Mathematics

Paper 4

Statistics

2 The heights, h metres, of the 120 boys in an athletics club are recorded.
The table shows information about the heights of the boys.

Height (h metres)	$1.3 < h \leqslant 1.4$	$1.4 < h \leqslant 1.5$	$1.5 < h \leqslant 1.6$	$1.6 < h \leqslant 1.7$	$1.7 < h \leqslant 1.8$	$1.8 < h \leqslant 1.9$
Frequency	7	18	30	24	27	14

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

..... $< h \leqslant$ ..... [1]

(ii) Calculate an estimate of the mean height.

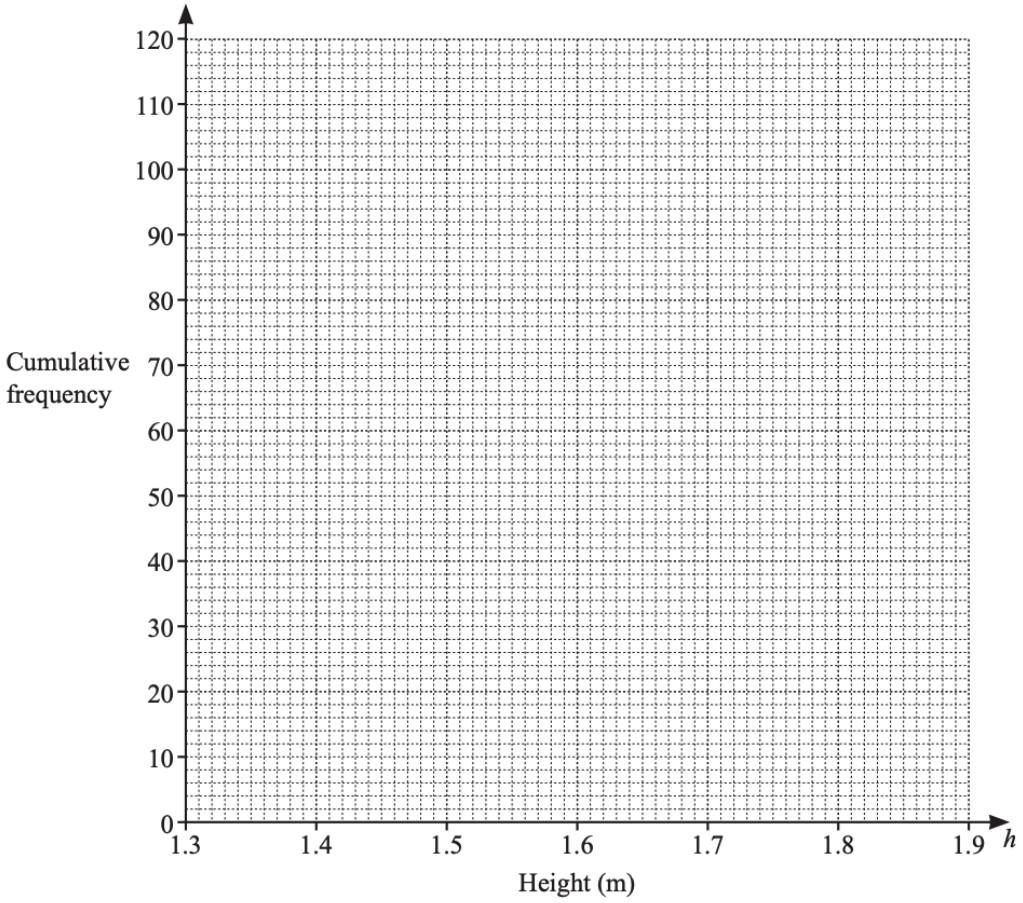
..... m [4]

(c) (i) Use the frequency table on page 4 to complete the cumulative frequency table.

Height (h metres)	$h \leqslant 1.4$	$h \leqslant 1.5$	$h \leqslant 1.6$	$h \leqslant 1.7$	$h \leqslant 1.8$	$h \leqslant 1.9$
Cumulative frequency	7	25				

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.



[3]

(d) Use your diagram to find an estimate for

(i) the median height,

..... m [1]

(ii) the 40th percentile.

3 The speed, v km/h, of each of 200 cars passing a building is measured.
The table shows the results.

Speed (v km/h)	$0 < v \leqslant 20$	$20 < v \leqslant 40$	$40 < v \leqslant 45$	$45 < v \leqslant 50$	$50 < v \leqslant 60$	$60 < v \leqslant 80$
Frequency	16	34	62	58	26	4

(a) Calculate an estimate of the mean.

