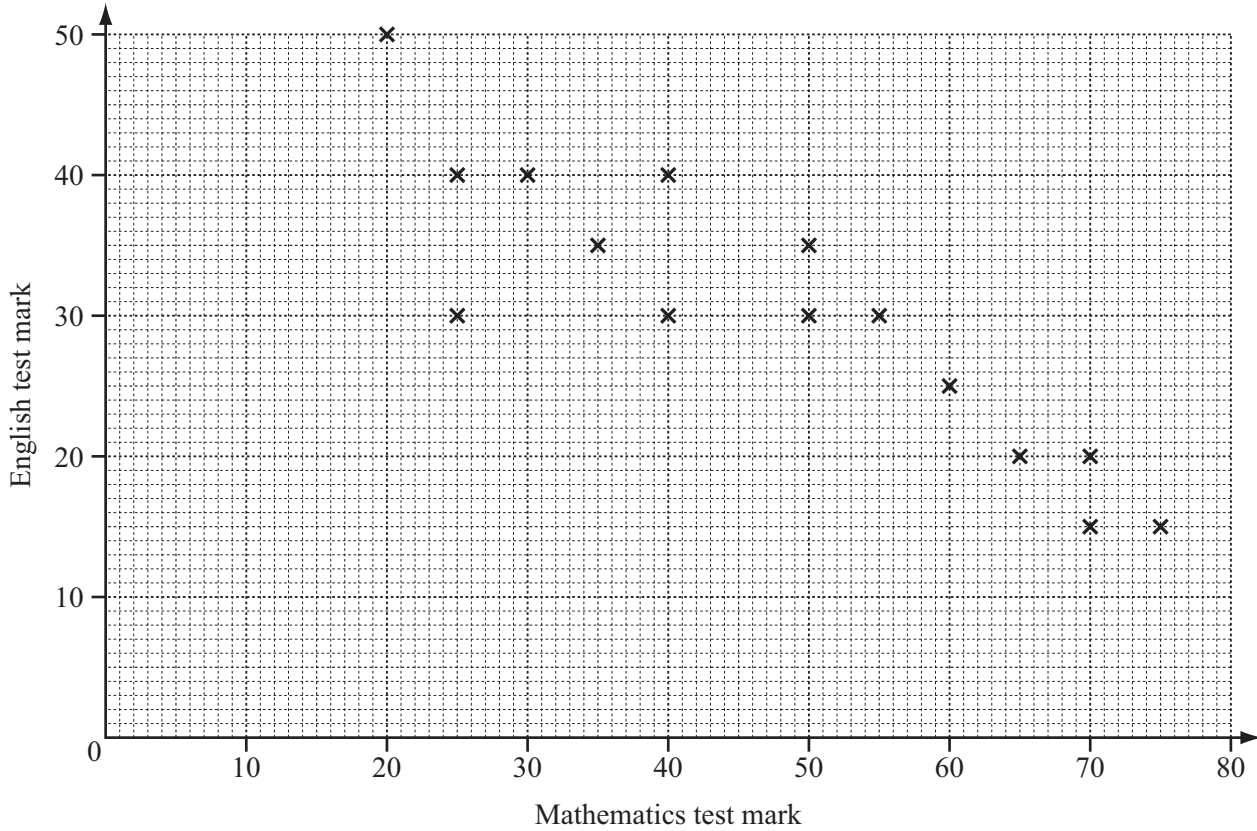


Statistics
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12



The scatter diagram shows the marks obtained in a Mathematics test and the marks obtained in an English test by 15 students.

(a) Describe the correlation.

Answer(a) [1]

(b) The mean for the Mathematics test is 47.3 .
The mean for the English test is 30.3 .

Plot the mean point (47.3, 30.3) on the scatter diagram above. [1]

(c) (i) Draw the line of best fit on the diagram above. [1]

(ii) One student missed the English test.
She received 45 marks in the Mathematics test.

Use your line to estimate the mark she might have gained in the English test.

Answer(c)(ii) [1]

16 In a survey of 60 cars, the type of fuel that they use is recorded in the table below.

Each car only uses one type of fuel.

| Petrol | Diesel | Liquid Hydrogen | Electricity |
|--------|--------|-----------------|-------------|
| 40 | 12 | 2 | 6 |

(a) Write down the mode.

Answer(a) [1]

(b) Olav drew a pie chart to illustrate these figures.

Calculate the angle of the sector for Diesel.

Answer(b) [2]

(c) Calculate the probability that a car chosen at random uses Electricity.

Write your answer as a fraction in its simplest form.

Answer(c) [2]

- 3 The table shows information about the heights of 120 girls in a swimming club.

| Height (h metres) | Frequency |
|----------------------|-----------|
| $1.3 < h \leq 1.4$ | 4 |
| $1.4 < h \leq 1.5$ | 13 |
| $1.5 < h \leq 1.6$ | 33 |
| $1.6 < h \leq 1.7$ | 45 |
| $1.7 < h \leq 1.8$ | 19 |
| $1.8 < h \leq 1.9$ | 6 |

- (a) (i) Write down the modal class.

Answer(a)(i) m [1]

- (ii) Calculate an estimate of the mean height. Show all of your working.

Answer(a)(ii) m [4]

- (b) Girls from this swimming club are chosen at random to swim in a race.
Calculate the probability that

- (i) the height of the first girl chosen is more than 1.8 metres,

Answer(b)(i) [1]

- (ii) the heights of **both** the first and second girl chosen are 1.8 metres or less.

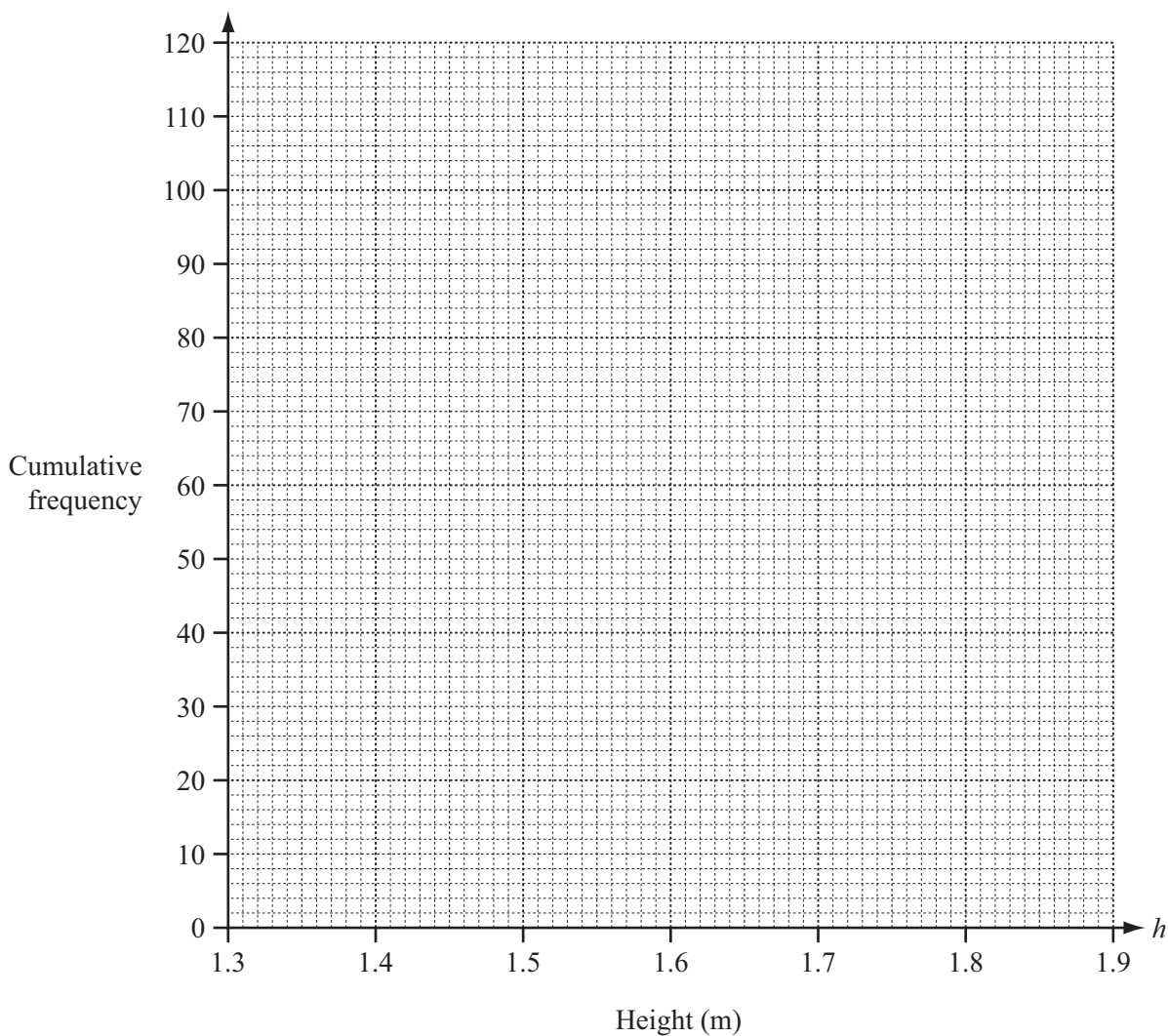
Answer(b)(ii) [3]

(c) (i) Complete the cumulative frequency table for the heights.

| Height (h metres) | Cumulative frequency |
|----------------------|----------------------|
| $h \leq 1.3$ | 0 |
| $h \leq 1.4$ | 4 |
| $h \leq 1.5$ | 17 |
| $h \leq 1.6$ | 50 |
| $h \leq 1.7$ | |
| $h \leq 1.8$ | 114 |
| $h \leq 1.9$ | |

[1]

(ii) Draw the cumulative frequency graph on the grid.



[3]

(d) Use your graph to find

(i) the median height,

Answer(d)(i) m [1]

(ii) the 30th percentile.

Answer(d)(ii) m [1]

5 (a) The times, t seconds, for 200 people to solve a problem are shown in the table.

| Time (t seconds) | Frequency |
|---------------------|-----------|
| $0 < t \leq 20$ | 6 |
| $20 < t \leq 40$ | 12 |
| $40 < t \leq 50$ | 20 |
| $50 < t \leq 60$ | 37 |
| $60 < t \leq 70$ | 42 |
| $70 < t \leq 80$ | 50 |
| $80 < t \leq 90$ | 28 |
| $90 < t \leq 100$ | 5 |

Calculate an estimate of the mean time.

Answer(a) s [4]

(b) (i) Complete the cumulative frequency table for this data.

| Time (t seconds) | $t \leq 20$ | $t \leq 40$ | $t \leq 50$ | $t \leq 60$ | $t \leq 70$ | $t \leq 80$ | $t \leq 90$ | $t \leq 100$ |
|----------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| Cumulative Frequency | 6 | 18 | 38 | | | 167 | | |

[2]

(ii) Draw the cumulative frequency graph on the grid opposite to show this data. [4]

(c) Use your cumulative frequency graph to find

(i) the median time,

Answer(c)(i) s [1]

(ii) the lower quartile,

Answer(c)(ii) s [1]

(iii) the inter-quartile range,

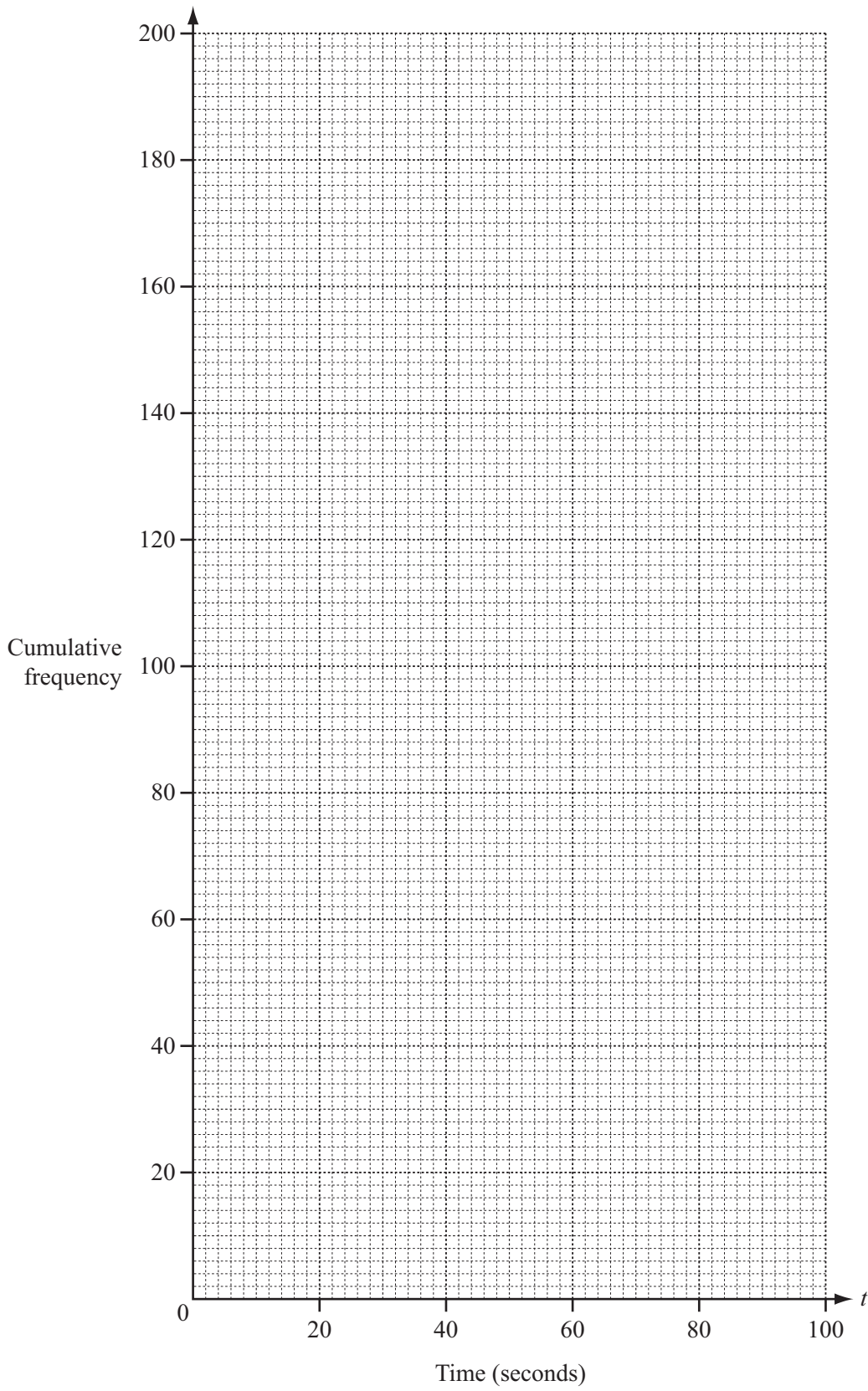
Answer(c)(iii) s [1]

(iv) how many people took between 65 and 75 seconds to solve the problem,

Answer(c)(iv) [1]

(v) how many people took longer than 45 seconds to solve the problem.

