Dulwich College Shanghai

IGCSE - Cumulative Frequency Questions

85 min

72 marks

1. **Answer the whole of this question on one sheet of graph paper.**

    The heights (h cm) of 270 students in a school are measured and the results are shown in the table.

h	Frequency
$120 < h \le 130$	15
$130 < h \le 140$	24
$140 < h \le 150$	36
$150 < h \le 160$	45
$160 < h \le 170$	50
$170 < h \le 180$	43
$180 < h \le 190$	37
$190 < h \le 200$	20

    (a) Write down the modal group.

    [1]

    (b) (i) Calculate an estimate of the mean height.

    [4]

    (ii) Explain why the answer to **part (b)(i)** is an estimate.

    [1]

(c)   The following table shows the cumulative frequencies for the heights of the students.

h	Cumulative frequency
$h \le 120$	0
$h \le 130$	p
$h \le 140$	q
$h \le 150$	r
$h \le 160$	120
$h \le 170$	170
$h \le 180$	213
$h \le 190$	250
$h \le 200$	270

Write down the values of p, q and r.

[2]

(d)   Using a scale of 1cm to 5 units, draw a horizontal h-axis, starting at $h = 120$.
Using a scale of 1cm to 20 units on the vertical axis, draw a cumulative frequency
diagram.

[5]

(e)   Use your diagram to find

(i)   the median height,

[1]

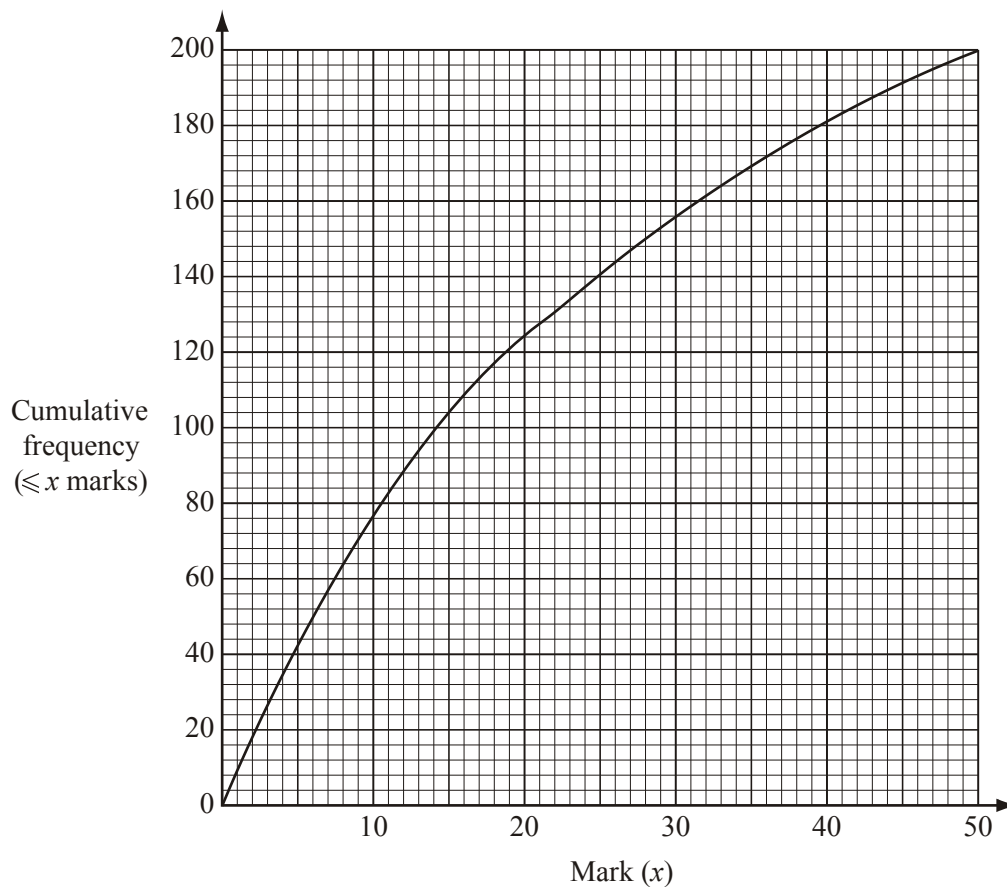(ii)   the upper quartile,

[1]

(iii) the inter-quartile range,

[1]

(iv)   the 60th percentile.

[1]

(f)   All the players in the school's basketball team are chosen from the 30 tallest students.
Use your diagram to find the least possible height of any player in the basketball team.

[2]

2. 200 students take a mathematics test.
The cumulative frequency diagram shows the results.