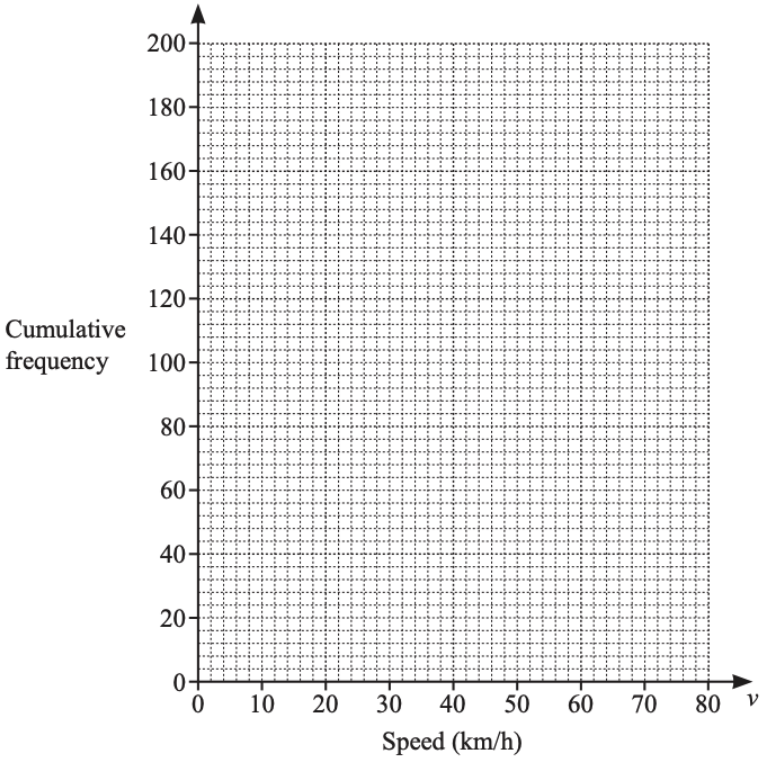
..... km/h [4]

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

Speed (v km/h)	$v \leqslant 20$	$v \leqslant 40$	$v \leqslant 45$	$v \leqslant 50$	$v \leqslant 60$	$v \leqslant 80$
Cumulative frequency	16	50			196	200

[1]

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



[3]

(iii) Use your diagram to find an estimate of

(a) the upper quartile,

..... km/h [1]

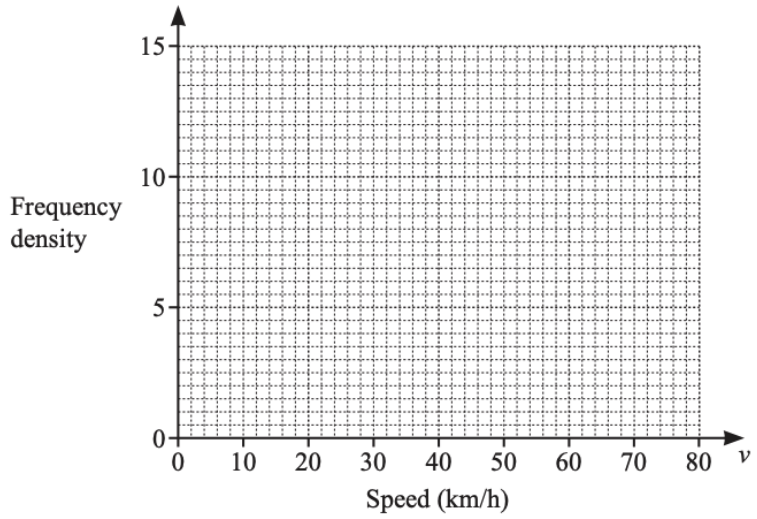
(b) the number of cars with a speed greater than 35 km/h.

..... [2]

(d) A new frequency table is made by combining intervals.

Speed (v km/h)	$0 < v \leqslant 40$	$40 < v \leqslant 50$	$50 < v \leqslant 80$
Frequency	50	120	30

On the grid, draw a histogram to show the information in this table.

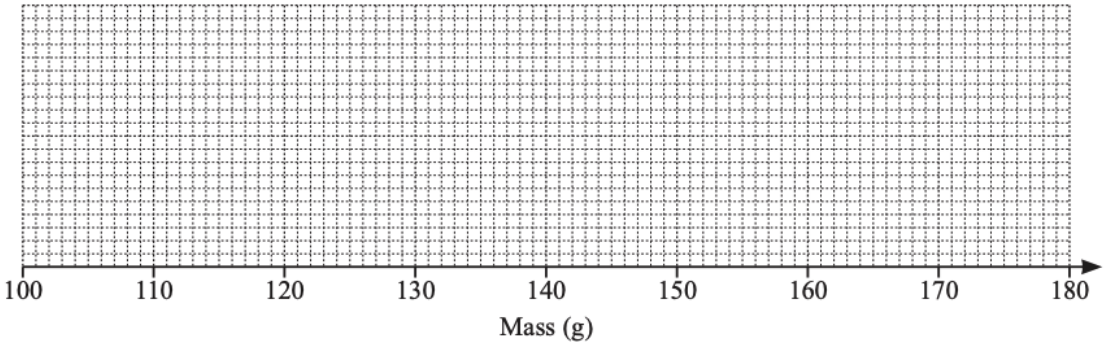


[3]

3 **(a)** Here is some information about the masses of potatoes in a sack:

- The largest potato has a mass of 174 g.
- The range is 69 g.
- The median is 148 g.
- The lower quartile is 121 g.
- The interquartile range is 38 g.