Answer(c)(v) [2]



- 7 The times, t minutes, taken for 200 students to cycle one kilometre are shown in the table.

| | | | | |
|---------------------|----------------|----------------|----------------|----------------|
| Time (t minutes) | $0 < t \leq 2$ | $2 < t \leq 3$ | $3 < t \leq 4$ | $4 < t \leq 8$ |
| Frequency | 24 | 68 | 72 | 36 |

- (a) Write down the class interval that contains the median.

Answer(a) [1]

- (b) Calculate an estimate of the mean.
Show all your working.

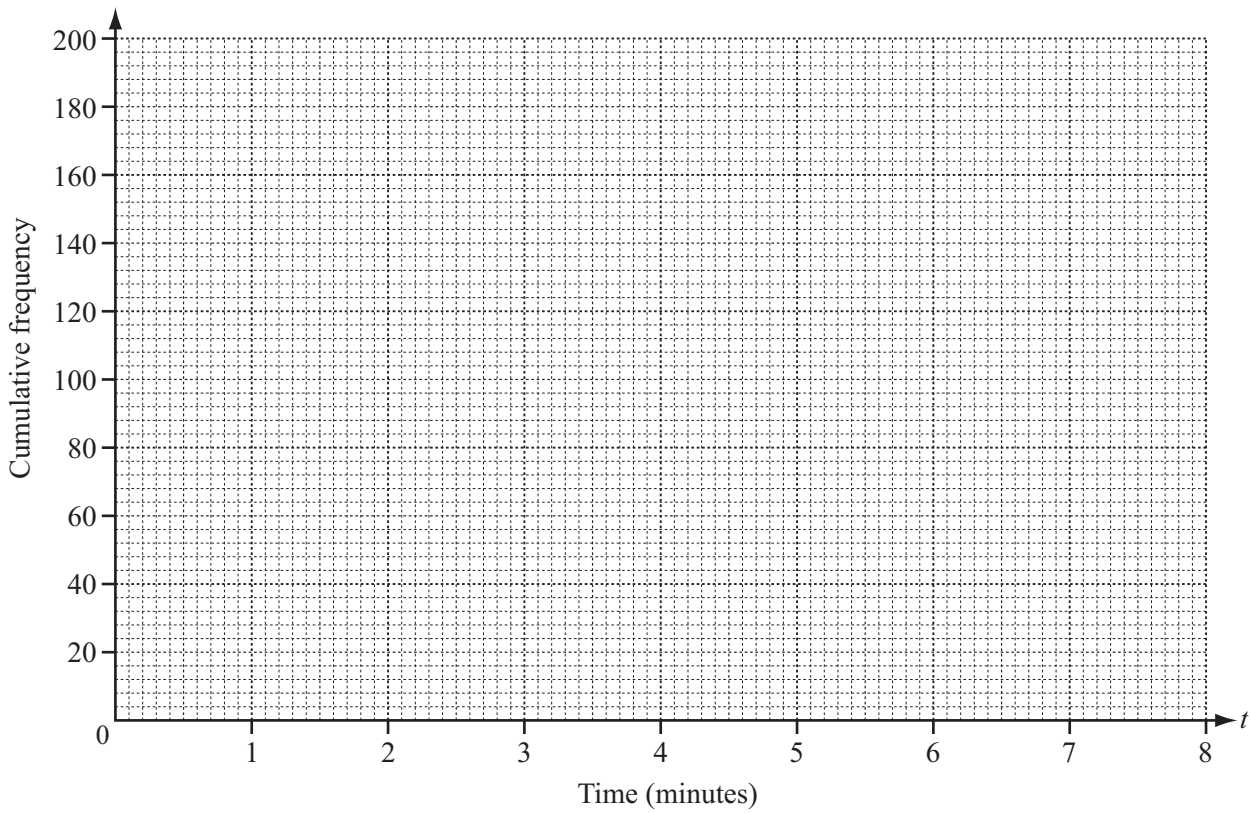
Answer(b) min [4]

(c) (i) Use the information in the table opposite to complete the cumulative frequency table.

| | | | | |
|----------------------|------------|------------|------------|------------|
| Time (t minutes) | $t \leq 2$ | $t \leq 3$ | $t \leq 4$ | $t \leq 8$ |
| Cumulative frequency | 24 | | | 200 |

[1]

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



[3]

(iii) Use your diagram to find the median, the lower quartile and the inter-quartile range.

Answer(c)(iii) Median = min

Lower quartile = min

Inter-quartile range = min [3]

- 9 (a) The number of people living in six houses is

3, 8, 4, x , y and z .

The median is $7\frac{1}{2}$.

The mode is 8.

The mean is 7.

Find a value for each of x , y and z .

[5]

- (b) The grouped frequency table below shows the amount (\$ A) spent on travel by a number of students.

| | | | |
|--------------------------|-----------------|------------------|------------------|
| Cost of travel (\$ A) | $0 < A \leq 10$ | $10 < A \leq 20$ | $20 < A \leq 40$ |
| Frequency | 15 | m | n |

- (i) Write down an estimate for the total amount in terms of m and n .

[2]

- (ii) The calculated estimate of the mean amount is \$13 exactly.

Write down an equation containing m and n .

Show that it simplifies to $2m + 17n = 120$.

[3]

- (iii) A student drew a histogram to represent this data.

The area of the rectangle representing the $0 < A \leq 10$ group was equal to the sum of the areas of the other two rectangles.

Explain why $m + n = 15$.

[1]

- (iv) Find the values of m and n by solving the simultaneous equations

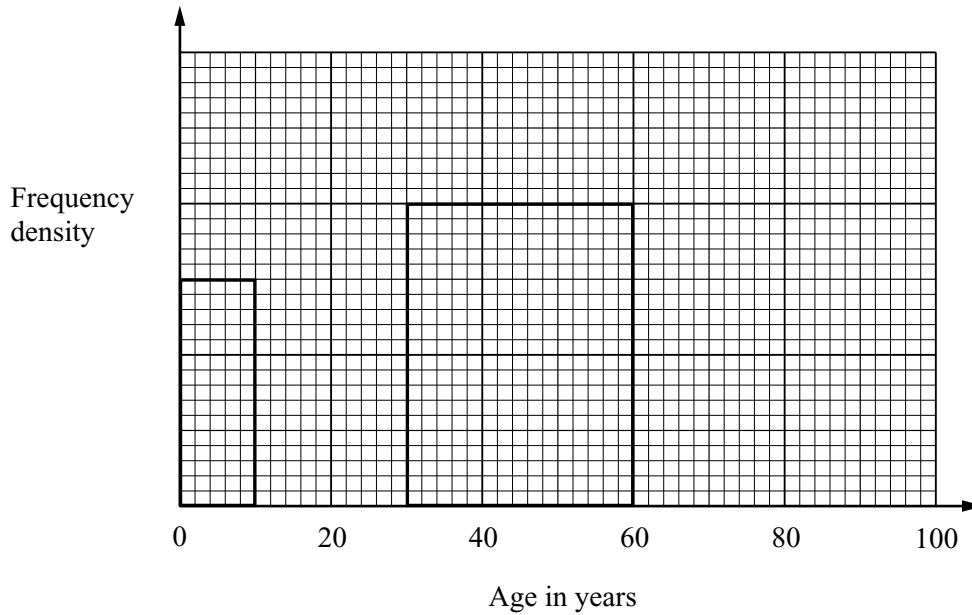
$$2m + 17n = 120,$$

$$m + n = 15.$$

[3]

- 13 A doctor's patients are grouped by age, as shown in the table and the histogram below.

| Age (x years) | $0 \leq x < 10$ | $10 \leq x < 30$ | $30 \leq x < 60$ | $60 \leq x < 100$ |
|--------------------|-----------------|------------------|------------------|-------------------|
| Number of patients | 300 | 600 | | 880 |



- (a) Complete the following:
 1 cm² represents patients. [1]
- (b) Use the histogram to fill in the blank in the table. [1]
- (c) Draw the missing two rectangles to complete the histogram. [2]

14 (a) Multiply $\begin{pmatrix} 5 & 4 \\ -3 & -2 \end{pmatrix} \begin{pmatrix} 2 & 1 & -4 \\ 0 & 3 & 6 \end{pmatrix}$.

Answer (a) $\begin{pmatrix} & & \\ & & \end{pmatrix}$ [2]

(b) Find the inverse of $\begin{pmatrix} 5 & 4 \\ -3 & -2 \end{pmatrix}$.

Answer (b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

8 Answer the whole of this question on a sheet of graph paper.

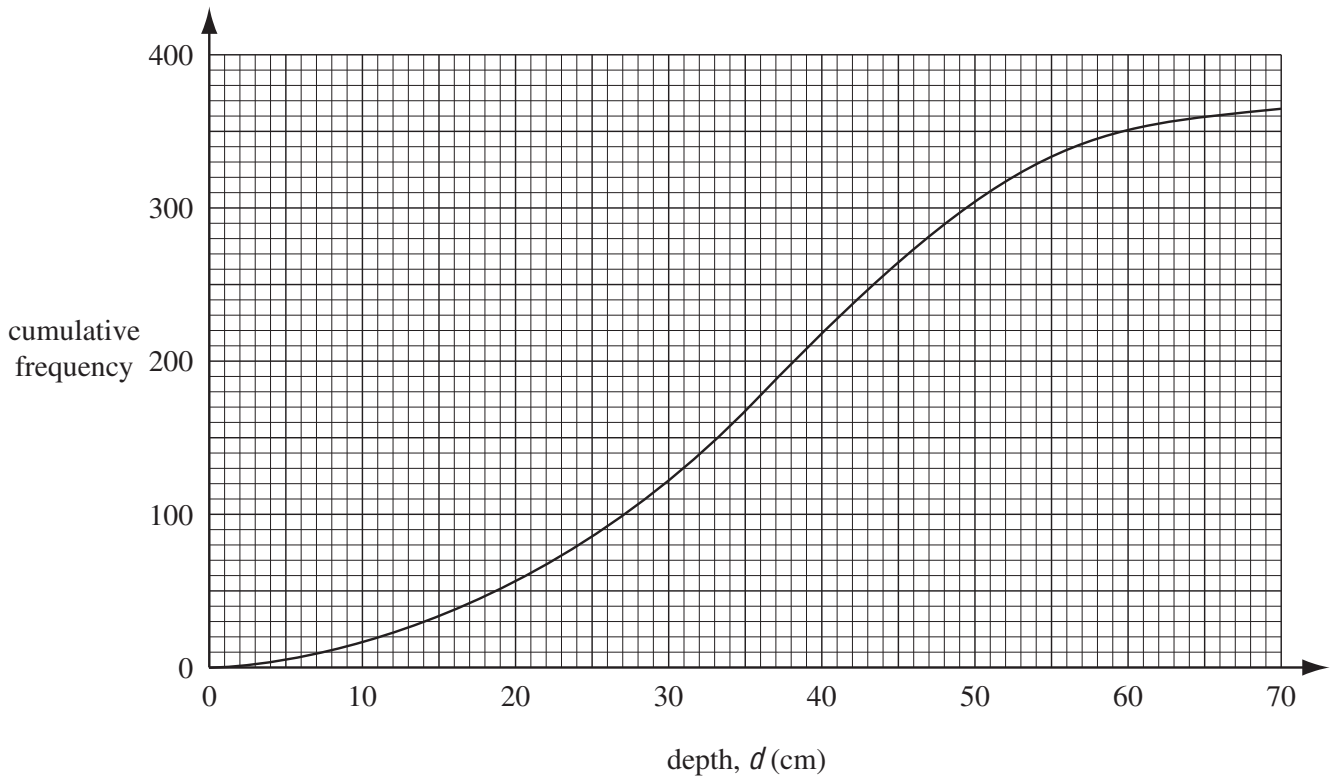
In a survey, 200 shoppers were asked how much they had just spent in a supermarket. The results are shown in the table.

| Amount(\$ x) | $0 < x \leq 20$ | $20 < x \leq 40$ | $40 < x \leq 60$ | $60 < x \leq 80$ | $80 < x \leq 100$ | $100 < x \leq 140$ |
|--------------------|-----------------|------------------|------------------|------------------|-------------------|--------------------|
| Number of shoppers | 10 | 32 | 48 | 54 | 36 | 20 |

- (a) (i) Write down the modal class. [1]
(ii) Calculate an estimate of the mean amount, giving your answer correct to 2 decimal places. [4]
- (b) (i) Make a cumulative frequency table for these 200 shoppers. [2]
(ii) Using a scale of 2 cm to represent \$20 on the horizontal axis and 2 cm to represent 20 shoppers on the vertical axis, draw a cumulative frequency diagram for this data. [4]
- (c) Use your cumulative frequency diagram to find
(i) the median amount, [1]
(ii) the upper quartile, [1]
(iii) the interquartile range, [1]
(iv) how many shoppers spent at least \$75. [2]

Question 9 is on the next page

- 3 The depth, d centimetres, of a river was recorded each day during a period of one year (365 days). The results are shown by the cumulative frequency curve.



- (a) Use the cumulative frequency curve to find

- (i) the median depth, [1]
- (ii) the inter-quartile range, [2]
- (iii) the depth at the 40th percentile, [2]
- (iv) the number of days when the depth of the river was **at least** 25 cm. [2]

- (b)

| d | $0 < d \leq 10$ | $10 < d \leq 20$ | $20 < d \leq 30$ | $30 < d \leq 40$ | $40 < d \leq 50$ | $50 < d \leq 60$ | $60 < d \leq 70$ |
|----------------|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Number of days | 17 | 41 | 62 | 98 | 85 | p | q |

- (i) Show that $p = 47$ and $q = 15$. [2]
- (ii) Use the information in the table and the values of p and q to calculate an estimate of the mean depth of the river. [4]

(c) The following information comes from the table in **part (b)**.

| d | $0 < d \leq 20$ | $20 < d \leq 40$ | $40 < d \leq 70$ |
|----------------|-----------------|------------------|------------------|
| Number of days | 58 | 160 | 147 |

A histogram was drawn to show this information.