Cumulative frequency (≤ x marks) vs Mark (x)

Write down

(i)   the median mark,

[1]

(ii)   the lower quartile,

[1]

(iii)   the upper quartile,

[1]

(iv)   the inter-quartile range,

[1]

(v)   the lowest possible mark scored by the top 40 students,

[1]

(iv)   the number of students scoring more than 25 marks.

[1]

3. Kristina asked 200 people how much water they drink in one day.

The table shows her results.

Amount of water (x litres)	Number of people
$0 < x \leq 0.5$	8
$0.5 < x \leq 1$	27
$1 < x \leq 1.5$	45
$1.5 < x \leq 2$	50
$2 < x \leq 2.5$	39
$2.5 < x \leq 3$	21
$3 < x \leq 3.5$	7
$3.5 < x \leq 4$	3

(a) Write down the modal interval.

[1]

(b) Calculate an estimate of the mean.

[4]

(c) Make a cumulative frequency table for this data.

[2]

(d) Using a scale of 4 cm to 1 litre of water on the horizontal axis and 1 cm to 10 people on the vertical axis, draw the cumulative frequency graph.

[5]

(e) Use your cumulative frequency graph to find

    (i) the median,

[1]

    (ii) the 40$^{\text{th}}$ percentile,

[1]

    (iii) the number of people who drink at least 2.6 litres of water.

[2]

(f)   A doctor recommends that a person drinks at least 1.8 litres of water each day.
        What percentage of these 200 people do not drink enough water?

                                                                                              [2]

4.   The mass of each of 200 tea bags was checked by an inspector in a factory.
          The results are shown by the cumulative frequency curve.
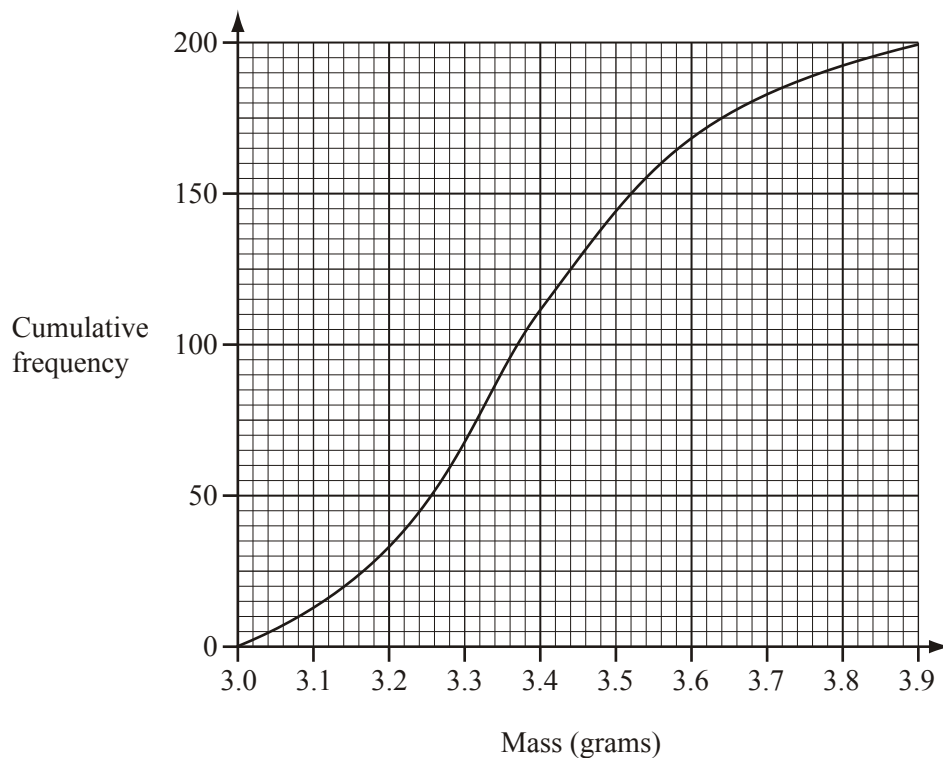
Use the cumulative frequency curve to find