On the grid below, draw a box-and-whisker plot to show this information.



[4]

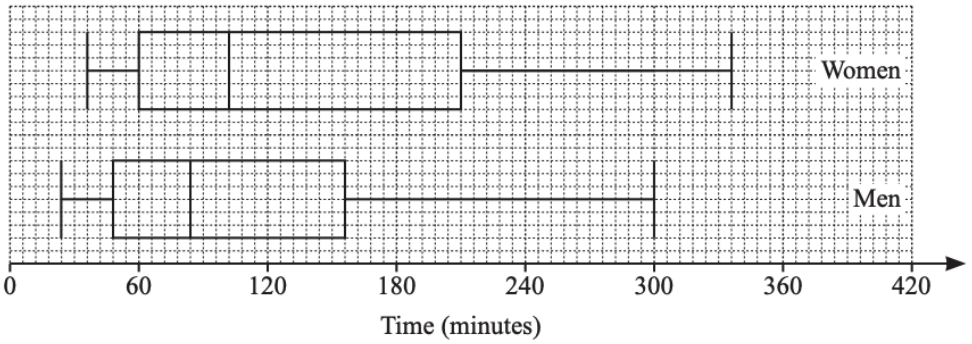
(b) The table shows the marks scored by some students in a test.

Mark	5	6	7	8	9	10
Frequency	8	2	12	2	0	1

Calculate the mean mark.

..... [3]

3 **(a)**



The box-and-whisker plots show the times spent exercising in one week by a group of women and a group of men.

Below are two statements comparing these times.
For each one, write down whether you agree or disagree, giving a reason for your answer.

Statement	Agree or disagree	Reason
On average, the women spent less time exercising than the men.		
The times for the women show less variation than the times for the men.		

[2]

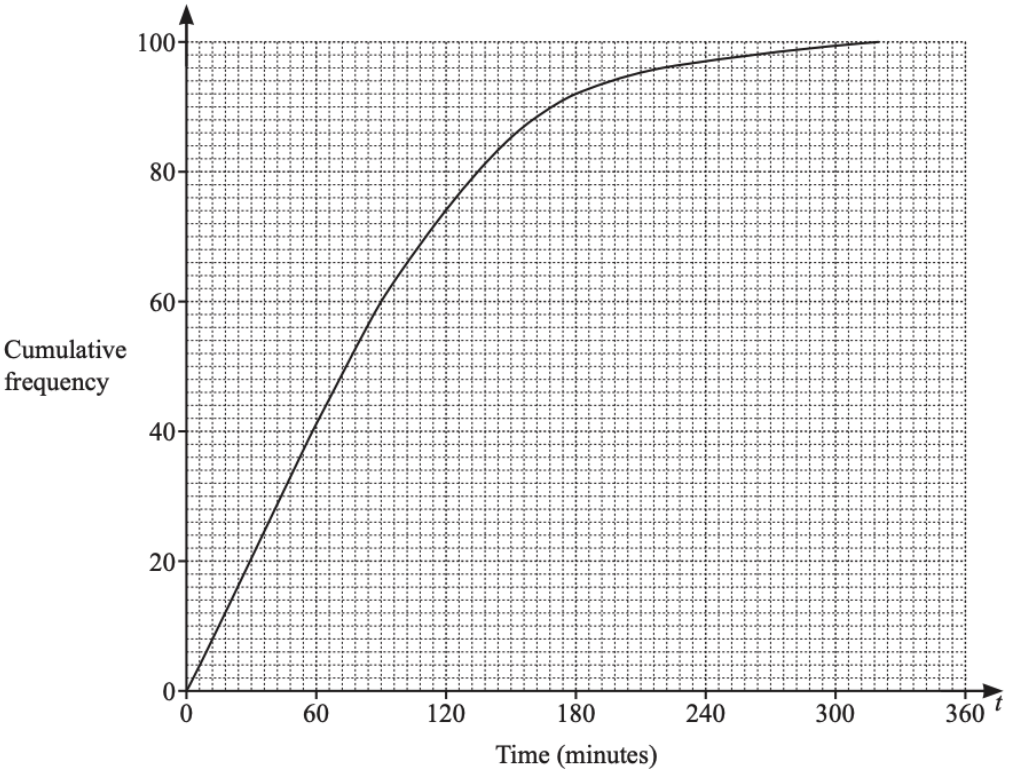
(b) The frequency table shows the times, t minutes, each of 100 children spent exercising in one week.

Time (t minutes)	$0 < t \leqslant 60$	$60 < t \leqslant 100$	$100 < t \leqslant 160$	$160 < t \leqslant 220$	$220 < t \leqslant 320$
Frequency	41	24	23	8	4

(i) Calculate an estimate of the mean time.

..... min [4]

(ii) The information in the frequency table is shown in this cumulative frequency diagram.