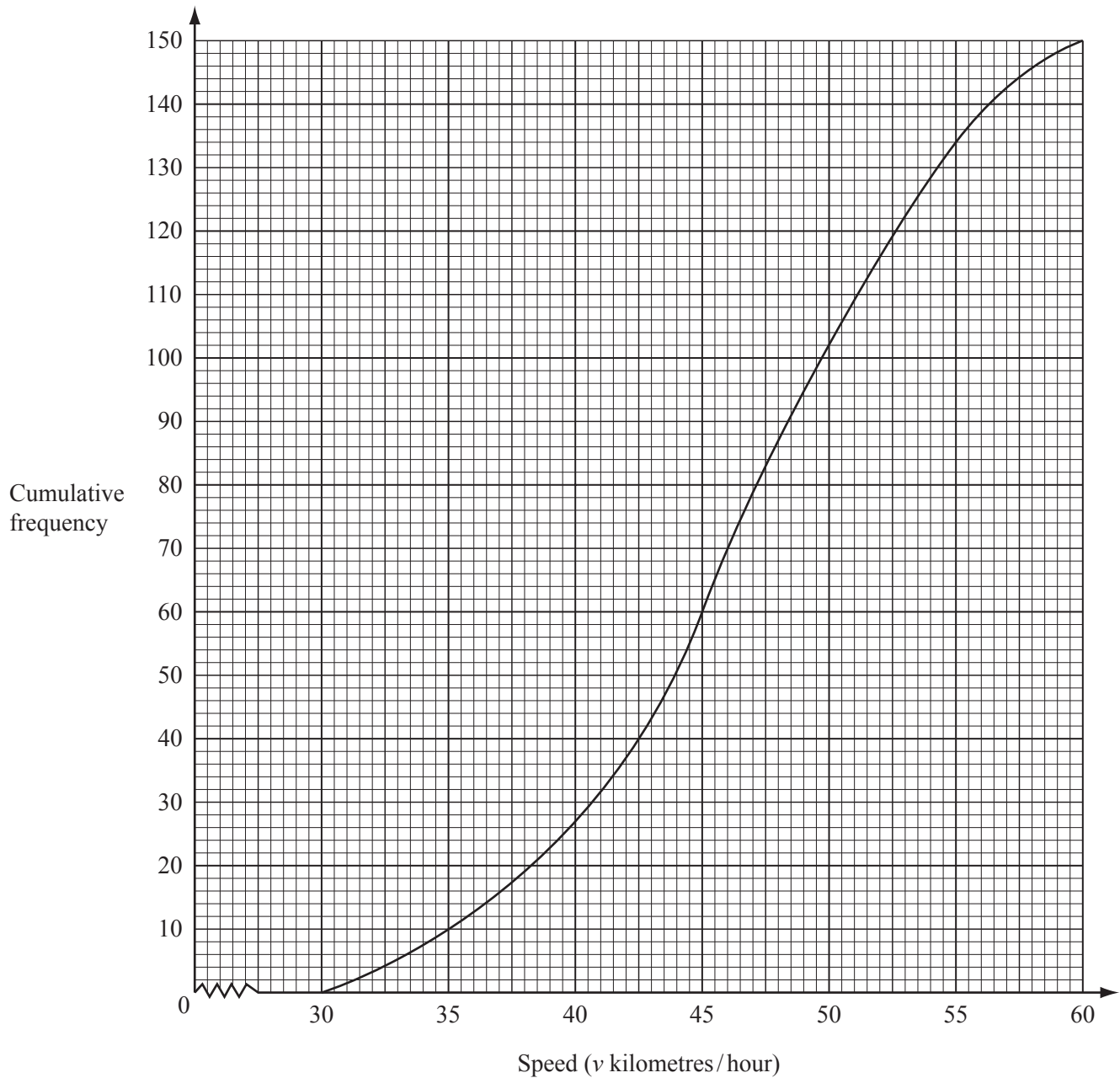
The height of the column for the interval $20 < d \leq 40$ was 8 cm.

Calculate the height of each of the other two columns.

[Do not draw the histogram.]

[3]

- 7 The speeds (v kilometres/hour) of 150 cars passing a 50 km/h speed limit sign are recorded. A cumulative frequency curve to show the results is drawn below.



(a) Use the graph to find

- (i) the median speed, [1]
- (ii) the inter-quartile range of the speeds, [2]
- (iii) the number of cars travelling with speeds of more than 50 km/h. [2]

(b) A frequency table showing the speeds of the cars is

| | | | | | | |
|-------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Speed (v km/h) | $30 < v \leq 35$ | $35 < v \leq 40$ | $40 < v \leq 45$ | $45 < v \leq 50$ | $50 < v \leq 55$ | $55 < v \leq 60$ |
| Frequency | 10 | 17 | 33 | 42 | n | 16 |

(i) Find the value of n . [1]

(ii) Calculate an estimate of the mean speed. [4]

(c) Answer this part of this question on a sheet of graph paper.

Another frequency table for the same speeds is

| | | | |
|-------------------|------------------|------------------|------------------|
| Speed (v km/h) | $30 < v \leq 40$ | $40 < v \leq 55$ | $55 < v \leq 60$ |
| Frequency | 27 | 107 | 16 |

Draw an accurate histogram to show this information.

Use 2 cm to represent 5 units on the speed axis and 1 cm to represent 1 unit on the frequency density axis (so that 1 cm^2 represents 2.5 cars). [5]

8 $f(x) = x^2 - 4x + 3$ and $g(x) = 2x - 1$.

(a) Solve $f(x) = 0$. [2]

(b) Find $g^{-1}(x)$. [2]

(c) Solve $f(x) = g(x)$, giving your answers correct to 2 decimal places. [5]

(d) Find the value of $gf(-2)$. [2]

(e) Find $fg(x)$. Simplify your answer. [3]

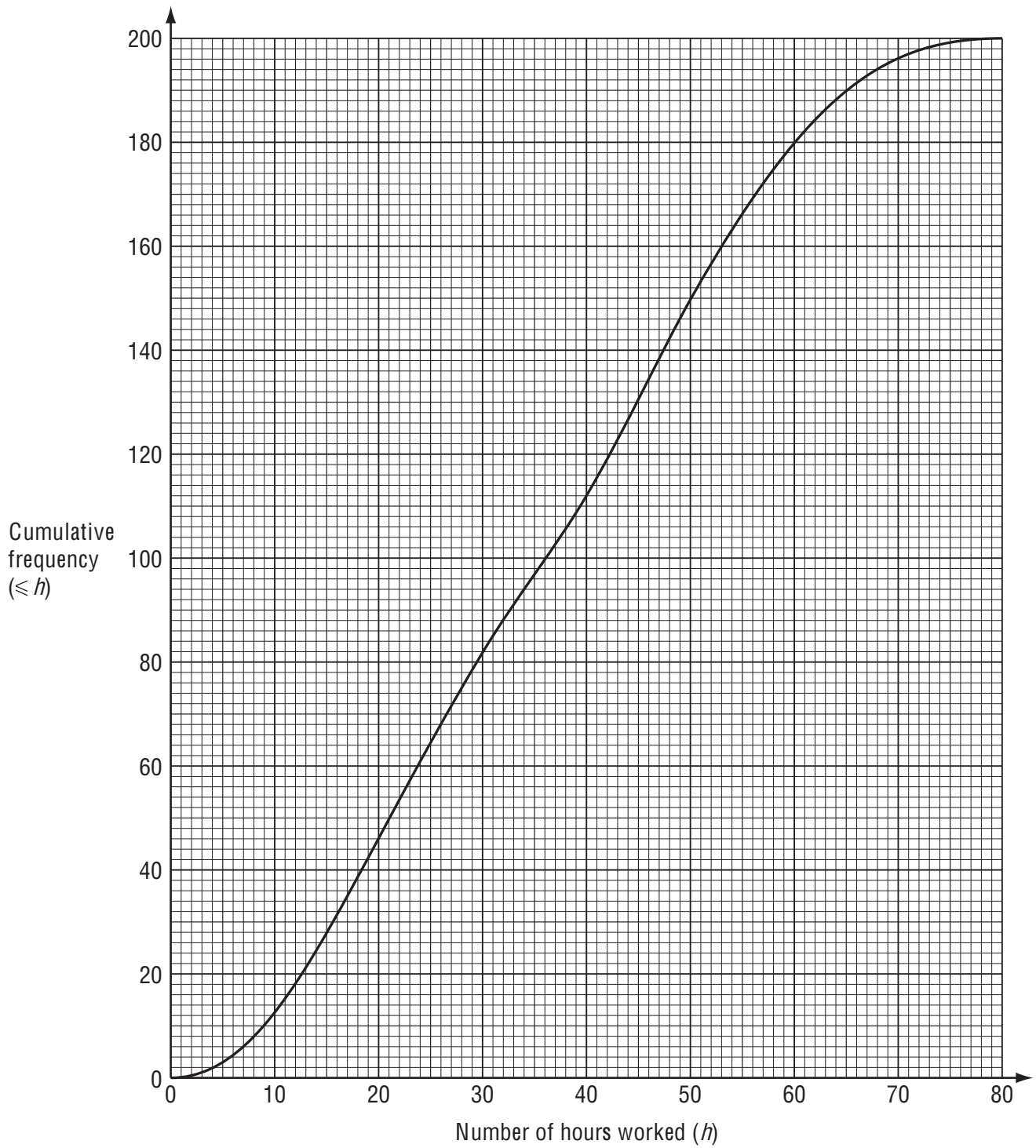
6 Answer the whole of this question on a sheet of graph paper.

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 40th 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]



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]

- 2 A normal die, numbered 1 to 6, is rolled 50 times.



The results are shown in the frequency table.

| | | | | | | |
|-----------|----|----|---|---|---|---|
| Score | 1 | 2 | 3 | 4 | 5 | 6 |
| Frequency | 15 | 10 | 7 | 5 | 6 | 7 |

- (a) Write down the modal score.

Answer(a) [1]

- (b) Find the median score.

Answer(b) [1]

- (c) Calculate the mean score.

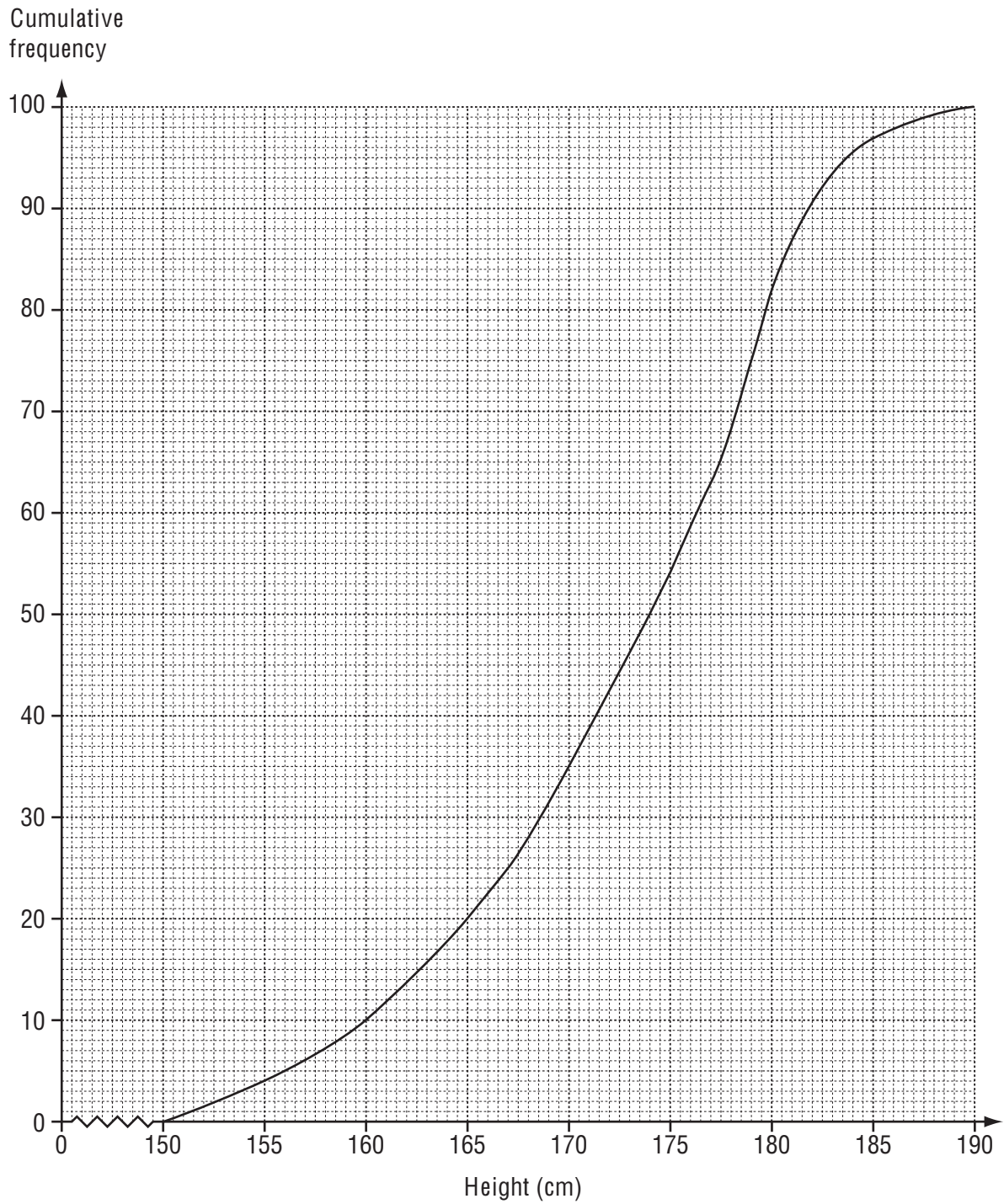
Answer(c) [2]

- (d) The die is then rolled another 10 times.
The mean score for the 60 rolls is 2.95.
Calculate the mean score for the extra 10 rolls.

Answer(d) [3]

9 The heights of 100 students are measured.

The results have been used to draw this cumulative frequency diagram.



(a) Find

(i) the median height,

Answer(a)(i) cm [1]

(ii) the lower quartile,

Answer(a)(ii) cm [1]

(iii) the inter-quartile range,

Answer(a)(iii) cm [1]

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

Answer(a)(iv) [2]

(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. [1]

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

Answer(b)(ii) cm [4]

- 2 40 students are asked about the number of people in their families.