(a)   the median mass,

                                        Answer (a) …………………… g

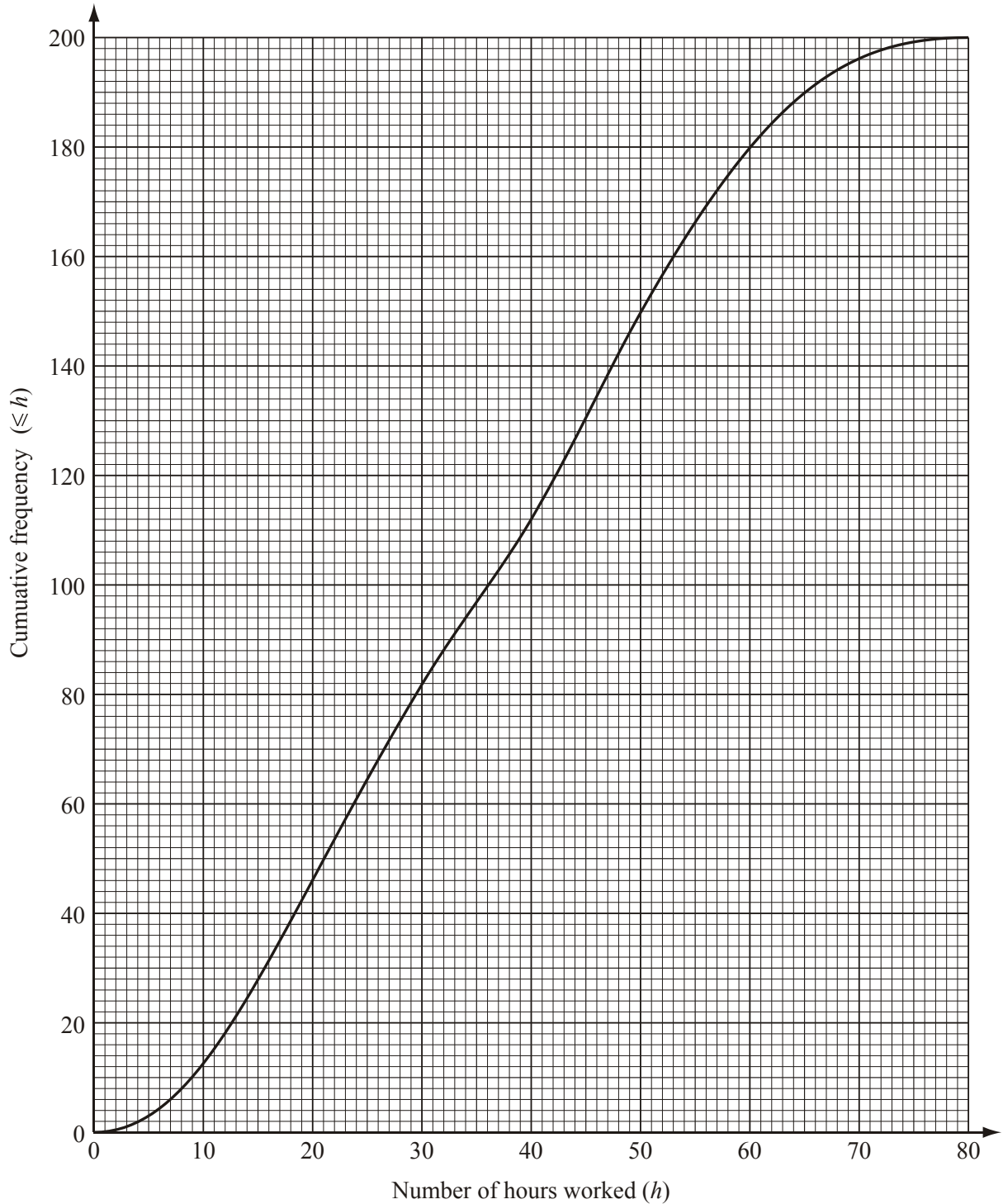   [1]

(b)   the interquartile range,

Answer (b) …………………… g

[2]

(c)   the number of tea bags with a mass greater than 3.5 grams.

Answer (c) …………..………..

[1]

5.

Cumulative frequency ($\leqslant h$)

Number of hours worked (h)

200 people record the number of hours they work in a week.
The cumulative frequency graph shows this information.

(a)   Use the graph to find

(i)   the median,

[1]

(ii)   the upper quartile,

[1]

(iii)   the inter-quartile range,

[1]

(iv)   the number of people who work more than 60 hours in a week.

[2]

(b)   Omar uses the graph to make the following frequency table.

Hours worked (h)	$0 < h \leq 10$	$10 < h \leq 20$	$20 < h \leq 30$	$30 < h \leq 40$	$40 < h \leq 50$	$50 < h \leq 60$	$60 < h \leq 70$	$70 < h \leq 80$
Frequency	12	34	36	30	38	30	p	q

(i)   Use the graph to find the values of p and q.

[2]

(ii)   Calculate an estimate of the mean number of hours worked in a week.

[4]

(c)   Shalini uses the graph to make a different frequency table.

Hours worked (h)	$0 < h \leq 30$	$30 < h \leq 40$	$40 < h \leq 50$	$50 < h \leq 80$
Frequency	82	30	38	50

When she draws a histogram, the height of the column for the interval $30 < h \leq 40$ is 9 cm.

Calculate the height of each of the other three columns.