Use the cumulative frequency diagram to find an estimate of

(a) the 60th percentile,

..... min [1]

(b) the number of children who spent more than 3 hours exercising.

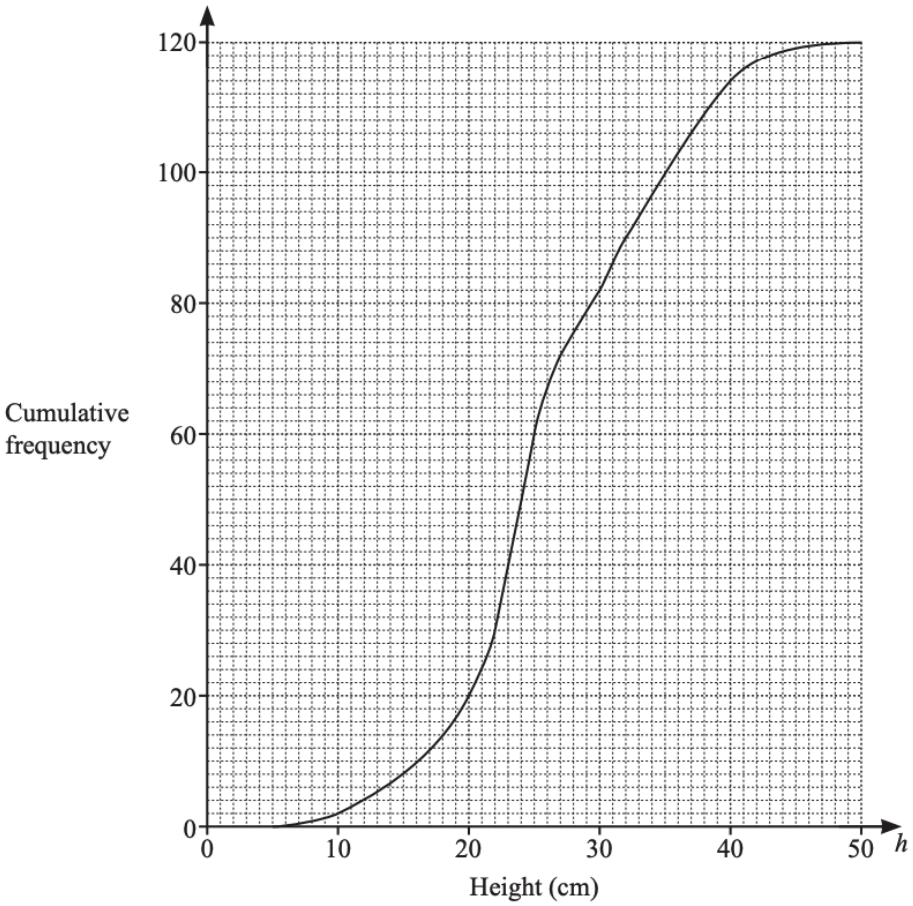
..... [2]

(iii) A histogram is drawn to show the information in the frequency table.
The height of the bar for the interval $60 < t \leqslant 100$ is 10.8 cm.

Calculate the height of the bar for the interval $160 < t \leqslant 220$.

..... cm [2]

4 The height, h cm, of each of 120 plants is measured.
The cumulative frequency diagram shows this information.



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

(i) the median,

..... cm [1]

(ii) the interquartile range,

..... cm [2]

(iii) the 60th percentile,

..... cm [1]

(iv) the number of plants with a height greater than 40 cm.

..... [2]

(b) The information in the cumulative frequency diagram is shown in this frequency table.

Height, h cm	$0 < h \leqslant 10$	$10 < h \leqslant 20$	$20 < h \leqslant 30$	$30 < h \leqslant 50$
Frequency	2	18	62	38

(i) Calculate an estimate of the mean height.

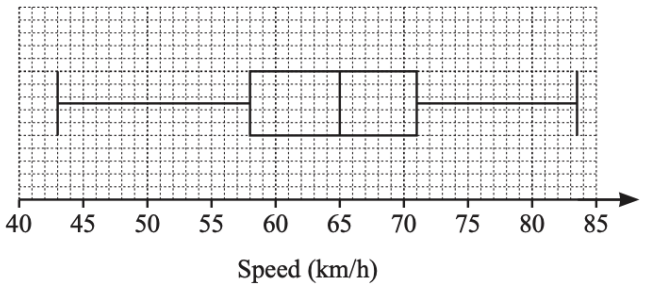
..... cm [4]

(ii) A histogram is drawn to show the information in the frequency table.
The height of the bar representing the interval $10 < h \leqslant 20$ is 7.2 cm.

Calculate the height of the bar representing the interval $30 < h \leqslant 50$.

..... cm [2]

3 **(a)** The average speeds, in km/h, of cars travelling along a road are recorded.
The box-and-whisker plot shows this information.



Find

(i) the lowest speed recorded,

..... km/h [1]

(ii) the median,

..... km/h [1]

(iii) the interquartile range.