The table shows the results.

| | | | | | | |
|----------------------------|---|---|----|----|---|---|
| Number of people in family | 2 | 3 | 4 | 5 | 6 | 7 |
| Frequency | 1 | 1 | 17 | 12 | 6 | 3 |

- (a) Find

- (i) the mode,

Answer(a)(i) [1]

- (ii) the median,

Answer(a)(ii) [1]

- (iii) the mean.

Answer(a)(iii) [3]

- (b) Another n students are asked about the number of people in their families.

The mean for these n students is 3.

Find, in terms of n , an expression for the mean number for all $(40 + n)$ students.

Answer(b) [2]

(i) Use the information from the histogram to complete the frequency table.

| | | | | | | |
|-------------------------|----------------|----------------|-----------------|------------------|------------------|------------------|
| Number of hours (h) | $0 < h \leq 5$ | $5 < h \leq 8$ | $8 < h \leq 10$ | $10 < h \leq 12$ | $12 < h \leq 16$ | $16 < h \leq 20$ |
| Frequency | | | | 20 | 24 | 10 |

[3]

(ii) Use the information in this table to calculate an estimate of the mean number of hours. Show your working.

Answer(b)(ii) hours [4]

- 8 30 students took a vocabulary test.
The marks they scored are shown below.

| | | | | | |
|---|---|---|----|----|---|
| 7 | 8 | 5 | 8 | 3 | 2 |
| 6 | 6 | 3 | 3 | 6 | 2 |
| 7 | 1 | 5 | 10 | 2 | 6 |
| 6 | 5 | 8 | 1 | 2 | 7 |
| 3 | 1 | 5 | 3 | 10 | 3 |

- (a) Complete the frequency table below.

The first five frequencies have been completed for you.
You may use the tally column to help you.

| Mark | Tally | Frequency |
|------|-------|-----------|
| 1 | | 3 |
| 2 | | 4 |
| 3 | | 6 |
| 4 | | 0 |
| 5 | | 4 |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

[3]

(b) (i) Find the range.

Answer(b)(i) [1]

(ii) Write down the mode.

Answer(b)(ii) [1]

(iii) Find the median.

Answer(b)(iii) [2]

(iv) Calculate the mean.

Answer(b)(iv) [3]

(c) A student is chosen at random.

Find the probability that the student scored

(i) 1 mark,

Answer(c)(i) [1]

(ii) 4 marks,

Answer(c)(ii) [1]

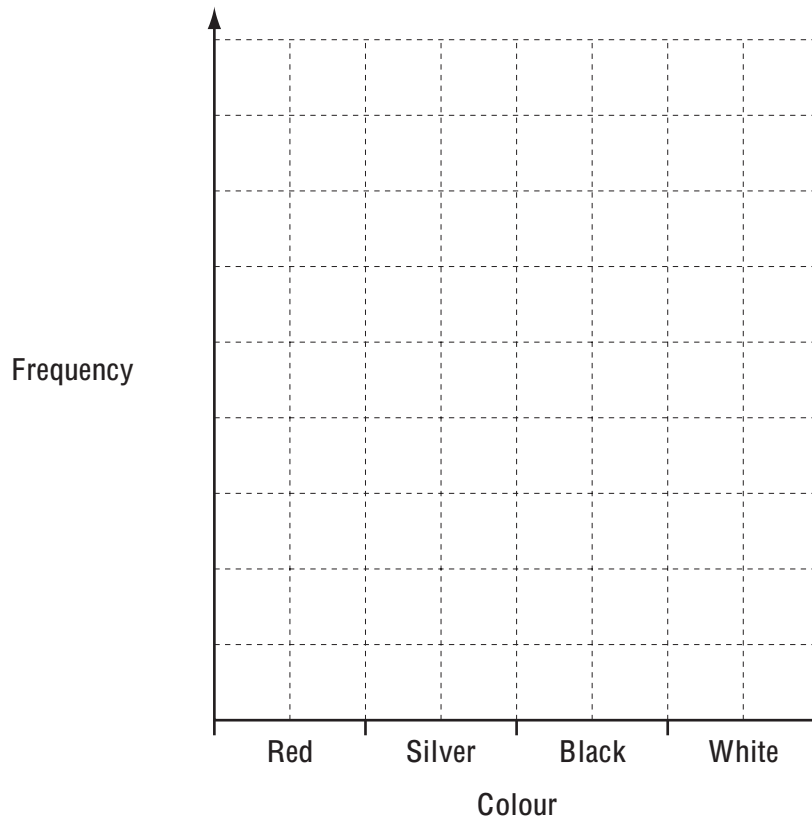
(iii) fewer than 6 marks.

Answer(c)(iii) [1]

3 The colours of 30 cars in a car park are shown in the frequency table.

| Colour | Frequency |
|--------|-----------|
| Red | 5 |
| Silver | 15 |
| Black | 6 |
| White | 4 |

(a) Complete the bar chart to represent this information.



[3]

(b) Write down the mode.

Answer(b) [1]

6 The number of ice-creams sold in a shop each month is shown in the table.

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Number of ice-creams sold | 1300 | 1200 | 1700 | 1800 | 2300 | 2500 | 2800 | 2600 | 1500 | 1600 | 1100 | 1900 |

(a) (i) Find the range.

Answer(a)(i) [1]

(ii) Calculate the mean.

Answer(a)(ii) [2]

(iii) Find the median.

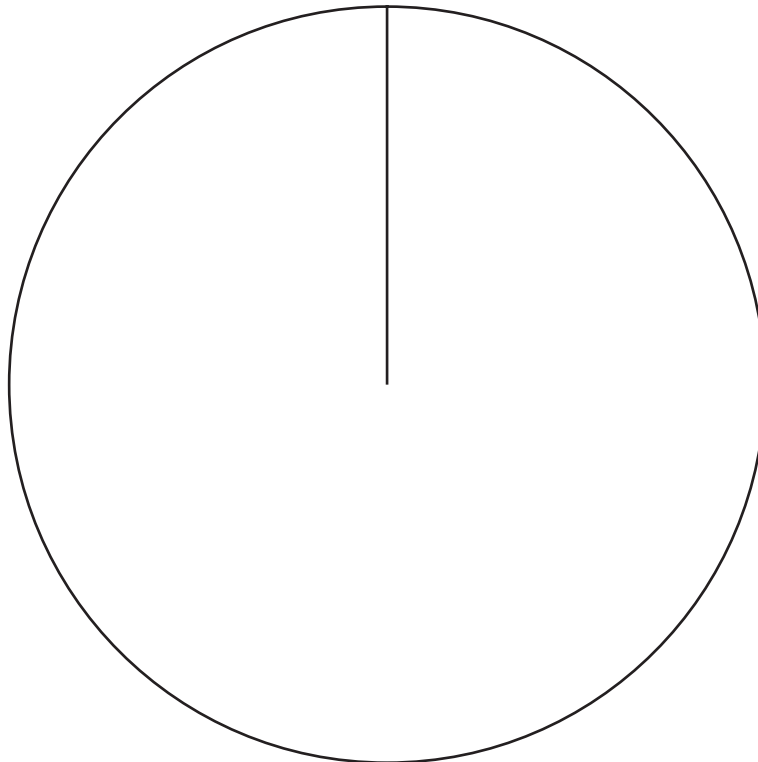
Answer(a)(iii) [2]

(b) The numbers of chocolate, strawberry and vanilla ice-creams sold are shown in the table.

| Flavour | Number of ice-creams | Pie chart sector angle |
|------------|----------------------|------------------------|
| Chocolate | 4200 | 140° |
| Strawberry | 3600 | |
| Vanilla | 3000 | |

(i) Complete the table by working out the sector angles for strawberry and vanilla. [3]

(ii) Complete the pie chart below and label the sectors.

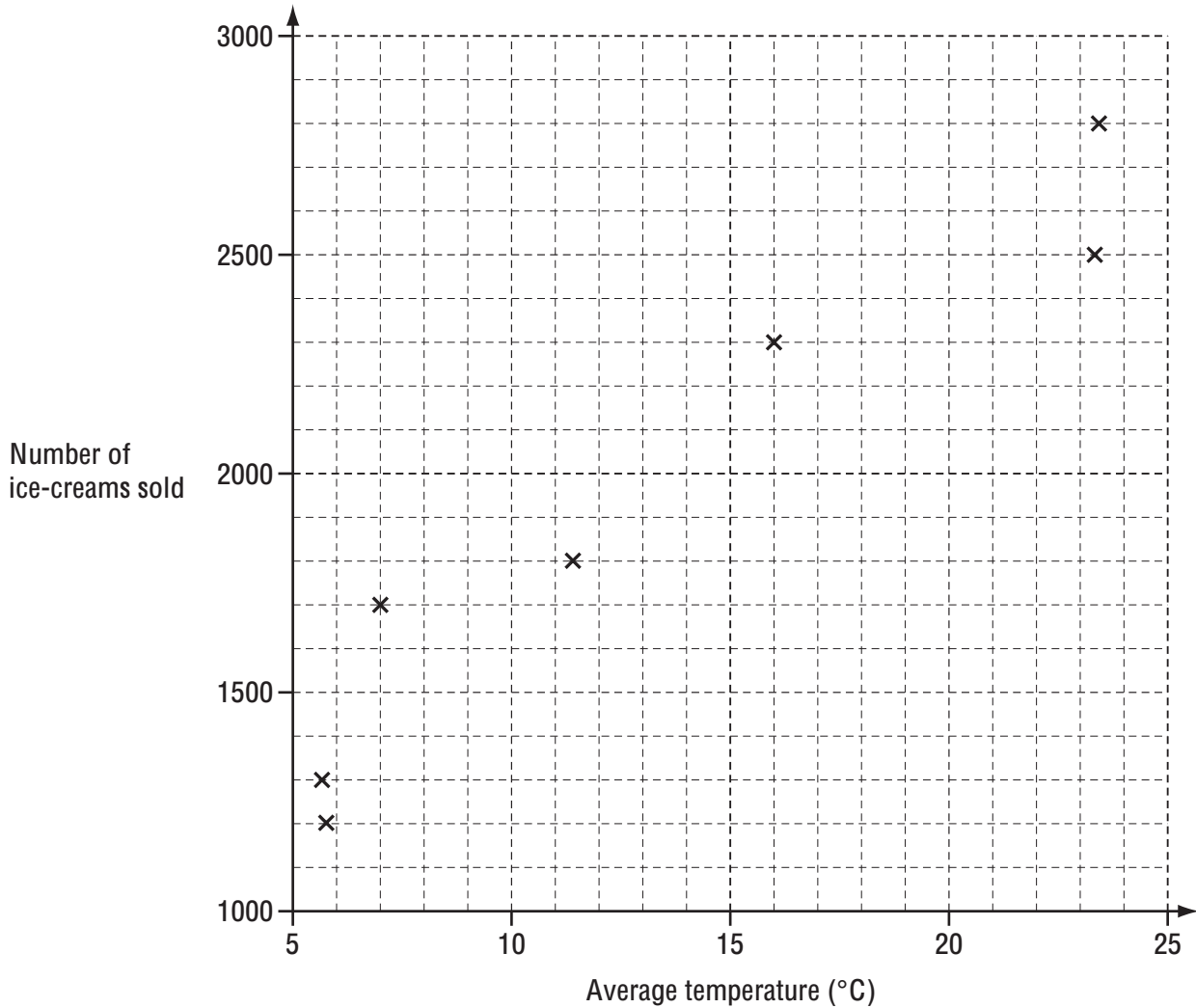


[2]

(c) The table shows the average temperature and the number of ice-creams sold each month.

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Temperature (°C) | 5.6 | 5.7 | 7.0 | 11.4 | 16.0 | 23.3 | 23.4 | 20.0 | 15.5 | 11.5 | 8.0 | 14.0 |
| Number of ice-creams sold | 1300 | 1200 | 1700 | 1800 | 2300 | 2500 | 2800 | 2600 | 1500 | 1600 | 1100 | 1900 |

(i) Complete the scatter diagram for the months August to December. The points for January to July are plotted for you.



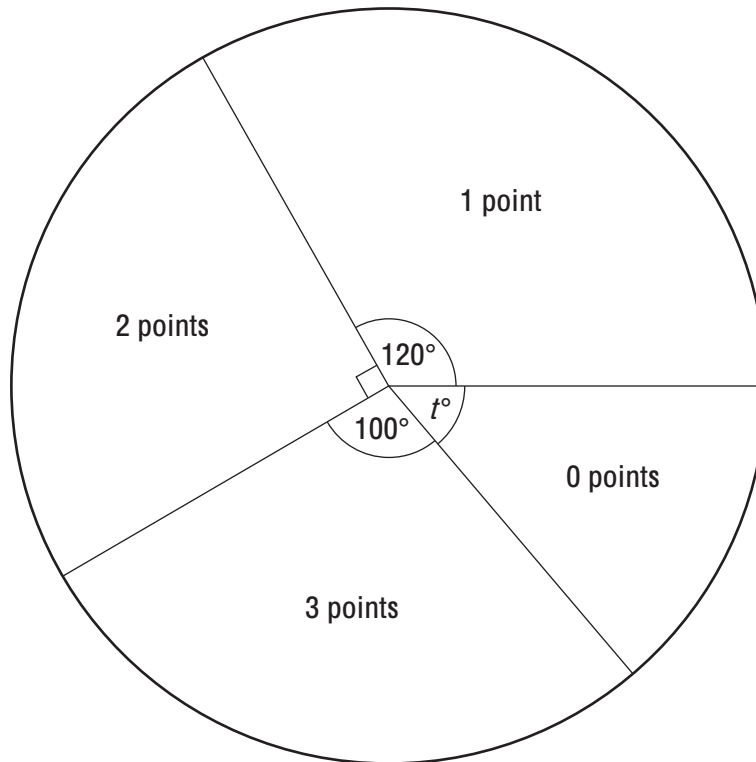
(ii) What type of correlation does the scatter diagram show? [2]

Answer(c)(ii) [1]

(iii) Write down a statement connecting the number of ice-creams sold to the average monthly temperature.

Answer(c)(iii) [1]

- 3 288 students took part in a quiz.
There were three questions in the quiz.
Each correct answer scored 1 point.
The pie chart shows the results.



- (a) Find the value of t .

Answer(a) $t =$ [1]

- (b) Find the number of students who scored 2 points.

Answer(b) [2]

- (c) Find the modal number of points.

