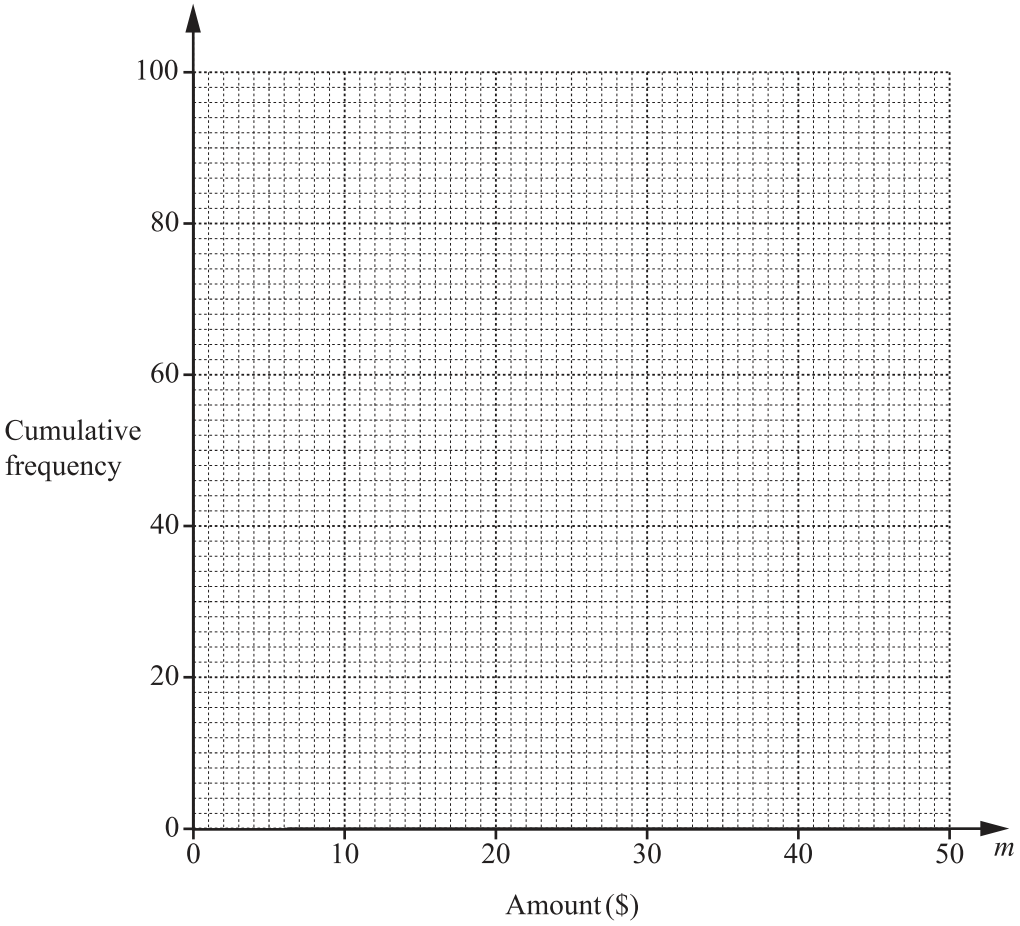
(b) Complete the cumulative frequency table below.

Amount ($\$m$)	$m \leqslant 5$	$m \leqslant 10$	$m \leqslant 20$	$m \leqslant 30$	$m \leqslant 50$
Cumulative frequency	16				100

[2]

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(c) On the grid, draw the cumulative frequency diagram.



[3]

(d) Use your cumulative frequency diagram to find an estimate for

(i) the median,

$ ..... [1]

(ii) the interquartile range,

$ ..... [2]

(iii) the number of students who spent more than $25.

..... [2]

(a) Averages from grouped data (b) Cumulative frequency (c) Cumulative frequency
(d)(i) Cumulative frequency (d)(ii) Range and interquartile range (d)(iii) Cumulative frequency

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9(a)	12.8[0]	**4**	**M1** for midpoints **soi** **M1** for use of $\sum fm$ with m in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fm \div 100$
9(b)	54 84 93	**2**	**B1** for 2 correct or 1 error and 2 correct or **FT**
9(c)	correct diagram with all points correctly plotted	**3**	**B1FT** *their* **(b)** for plots at 5 correct heights **B1** for 5 points at upper ends of intervals on correct vertical line **B1FT** (dep on at least **B1**) for increasing curve or polygon through 5 points After 0 scored, **SC1FT** for 4 correct points plotted
9(d)(i)	9 to 9.8 final answer	**1**	
9(d)(ii)	8.5 to 11.5	**2**	**B1** for [UQ =] 15.5 to 17.5 or [LQ =] 6 to 7 seen
9(d)(iii)	10, 11 or 12	**2**	**B1** for 88 to 90 seen or for answer between 10 and 12

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10 A school nurse records the height, h cm, of each of 180 children.
The table shows the information.

Height (h cm)	$60 < h \leqslant 70$	$70 < h \leqslant 90$	$90 < h \leqslant 100$	$100 < h \leqslant 110$	$110 < h \leqslant 115$	$115 < h \leqslant 125$
Frequency	8	26	35	67	28	16

(a) Calculate an estimate of the mean.
Give your answer correct to 1 decimal place.

..... cm [4]

(b) In a histogram showing the information, the height of the bar for the interval $60 < h \leqslant 70$ is 0.4 cm.

Calculate the height of the bar for each of the following intervals.