..... km/h [1]

(b) Another car takes 18 seconds to travel 400 m along this road.

Calculate the average speed of this car in km/h.

..... km/h [3]

7 **(a)** 20 students each record the mass, p grams, of their pencil case.
The table below shows the results.

Mass (p grams)	$0 < p \leqslant 50$	$50 < p \leqslant 100$	$100 < p \leqslant 125$	$125 < p \leqslant 150$	$150 < p \leqslant 200$
Frequency	2	5	4	6	3

(i) Calculate an estimate of the mean mass.

..... g [4]

(ii) Use the frequency table above to complete the cumulative frequency table.

Mass (p grams)	$p \leqslant 50$	$p \leqslant 100$	$p \leqslant 125$	$p \leqslant 150$	$p \leqslant 200$
Cumulative frequency					20

[2]

(iii) A student is chosen at random.

Find the probability that this student has a pencil case with a mass greater than 150 g.

..... [1]

(b) Some students each record the mass, m kg, of their school bag.
Adil wants to draw a histogram to show this information.

Complete the table below.

Mass (m kg)	$0 < m \leqslant 4$	$4 < m \leqslant 6$	$6 < m \leqslant 7$	$7 < m \leqslant 10$
Frequency	32			42
Height of bar on histogram (cm)	1.6	2	1.2	2.8

[2]

(c) The frequency table below shows information about the number of books read by some students in a reading marathon.

Number of books read	1	2	3	4	5	6	7	8
Frequency	2	2	16	10	9	4	x	2

(i) The mean number of books read is 4.28 .

Find the value of x.

$x =$ ..... [3]

(ii) Write down the mode.

..... [1]

(iii) Write down the median.

..... [1]

4 **(a)** The test scores of 14 students are shown below.

21 21 23 26 25 21 22 20 21 23 23 27 24 21

(i) Find the range, mode, median and mean of the test scores.

Range = ...

Mode = ...

Median = ...

Mean = ... [6]

(ii) A student is chosen at random.

Find the probability that this student has a test score of more than 24.

..... [1]

(b) Petra records the score in each test she takes.

The mean of the first n scores is x.
The mean of the first $(n - 1)$ scores is $(x + 1)$.

Find the nth score in terms of n and x.
Give your answer in its simplest form.

..... [3]

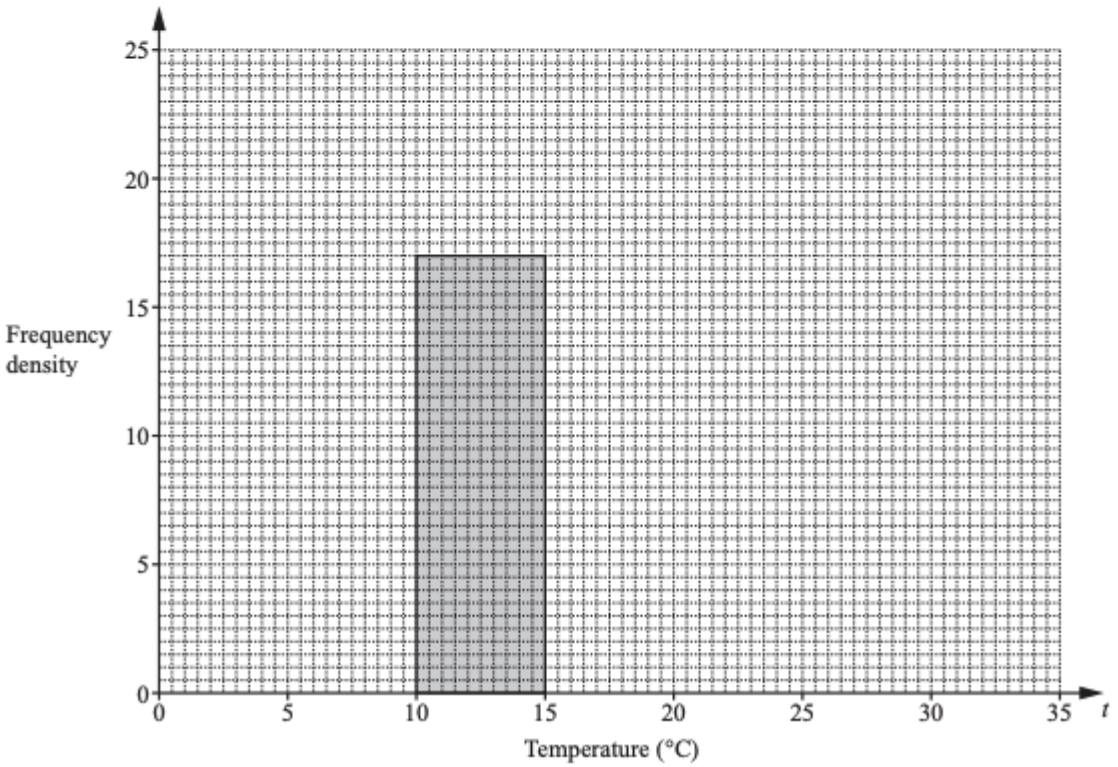
(c) During one year the midday temperatures, t°C, in Zedford were recorded.
The table shows the results.