Answer(c) [1]

- (d) (i) Use the information in the pie chart to complete the frequency table for the 288 students.

| | | | | |
|--------------------|---|---|---|---|
| Number of points | 0 | 1 | 2 | 3 |
| Number of students | | | | |

[2]

- (ii) Calculate the mean number of points.

Answer(d)(ii) [3]

- (e) One student is chosen at random.

Find the probability that this student scored

- (i) 3 points,

Answer(e)(i) [1]

- (ii) at least 1 point,

Answer(e)(ii) [2]

- (iii) more than 3 points.

Answer(e)(iii) [1]

- (f) 1440 students took part in the same quiz.

How many students would be expected to score 3 points?

Answer(f) [1]

- 8 The table below shows the marks scored by a group of students in a test.

| | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|
| Mark | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Frequency | 10 | 8 | 16 | 11 | 7 | 8 | 6 | 9 |

- (a) Find the mean, median and mode.

Answer(a) mean =

median =

mode = [6]

- (b) The table below shows the time (t minutes) taken by the students to complete the test.

| | | | | | | |
|--------------|-----------------|------------------|------------------|------------------|------------------|------------------|
| Time (t) | $0 < t \leq 10$ | $10 < t \leq 20$ | $20 < t \leq 30$ | $30 < t \leq 40$ | $40 < t \leq 50$ | $50 < t \leq 60$ |
| Frequency | 2 | 19 | 16 | 14 | 15 | 9 |

- (i) Cara rearranges this information into a new table.

Complete her table.

| | | | | |
|--------------|-----------------|------------------|------------------|------------------|
| Time (t) | $0 < t \leq 20$ | $20 < t \leq 40$ | $40 < t \leq 50$ | $50 < t \leq 60$ |
| Frequency | | | | 9 |

[2]

- (ii) Cara wants to draw a histogram to show the information in **part (b)(i)**.

Complete the table below to show the interval widths and the frequency densities.

| | | | | |
|-------------------|-----------------|------------------|------------------|------------------|
| | $0 < t \leq 20$ | $20 < t \leq 40$ | $40 < t \leq 50$ | $50 < t \leq 60$ |
| Interval width | | | | 10 |
| Frequency density | | | | 0.9 |

[3]

(c) **Some** of the students were asked how much time they spent revising for the test.

10 students revised for 2.5 hours, 12 students revised for 3 hours and n students revised for 4 hours.

The mean time that **these** students spent revising was 3.1 hours.

Find n .

Show all your working.

Answer(c) n = [4]

6

| | | | | | | |
|---------------------|-----------------|------------------|------------------|------------------|------------------|------------------|
| Time (t mins) | $0 < t \leq 20$ | $20 < t \leq 35$ | $35 < t \leq 45$ | $45 < t \leq 55$ | $55 < t \leq 70$ | $70 < t \leq 80$ |
| Frequency | 6 | 15 | 19 | 37 | 53 | 20 |

The table shows the times taken, in minutes, by 150 students to complete their homework on one day.

(a) (i) In which interval is the median time?

Answer(a)(i) [1]

(ii) Using the mid-interval values 10, 27.5,calculate an estimate of the mean time.

Answer(a)(ii) min [3]

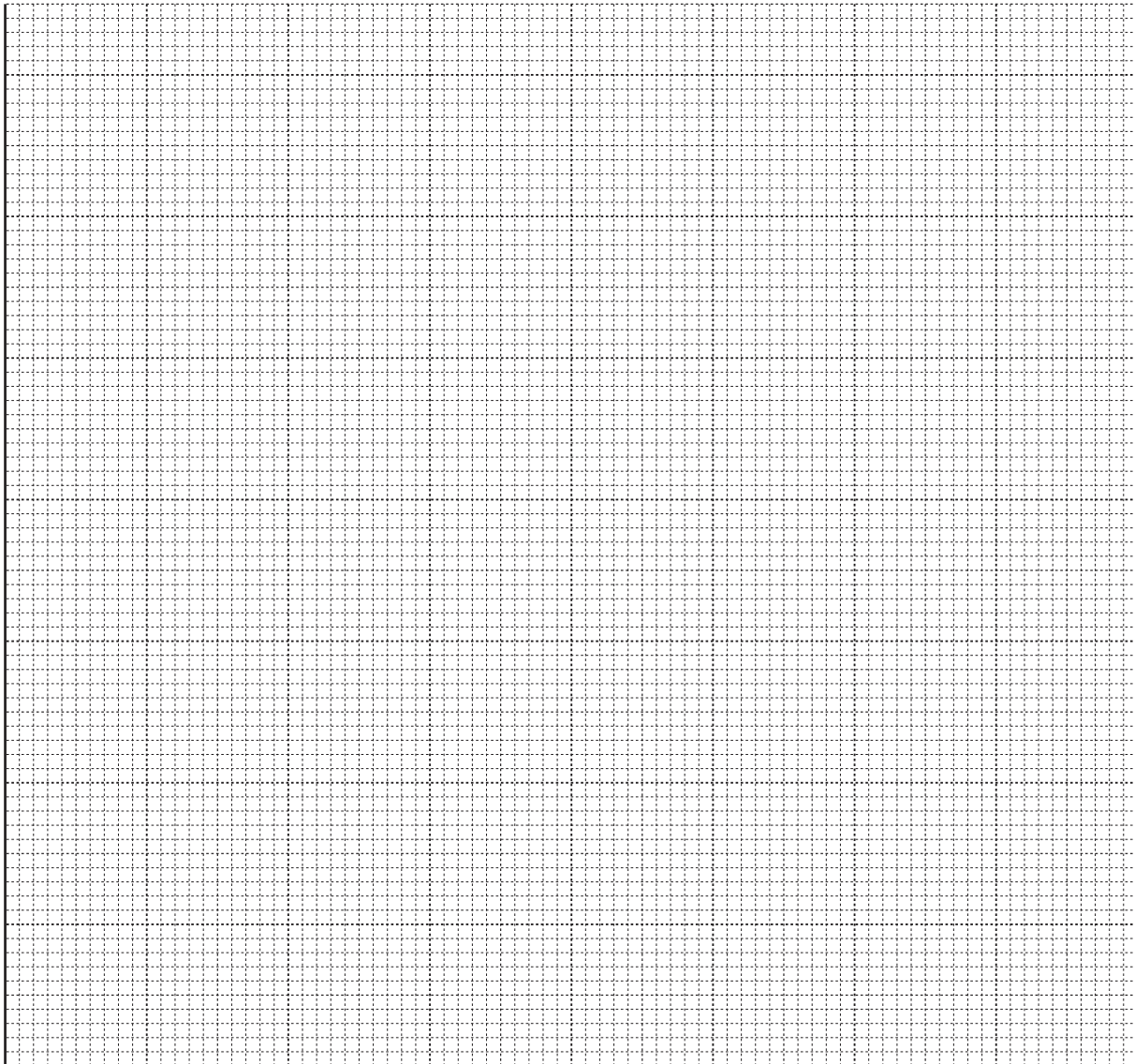
(b) (i) Complete the table of cumulative frequencies.

| | | | | | | |
|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Time (t mins) | $t \leq 20$ | $t \leq 35$ | $t \leq 45$ | $t \leq 55$ | $t \leq 70$ | $t \leq 80$ |
| Cumulative frequency | 6 | 21 | | | | |

[2]

(ii) On the grid, label the horizontal axis from 0 to 80, using the scale 1 cm represents 5 minutes and the vertical axis from 0 to 150, using the scale 1 cm represents 10 students.

Draw a cumulative frequency diagram to show this information. [5]



(c) Use your graph to estimate

(i) the median time, *Answer(c)(i)* min [1]

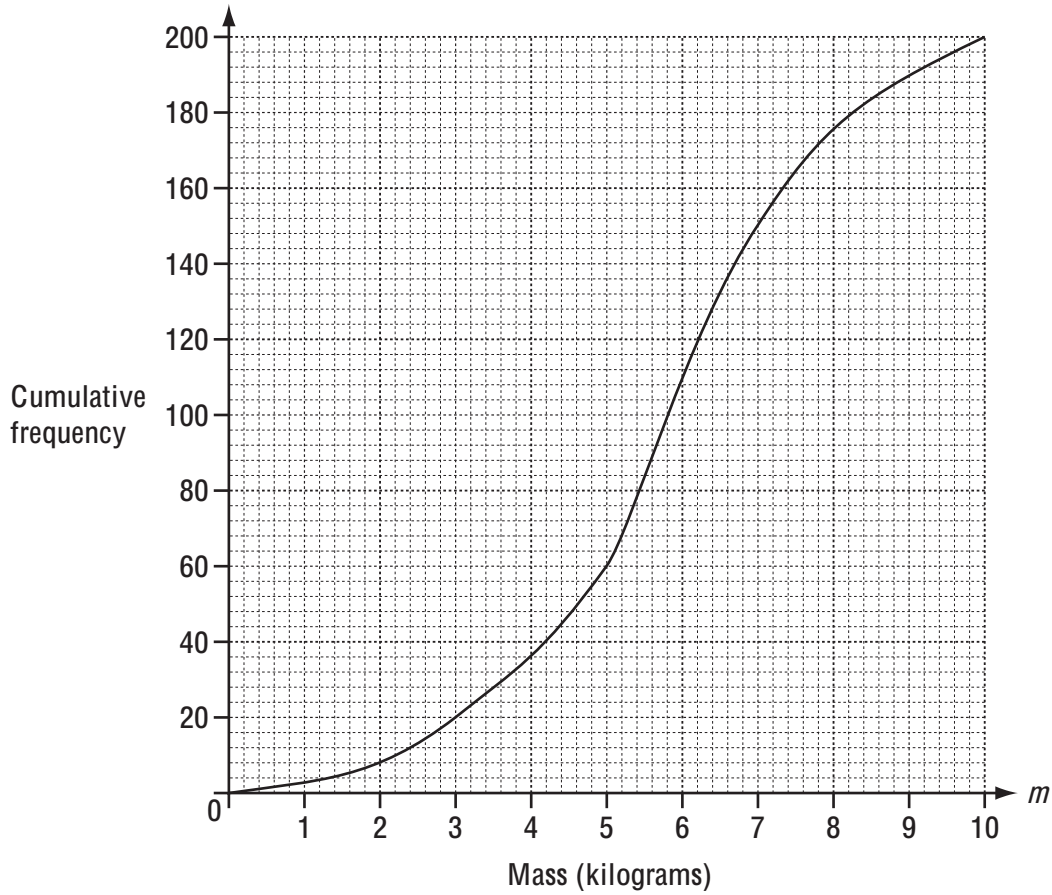
(ii) the inter-quartile range, *Answer(c)(ii)* min [2]

(iii) the number of students whose time was in the range $50 < t \leq 60$,
Answer(c)(iii) [1]

(iv) the probability, as a fraction, that a student, chosen at random, took longer than 50 minutes,
Answer(c)(iv) [2]

(v) the probability, as a fraction, that two students, chosen at random, both took longer than 50 minutes.
Answer(c)(v) [2]

6



The masses of 200 parcels are recorded.

The results are shown in the cumulative frequency diagram above.

(a) Find

(i) the median,

Answer(a)(i) kg [1]

(ii) the lower quartile,

Answer(a)(ii) kg [1]

(iii) the inter-quartile range,

Answer(a)(iii) kg [1]

(iv) the number of parcels with a mass greater than 3.5 kg.

Answer(a)(iv) [2]

- (b) (i) Use the information from the cumulative frequency diagram to complete the grouped frequency table.

| | | | | |
|-----------------|----------------|----------------|----------------|-----------------|
| Mass (m) kg | $0 < m \leq 4$ | $4 < m \leq 6$ | $6 < m \leq 7$ | $7 < m \leq 10$ |
| Frequency | 36 | | | 50 |

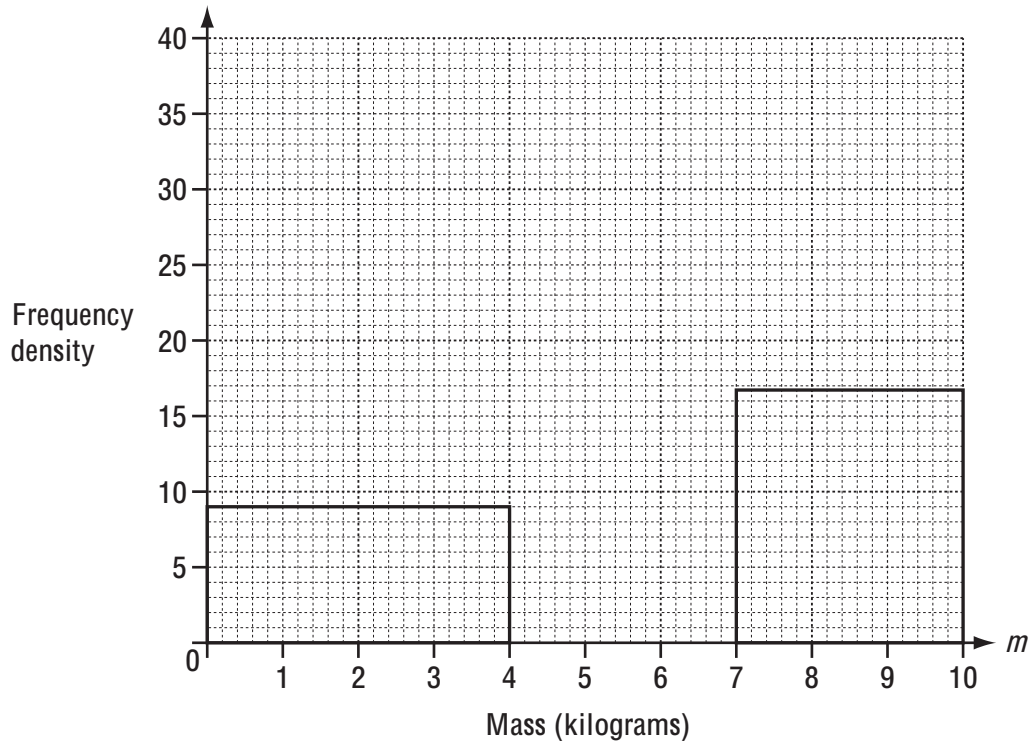
[2]

- (ii) Use the grouped frequency table to calculate an estimate of the mean.