$115 < h \leqslant 125$ ..... cm

$110 < h \leqslant 115$ ..... cm

$70 < h \leqslant 90$ ..... cm [3]

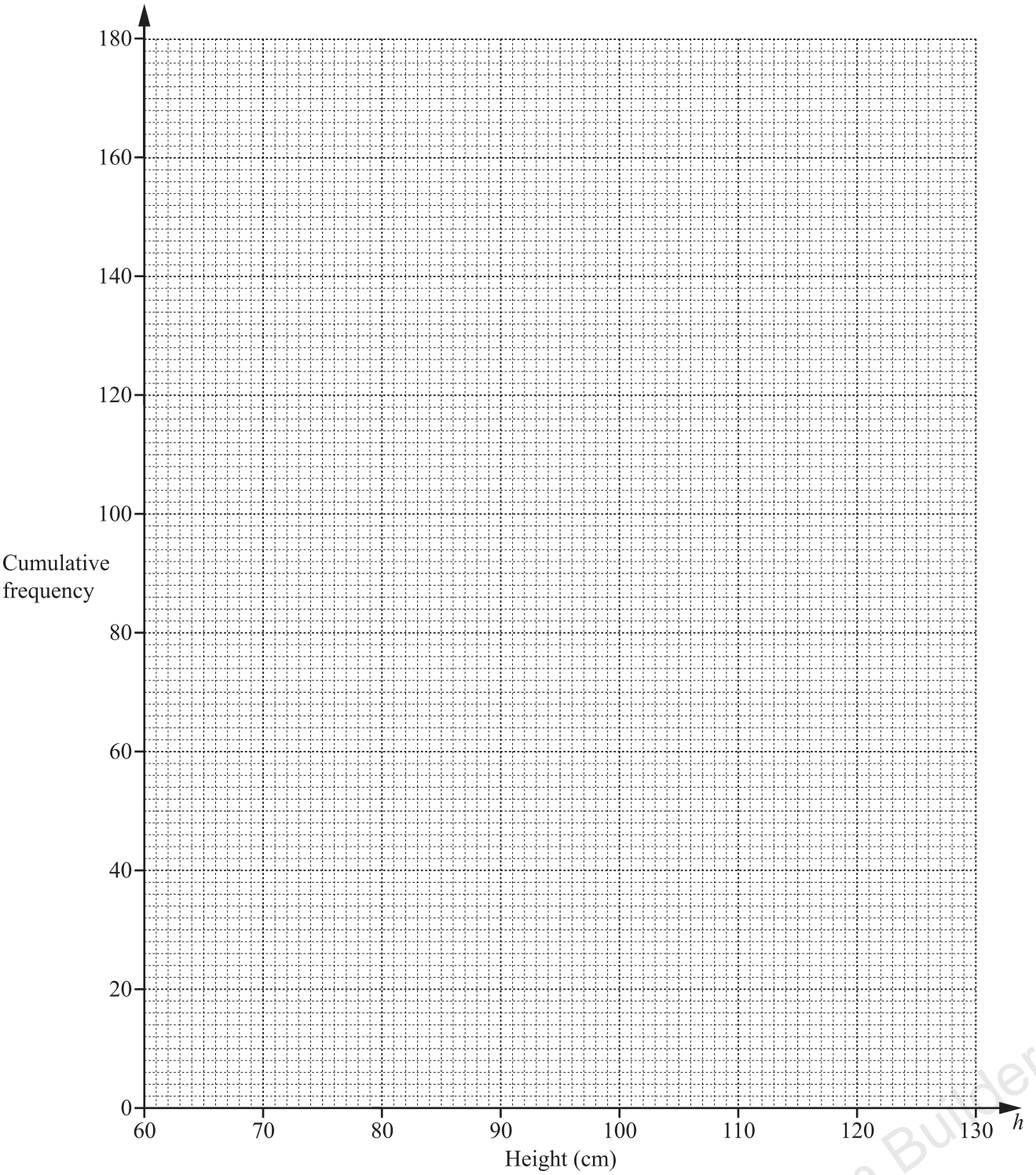
(c) Complete the cumulative frequency table below.

Height (h cm)	$h \leqslant 70$	$h \leqslant 90$	$h \leqslant 100$	$h \leqslant 110$	$h \leqslant 115$	$h \leqslant 125$
Cumulative frequency						180

[2]

(d) On the grid opposite, draw a cumulative frequency diagram.

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[3]

(e) Use your cumulative frequency diagram to find an estimate of

(i) the interquartile range,

..... cm [2]

(ii) the 70th percentile,

..... cm [2]

(iii) the number of children with height greater than 106 cm.

..... [2]

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(a) Averages from grouped data | (b) Histograms | (c) Cumulative frequency | (d) Cumulative frequency | (e)(i) Range and interquartile range | (e)(ii) Cumulative frequency | (e)(iii) Cumulative frequency

Click for more variations

10(a)	100.2 nfww	**4**	**M1** for midpoints soi 65, 80, 95, 105, 112.5, 120 **M1** for use of $\sum fx$ with x in correct interval including both boundaries **M1**dep for $\sum fx \div 180$ dep on previous **M1**
10(b)	0.8 2.8 0.65	**3**	**B1** for each If zero scored, **SC1** for 1.6, 5.6 and 1.3 seen
10(c)	8 34 69 136 164	**2**	**B1** for one error **FT** other values or for 3 or 4 correct
10(d)	Correct diagram	**3**	**B1FT** for correct vertical placement for 6 plots **B1** for correct horizontal placement for 6 plots **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 6 points If zero scored, **SC1FT** for 5 out of 6 correct plots
10(e)(i)	15 to 17	**2**	**B1** for [LQ =] 93 to 94 or [UQ =] 109 to 110
10(e)(ii)	107 to 109	**2**	**B1** for 126 seen
10(e)(iii)	66 to 72	**2**	**FT** their graph for 2 marks **B1** for answer 106 to 114 or **B1FT** *their* graph reading at 106 cm seen

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