Temperature (t°C)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 25$	$25 < t \leqslant 35$
Number of days	50	85	100	120	10

(i) Calculate an estimate of the mean.

..... °C [4]

(ii) Complete the histogram to show the information in the table.



[4]

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.

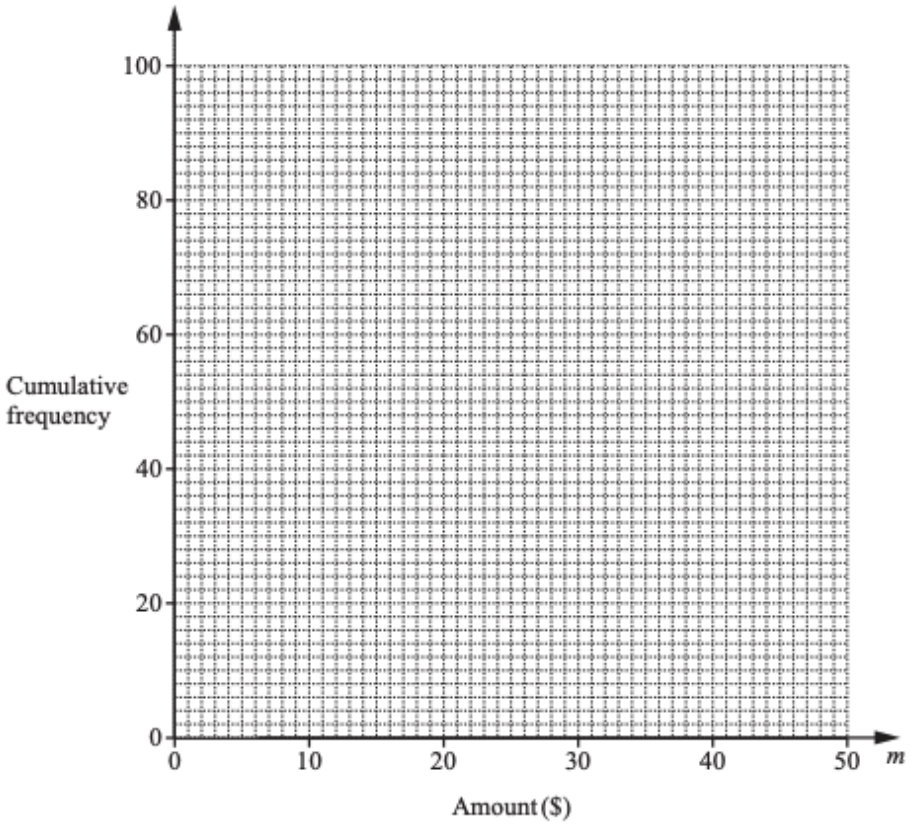
$ ..... [4]

(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]

(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]

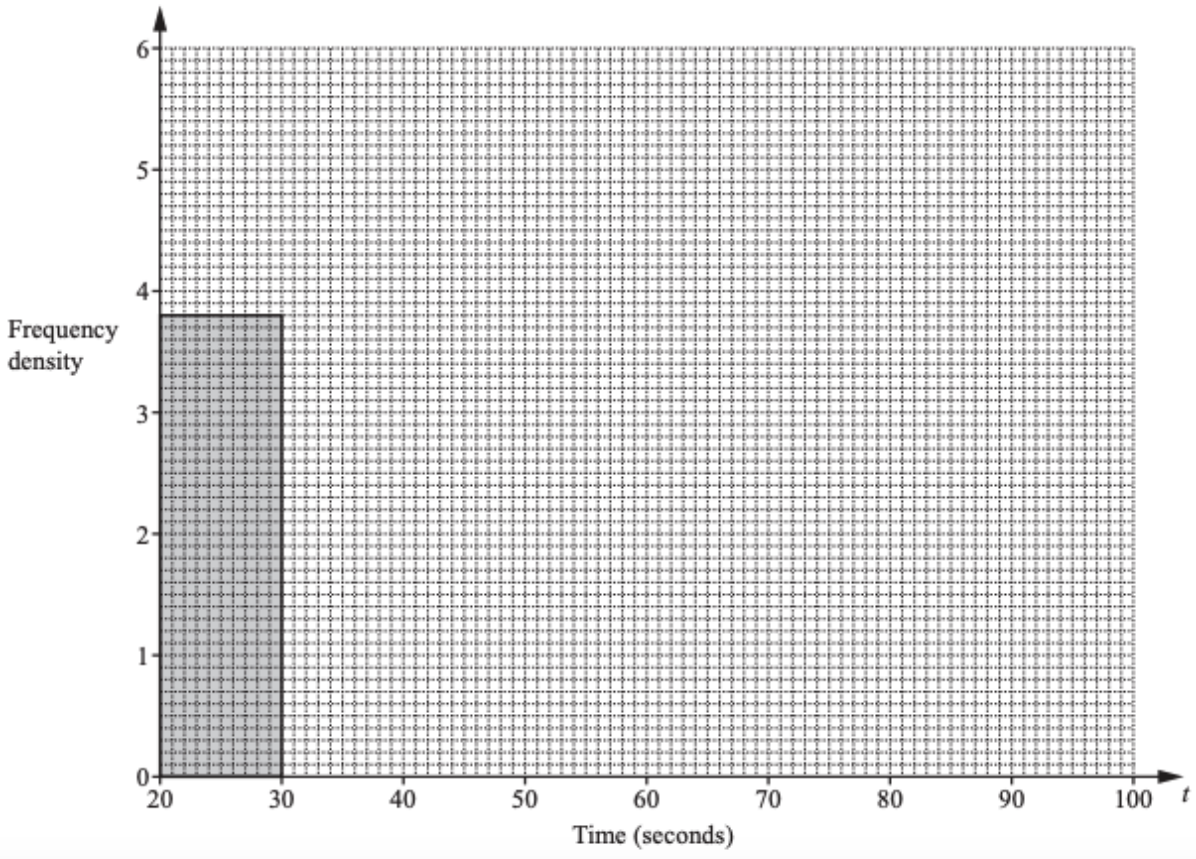
6 The table shows the time, t seconds, taken by each of 120 boys to solve a puzzle.