Answer(b)(ii) kg [4]

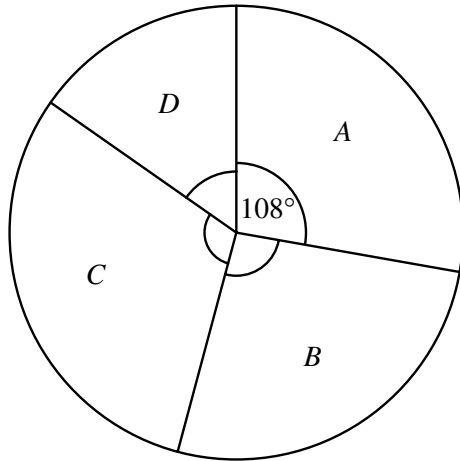
- (iii) Complete the frequency density table and use it to complete the histogram.

| | | | | |
|-------------------|----------------|----------------|----------------|-----------------|
| Mass (m) kg | $0 < m \leq 4$ | $4 < m \leq 6$ | $6 < m \leq 7$ | $7 < m \leq 10$ |
| Frequency density | 9 | | | 16.7 |



[4]

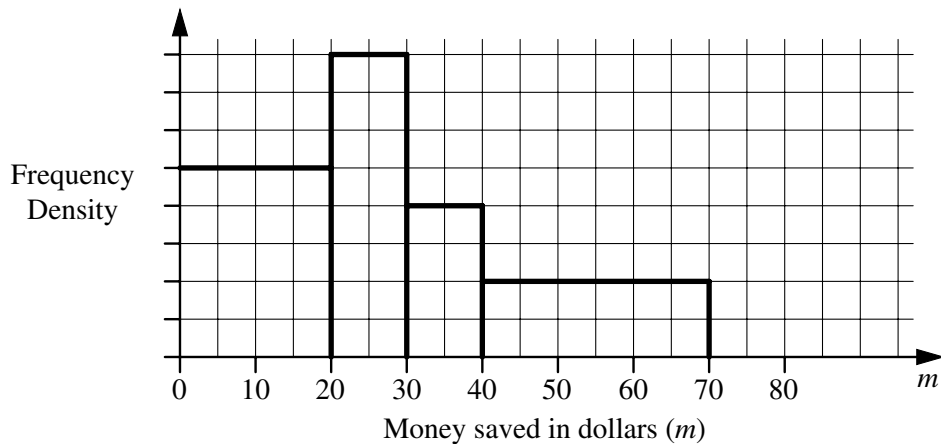
- 7 (a) A group of students sat an examination. Each student got one of the grades A , B , C or D . The pie chart shows these results.



NOT TO SCALE

36 students got grade A , shown by an angle of 108° .

- (i) Calculate the total number of students who sat the examination. [2]
- (ii) How many students did **not** get grade A ? [1]
- (iii) The ratio of the number of students getting grades B , C or D is $4 : 5 : 3$. Find the number of students getting each grade. [3]
- (iv) Work out the angles in the pie chart for grades B , C and D . [3]
- (v) Find the ratio, **in its lowest terms**, the number of students with grade A : the number of students with grade B . [1]
- (b) A group of children were asked how much money they had saved. The histogram and table show the results.



| | | | | |
|-----------------------|-----------------|------------------|------------------|------------------|
| Money saved (\$ m) | $0 < m \leq 20$ | $20 < m \leq 30$ | $30 < m \leq 40$ | $40 < m \leq 70$ |
| Frequency | 25 | p | q | r |

Use the histogram to calculate the values of p , q and r .

[4]

8 Answer the whole of this question on a sheet of graph paper.

120 passengers on an aircraft had their baggage weighed. The results are shown in the table.

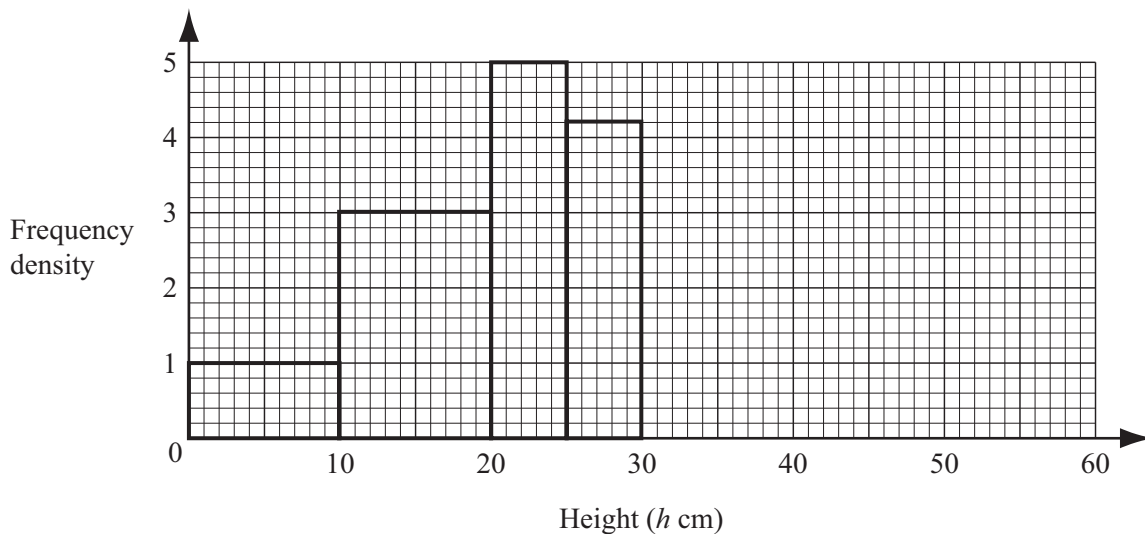
| | | | | | |
|---------------------------|-----------------|------------------|------------------|------------------|------------------|
| Mass of baggage (M kg) | $0 < M \leq 10$ | $10 < M \leq 15$ | $15 < M \leq 20$ | $20 < M \leq 25$ | $25 < M \leq 40$ |
| Number of passengers | 12 | 32 | 28 | 24 | 24 |

- (a) (i) Write down the modal class. [1]
- (ii) Calculate an estimate of the mean mass of baggage for the 120 passengers. Show all your working. [4]
- (iii) Sophia draws a pie chart to show the data.
What angle should she have in the $0 < M \leq 10$ sector? [1]
- (b) Using a scale of 2 cm to represent 5 kg, draw a horizontal axis for $0 < M \leq 40$.
Using an area scale of 1 cm^2 to represent 1 passenger, draw a histogram for this data. [7]
-

- 6 (a) Students are given marks 0, 1, 2, 3 or 4 for a piece of work. The table shows the number of students getting each mark.

| | | | | | |
|-----------|---|----|----|---|-----|
| Mark | 0 | 1 | 2 | 3 | 4 |
| Frequency | 3 | 10 | 12 | 9 | x |

- (i) The mean mark is 2.125.
Find the value of x . [4]
- (ii) Write down the lower quartile mark. [1]
- (b) The heights (h centimetres) of flowers in a shop are shown in the histogram below. All the flowers are less than 60 cm high. One bar has not been drawn on the histogram.



- (i) There are 25 flowers in the interval $20 < h \leq 25$.
How many flowers are there in the intervals
- (a) $25 < h \leq 30$, [1]
- (b) $10 < h \leq 20$? [1]
- (ii) There are 42 flowers in the interval $30 < h \leq 60$.
This can be shown by a single bar on the histogram.
Calculate the height of this bar. [2]
- (iii) Calculate an estimate of the mean height of the flowers. [3]

9

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 |
|--------------------|-----------|
| $120 < h \leq 130$ | 15 |
| $130 < h \leq 140$ | 24 |
| $140 < h \leq 150$ | 36 |
| $150 < h \leq 160$ | 45 |
| $160 < h \leq 170$ | 50 |
| $170 < h \leq 180$ | 43 |
| $180 < h \leq 190$ | 37 |
| $190 < h \leq 200$ | 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 |
|--------------|----------------------|
| $h \leq 120$ | 0 |
| $h \leq 130$ | p |
| $h \leq 140$ | q |
| $h \leq 150$ | r |
| $h \leq 160$ | 120 |
| $h \leq 170$ | 170 |
| $h \leq 180$ | 213 |
| $h \leq 190$ | 250 |
| $h \leq 200$ | 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]

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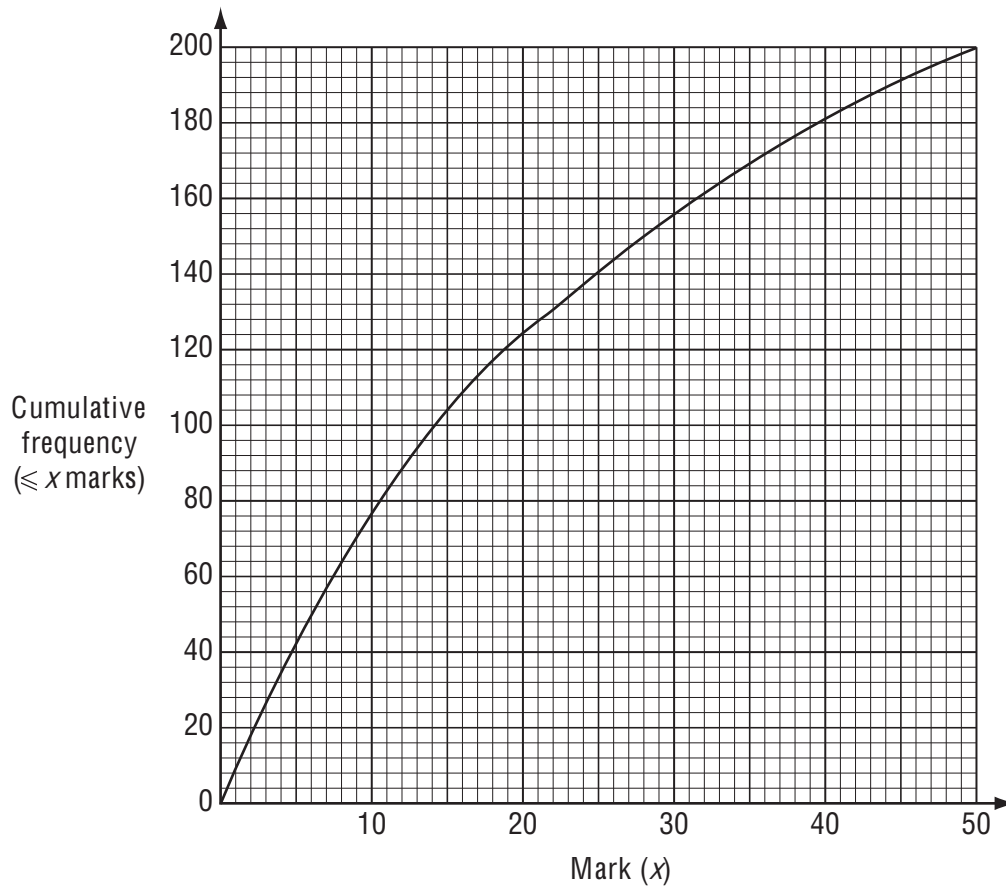
University of Cambridge International Examinations is part of the University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

- 7 (a) The quiz scores of a class of n students are shown in the table.

| | | | | |
|--------------------------------|---|---|-----|---|
| Quiz score | 6 | 7 | 8 | 9 |
| Frequency (number of students) | 9 | 3 | a | 5 |

The mean score is 7.2. Find

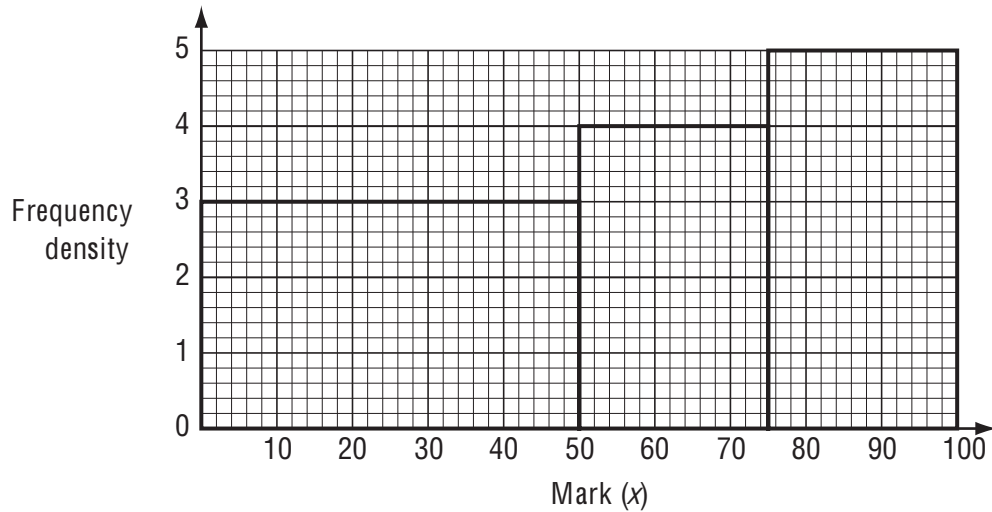
- (i) a , [3]
 (ii) n , [1]
 (iii) the median score. [1]
- (b) 200 students take a mathematics test.
 The cumulative frequency diagram shows the results.



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]
 (vi) the number of students scoring more than 25 marks. [1]

- (c) Another group of students takes an English test.
The results are shown in the histogram.



100 students score marks in the range $50 < x \leq 75$.