[4]

6. The heights of 100 students are measured.

The results have been used to draw this cumulative frequency diagram.
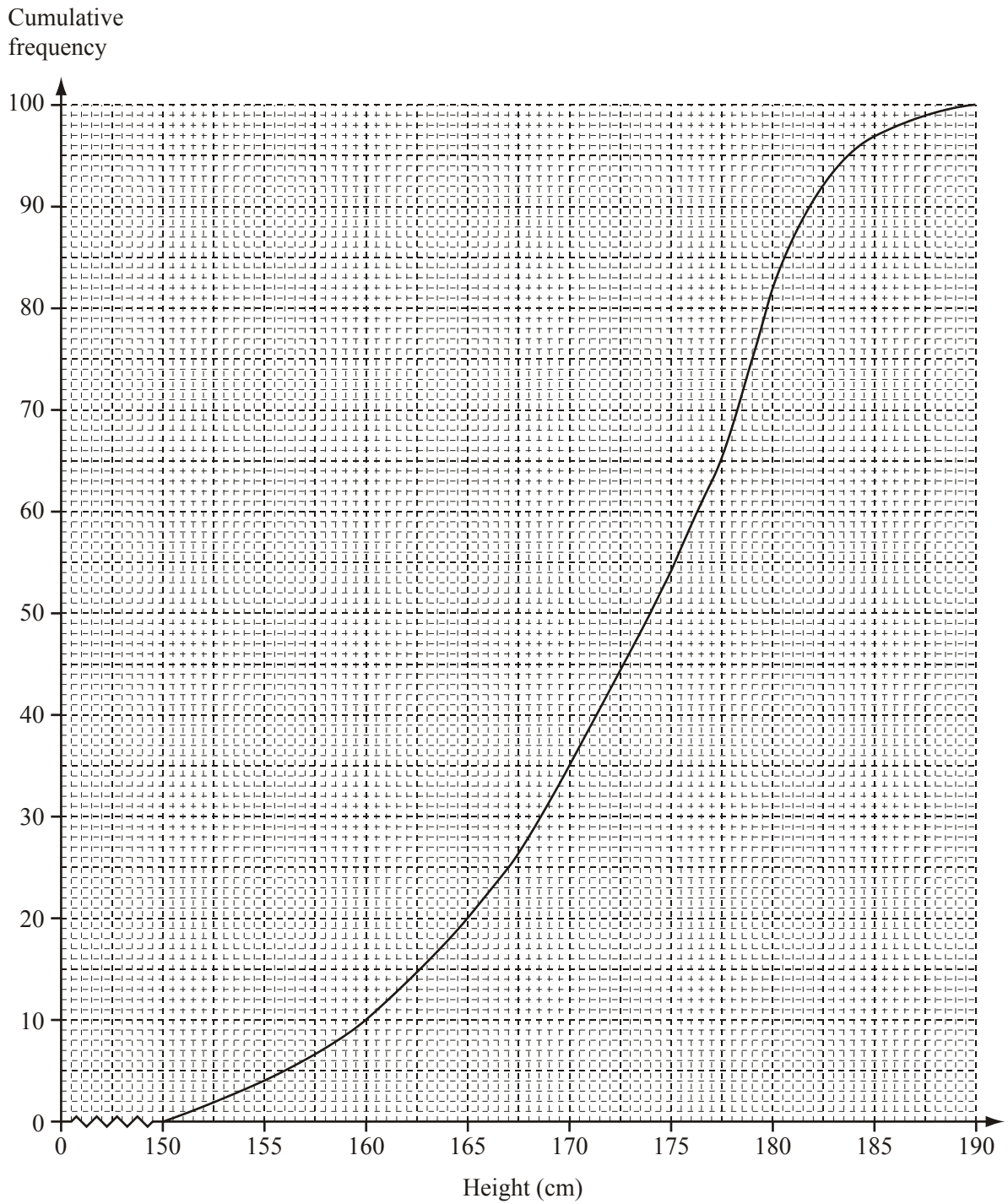
(a) Find

    (i)   the median height,

<div align="right">Answer (a)(i) …………..……… cm</div>

<div align="right">[1]</div>

    (ii)   the lower quartile,

<div align="right">Answer (a)(ii) ……………… cm</div>

<div align="right">[1]</div>

    (iii)   the inter-quartile range,

<div align="right">Answer (a)(iii) ……………… cm</div>

<div align="right">[1]</div>

    (iv)   the number of students with a height greater than 177 cm.

<div align="right">Answer (a)(iv) …….…..…………</div>

<div align="right">[2]</div>

(b) The frequency table shows the information about the 100 students who were measured.

Height (h cm)	$150 < h \leq 160$	$160 < h \leq 170$	$170 < h \leq 180$	$180 < h \leq 190$
Frequency			47	18

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

<div align="right">[1]</div>

    (ii)   Calculate an estimate of the mean height of the 100 students.

<div align="right">Answer (b)(ii) …………….… cm</div>

<div align="right">[4]</div>