Time (t seconds)	$20 < t \leqslant 30$	$30 < t \leqslant 35$	$35 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 100$
Frequency	38	27	21	16	18

(a) Calculate an estimate of the mean time.

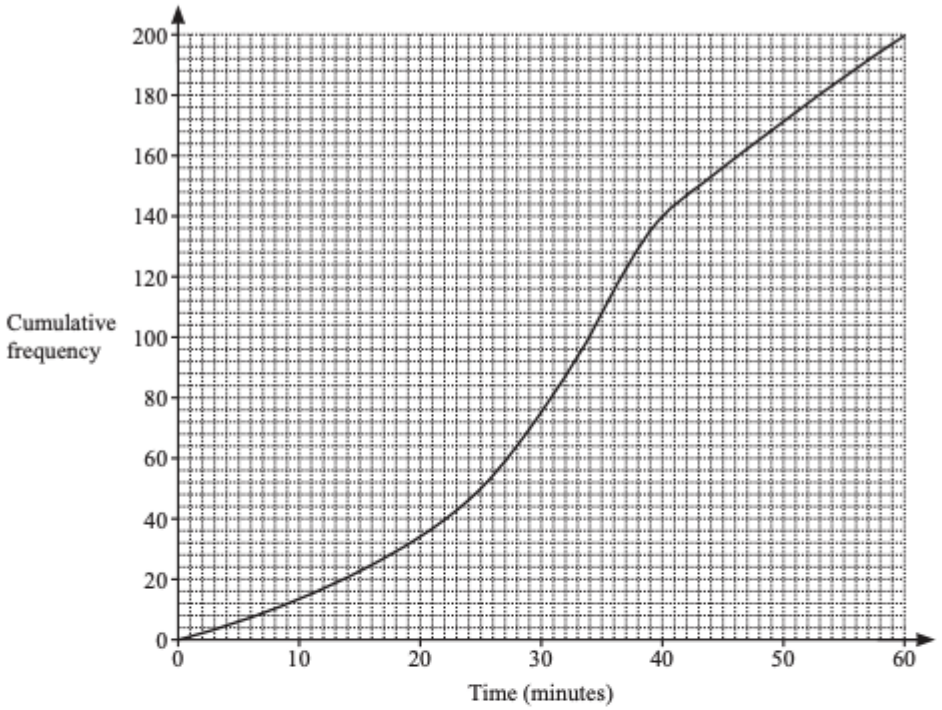
..... s [4]

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



[4]

6 **(a)** The cumulative frequency diagram shows information about the times taken by 200 students to solve a problem.



Use the cumulative frequency diagram to find an estimate for

(i) the median, ... min [1]

(ii) the interquartile range,

..... min [2]

(iii) the number of students who took more than 40 minutes.

..... [2]

(b) Roberto records the value of each of the coins he has at home.
The table shows the results.

Value (cents)	1	2	5	10	20	50
Frequency	3	1	3	2	4	2

(i) Find the range. ..... cents [1]

(ii) Find the mode. ..... cents [1]

(iii) Find the median.