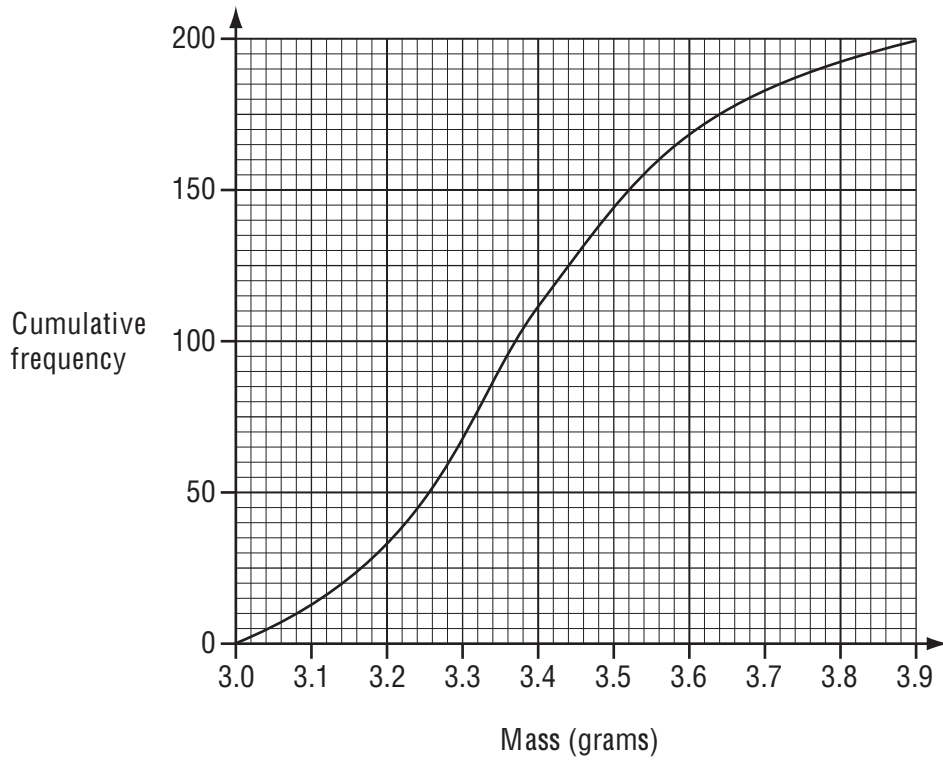
- (i) How many students score marks in the range $0 < x \leq 50$? [1]
- (ii) How many students score marks in the range $75 < x \leq 100$? [1]
- (iii) Calculate an estimate of the mean mark of this group of students. [4]

- 8 (a) The surface area, A , of a cylinder, radius r and height h , is given by the formula

$$A = 2\pi rh + 2\pi r^2.$$

- (i) Calculate the surface area of a cylinder of radius 5 cm and height 9 cm. [2]
- (ii) Make h the subject of the formula. [2]
- (iii) A cylinder has a radius of 6 cm and a surface area of 377 cm^2 .
Calculate the height of this cylinder. [2]
- (iv) A cylinder has a surface area of 1200 cm^2 and its radius and height are equal.
Calculate the radius. [3]
- (b) (i) On Monday a shop receives \$60.30 by selling bottles of water at 45 cents each.
How many bottles are sold? [1]
- (ii) On Tuesday the shop receives x cents by selling bottles of water at 45 cents each.
In terms of x , how many bottles are sold? [1]
- (iii) On Wednesday the shop receives $(x - 75)$ cents by selling bottles of water at 48 cents each.
In terms of x , how many bottles are sold? [1]
- (iv) The number of bottles sold on Tuesday was 7 more than the number of bottles sold on Wednesday.
Write down an equation in x and solve your equation. [4]

- 19 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]

2 (a)

| | | | | | | | |
|--------------------|---|---|---|---|---|---|---|
| Grade | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Number of students | 1 | 2 | 4 | 7 | 4 | 8 | 2 |

The table shows the grades gained by 28 students in a history test.

- (i) Write down the mode. [1]
- (ii) Find the median. [1]
- (iii) Calculate the mean. [3]
- (iv) Two students are chosen at random.
Calculate the probability that they both gained grade 5. [2]
- (v) From all the students who gained grades 4 or 5 or 6 or 7, two are chosen at random.
Calculate the probability that they both gained grade 5. [2]
- (vi) Students are chosen at random, one by one, from the original 28, until the student chosen has a grade 5.
Calculate the probability that this is the third student chosen. [2]
- (b) Claude goes to school by bus.
The probability that the bus is late is 0.1 .
If the bus is late, the probability that Claude is late to school is 0.8 .
If the bus is not late, the probability that Claude is late to school is 0.05 .
- (i) Calculate the probability that the bus is late and Claude is late to school. [1]
- (ii) Calculate the probability that Claude is late to school. [3]
- (iii) The school term lasts 56 days.
How many days would Claude expect to be late? [1]
-

- 6 (a) Each student in a class is given a bag of sweets.

The students note the number of sweets in their bag.

The results are shown in the table, where $0 \leq x < 10$.

| | | | |
|----------------------------|----|----|-----|
| Number of sweets | 30 | 31 | 32 |
| Frequency (number of bags) | 10 | 7 | x |

- (i) State the mode. [1]
- (ii) Find the possible values of the median. [3]
- (iii) The mean number of sweets is 30.65.

Find the value of x . [3]

- (b) The mass, m grams, of each of 200 chocolates is noted and the results are shown in the table.

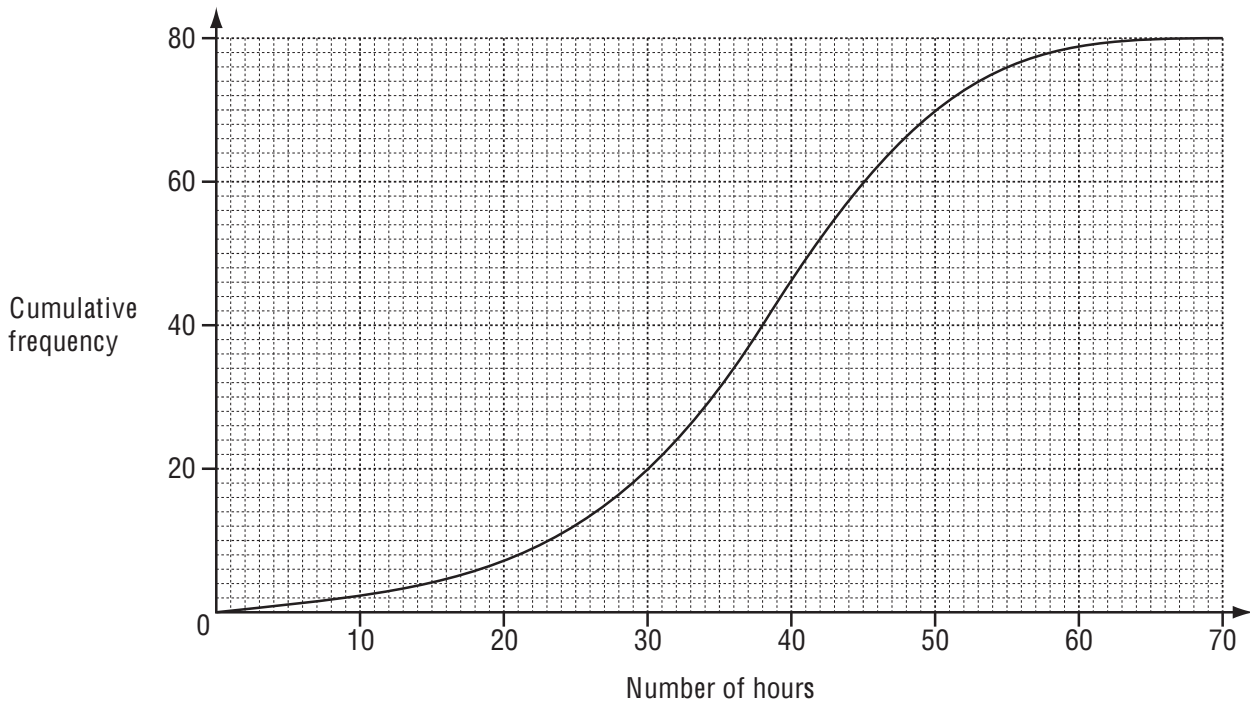
| | | | | |
|-------------------|------------------|------------------|------------------|------------------|
| Mass (m grams) | $10 < m \leq 20$ | $20 < m \leq 22$ | $22 < m \leq 24$ | $24 < m \leq 30$ |
| Frequency | 35 | 115 | 26 | 24 |

- (i) Calculate an estimate of the mean mass of a chocolate. [4]
- (ii) On a histogram, the height of the column for the $20 < m \leq 22$ interval is 11.5 cm.

Calculate the heights of the other three columns.

Do not draw the histogram. [5]

- 20 The number of hours that a group of 80 students spent using a computer in a week was recorded. The results are shown by the cumulative frequency curve.



Use the cumulative frequency curve to find

- (a) the median,

Answer(a) h [1]

- (b) the upper quartile,

Answer(b) h [1]

- (c) the interquartile range,

Answer(c) h [1]

- (d) the number of students who spent more than 50 hours using a computer in a week.

Answer(d) [2]

8 Fifty students are timed when running one kilometre.

The results are shown in the table.

| | | | | | | |
|------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Time (t minutes) | $4.0 < t \leq 4.5$ | $4.5 < t \leq 5.0$ | $5.0 < t \leq 5.5$ | $5.5 < t \leq 6.0$ | $6.0 < t \leq 6.5$ | $6.5 < t \leq 7.0$ |
| Frequency | 2 | 7 | 8 | 18 | 10 | 5 |

(a) Write down the modal time interval.

Answer(a) min [1]

(b) Calculate an estimate of the mean time.

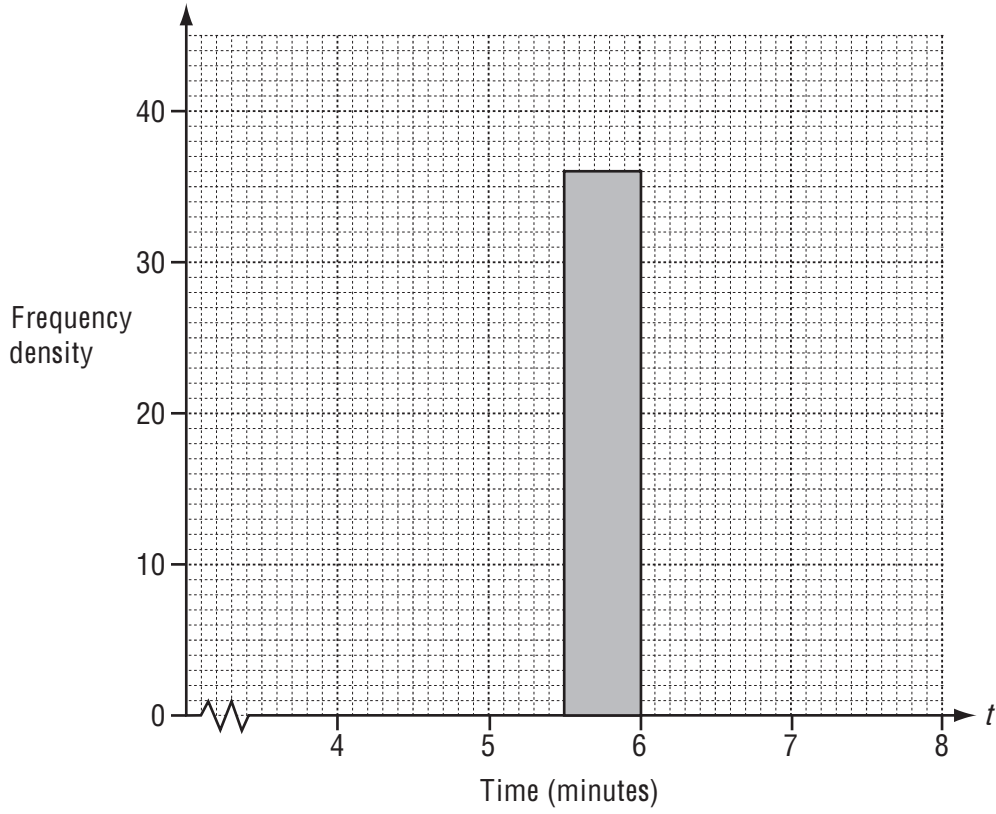
Answer(b) min [4]

(c) A new frequency table is made from the results shown in the table above.

| | | | |
|------------------------|--------------------|--------------------|--------------------|
| Time (t minutes) | $4.0 < t \leq 5.5$ | $5.5 < t \leq 6.0$ | $6.0 < t \leq 7.0$ |
| Frequency | | 18 | |

(i) Complete the table by filling in the two empty boxes. [1]

- (ii) On the grid below, complete an accurate histogram to show the information in this new table.



[3]

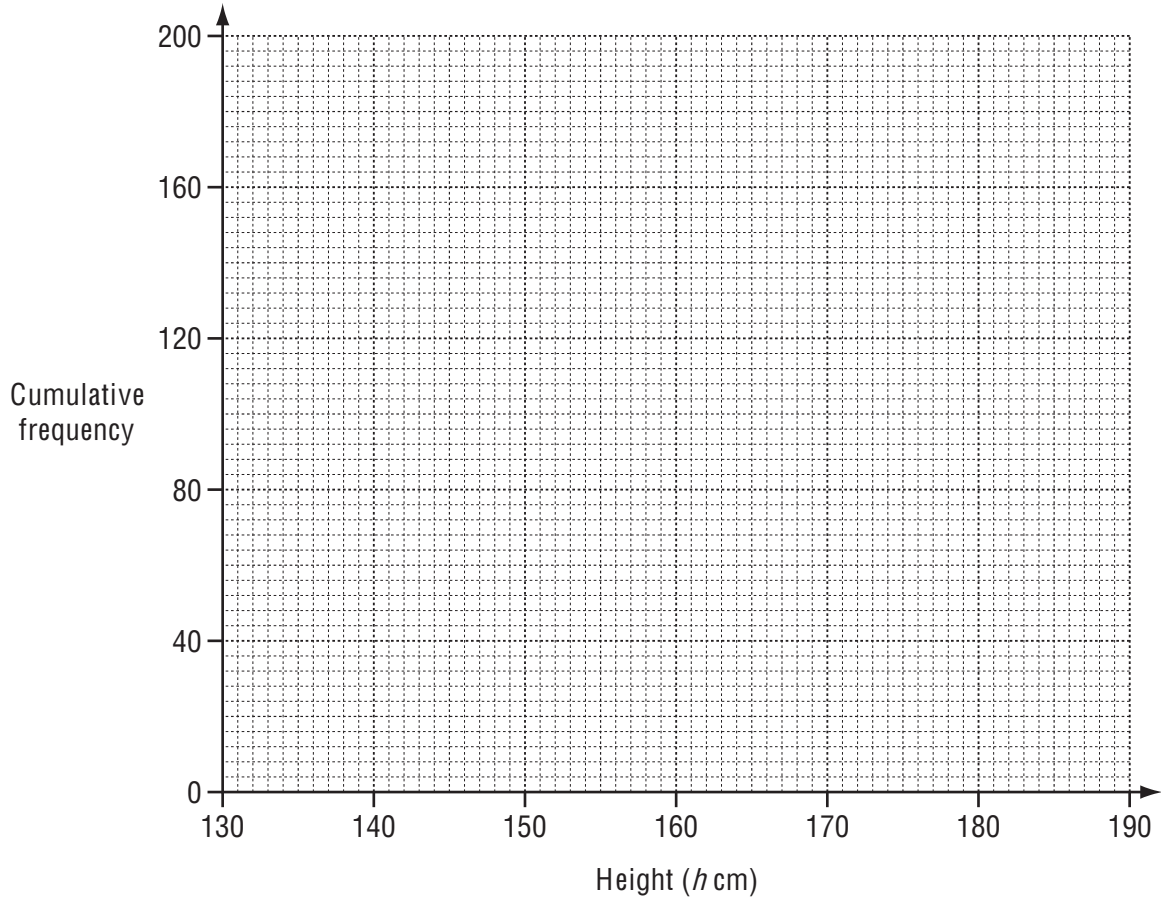
- (iii) Find the number of students represented by 1 cm^2 on the histogram.

Answer(c)(iii) [1]

5 The cumulative frequency table shows the distribution of heights, h centimetres, of 200 students.

| | | | | | | | | |
|----------------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Height (h cm) | ≤ 130 | ≤ 140 | ≤ 150 | ≤ 160 | ≤ 165 | ≤ 170 | ≤ 180 | ≤ 190 |
| Cumulative frequency | 0 | 10 | 50 | 95 | 115 | 145 | 180 | 200 |

(a) Draw a cumulative frequency diagram to show the information in the table.



[4]

(b) Use your diagram to find

(i) the median,

Answer(b)(i) cm [1]

(ii) the upper quartile,

Answer(b)(ii) cm [1]

(iii) the interquartile range.

Answer(b)(iii) cm [1]

(c) (i) One of the 200 students is chosen at random.

Use the table to find the probability that the height of this student is greater than 170 cm.
Give your answer as a fraction.

Answer(c)(i) [1]

- (ii) One of the 200 students is chosen at random and then a second student is chosen at random from the remaining students.

Calculate the probability that one has a height greater than 170 cm and the other has a height of 140 cm or less.

Give your answer as a fraction.

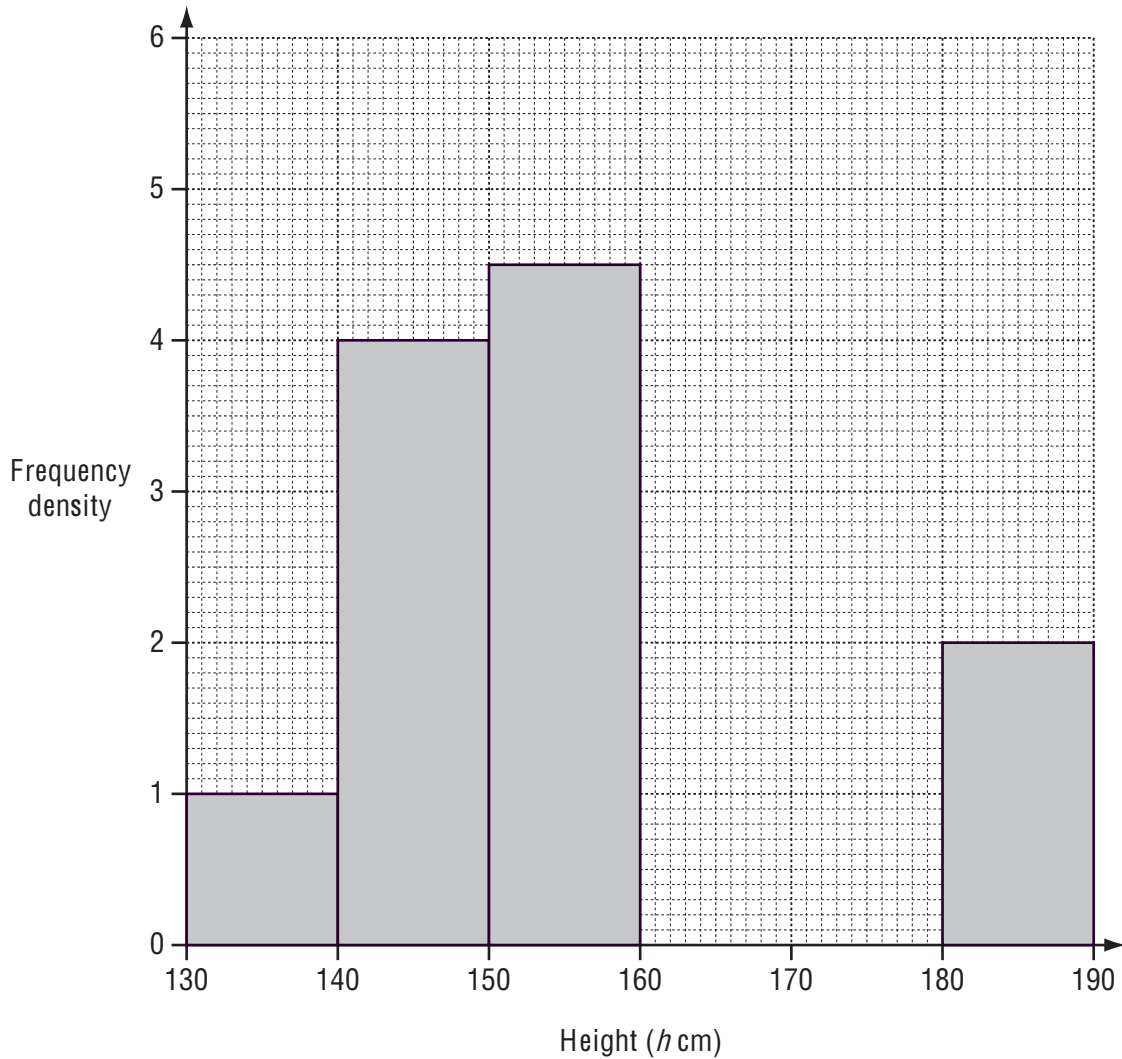
Answer(c)(ii) [3]

- (d) (i) Complete this frequency table which shows the distribution of the heights of the 200 students.

| Height (h cm) | $130 < h \leq 140$ | $140 < h \leq 150$ | $150 < h \leq 160$ | $160 < h \leq 165$ | $165 < h \leq 170$ | $170 < h \leq 180$ | $180 < h \leq 190$ |
|------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Frequency | 10 | 40 | 45 | 20 | | | |

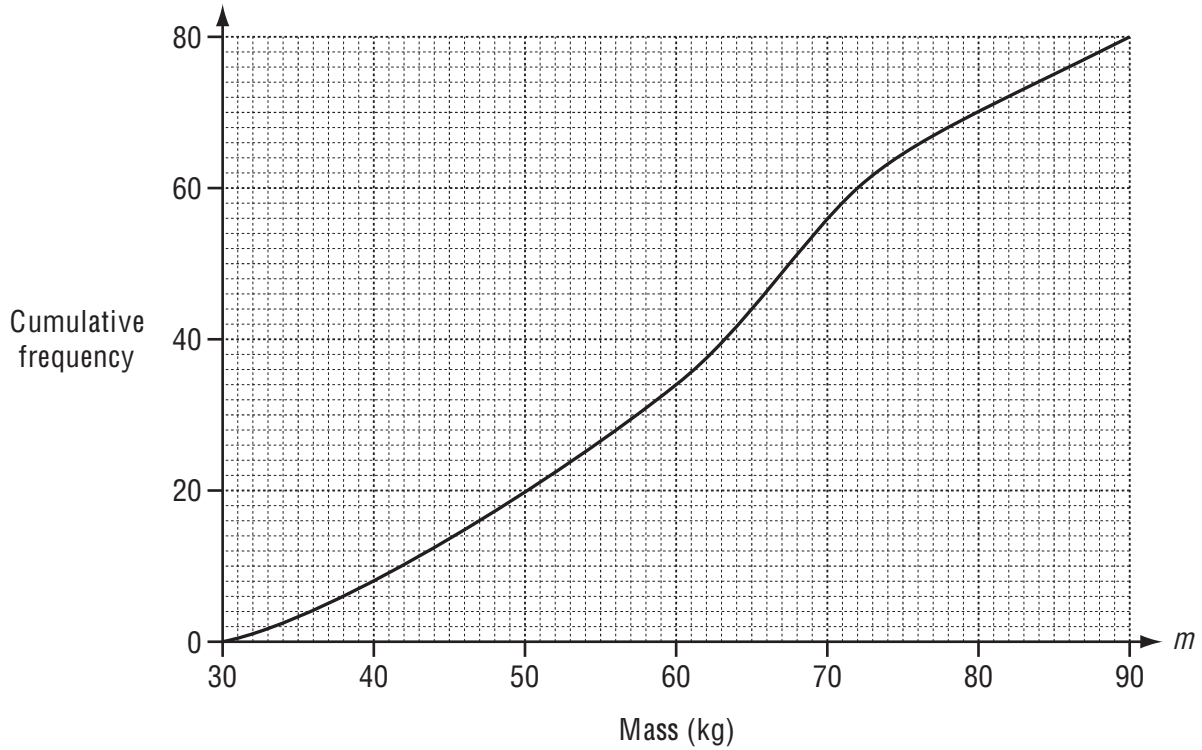
[2]

- (ii) Complete this histogram to show the distribution of the heights of the 200 students.



[3]

- 3 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]

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

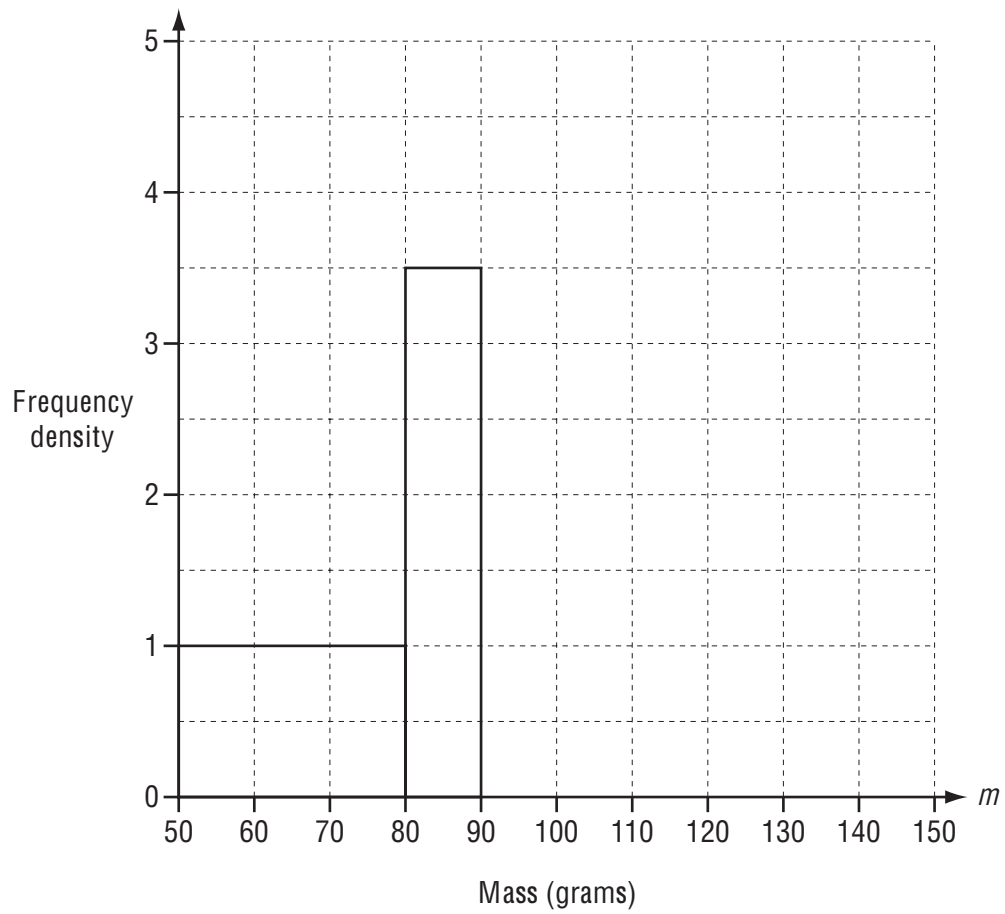
| Mass, m | Frequency |
|------------------|-----------|
| $30 < m \leq 40$ | 8 |
| $40 < m \leq 50$ | |
| $50 < m \leq 60$ | 14 |
| $60 < m \leq 70$ | 22 |
| $70 < m \leq 80$ | |
| $80 < m \leq 90$ | 10 |

[2]

(ii) Calculate an estimate of the mean mass.

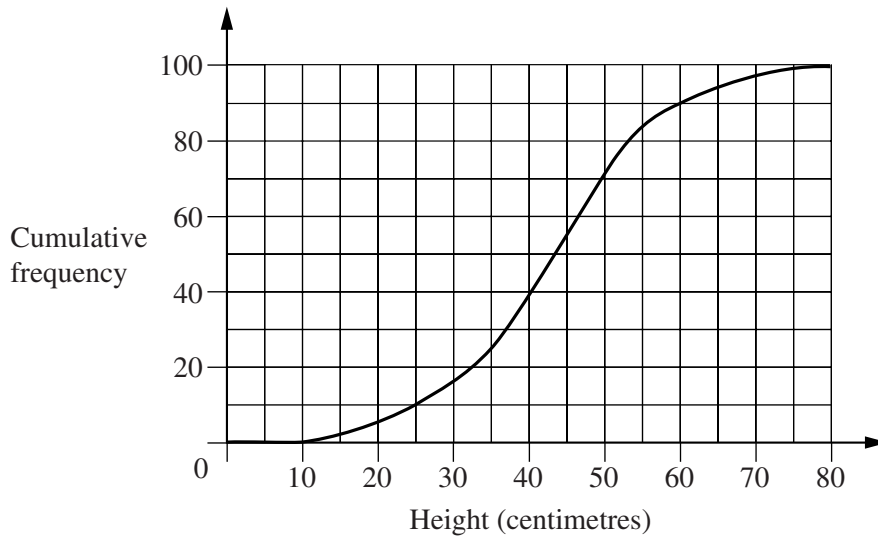
Answer(c)(ii) kg [4]

(ii) On the grid, complete the histogram to show the information in the table.



[4]

13



The cumulative frequency diagram shows the height of plants measured in an experiment. From the diagram, estimate

(a) (i) the lower quartile,

Answer (a)(i)cm [1]

(ii) the inter-quartile range,

Answer (a) (ii)cm [1]

(b) the number of plants with a height **greater than** 25 cm.

Answer (b) [1]

14 For a holiday in 1998, Stefan wanted to change 250 Cypriot pounds (£) into Greek Drachma. He first had to pay a bank charge of $1\frac{1}{2}\%$ of the £250. He then changed the remaining pounds into Drachma at a rate of £1 = 485 Drachma. Calculate how many Drachma Stefan received, giving your answer to the nearest 10.

AnswerDrachma [3]