..... cents [1]

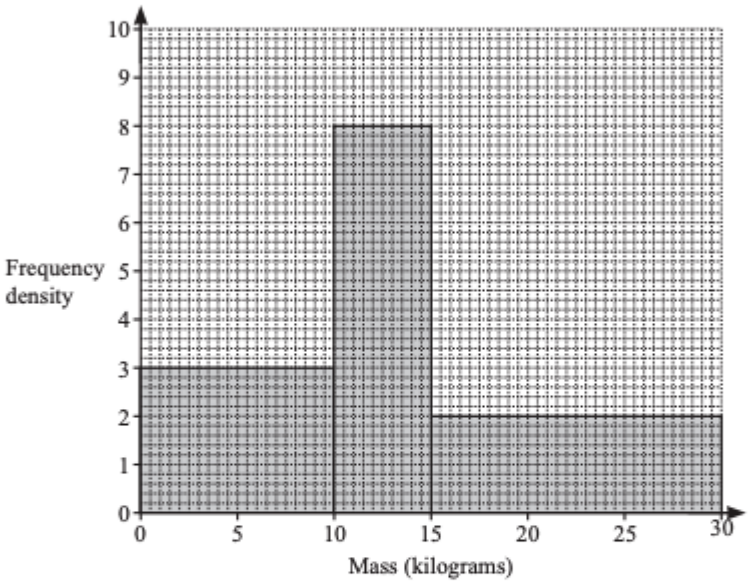
(iv) Work out the total value of Roberto's coins.

..... cents [2]

(v) Work out the mean.

..... cents [1]

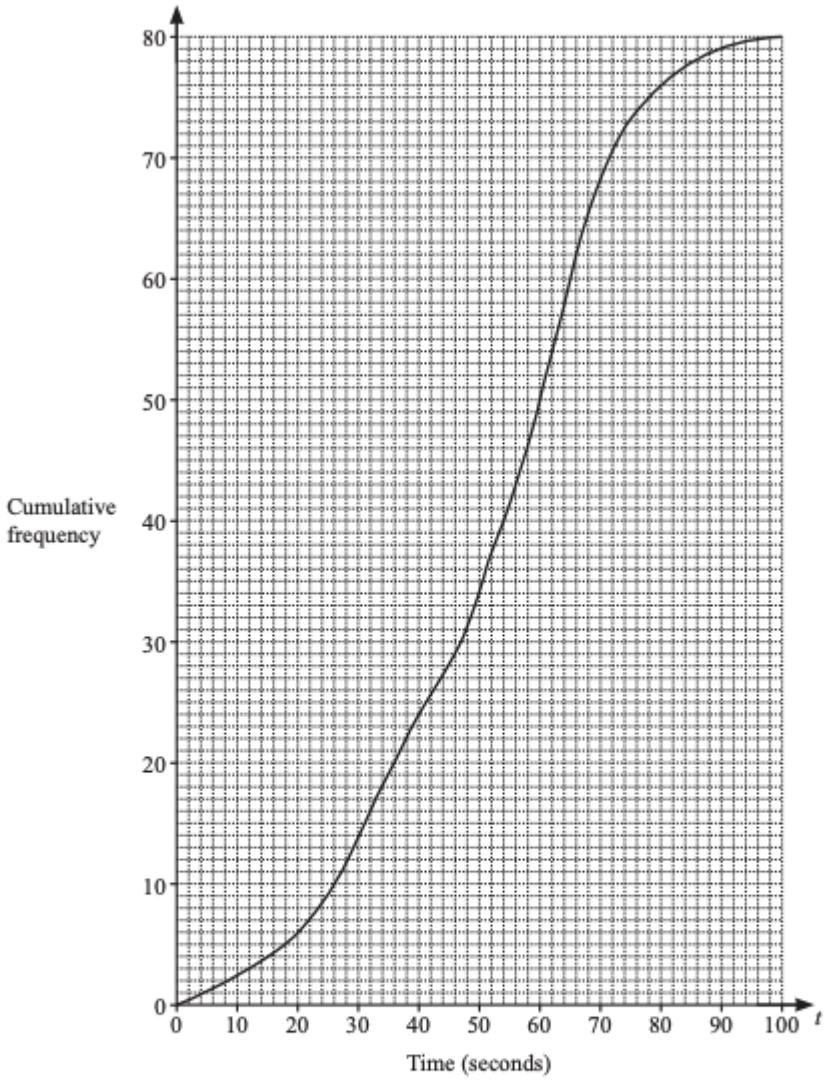
(c) The histogram shows information about the masses of 100 boxes.



Calculate an estimate of the mean.

..... kg [6]

2 The cumulative frequency diagram shows information about the time taken, t seconds, for a group of girls to each solve a maths problem.



(a) Use the cumulative frequency diagram to find an estimate for

(i) the median,

..... s [1]

(ii) the interquartile range,

..... s [2]

(iii) the 20th percentile,

..... s [1]

(iv) the number of girls who took more than 66 seconds to solve the problem.

..... [2]

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

Time (t seconds)	$0 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 100$
Frequency	6				4

[2]

(ii) Calculate an estimate of the mean time.

..... s [4]

(c) A group of boys solved the same problem.
The boys had a median time of 60 seconds, a lower quartile of 46 seconds and an upper quartile of 66 seconds.

(i) Write down the percentage of boys with a time of 66 seconds or less.

..... % [1]

(ii) Howard says

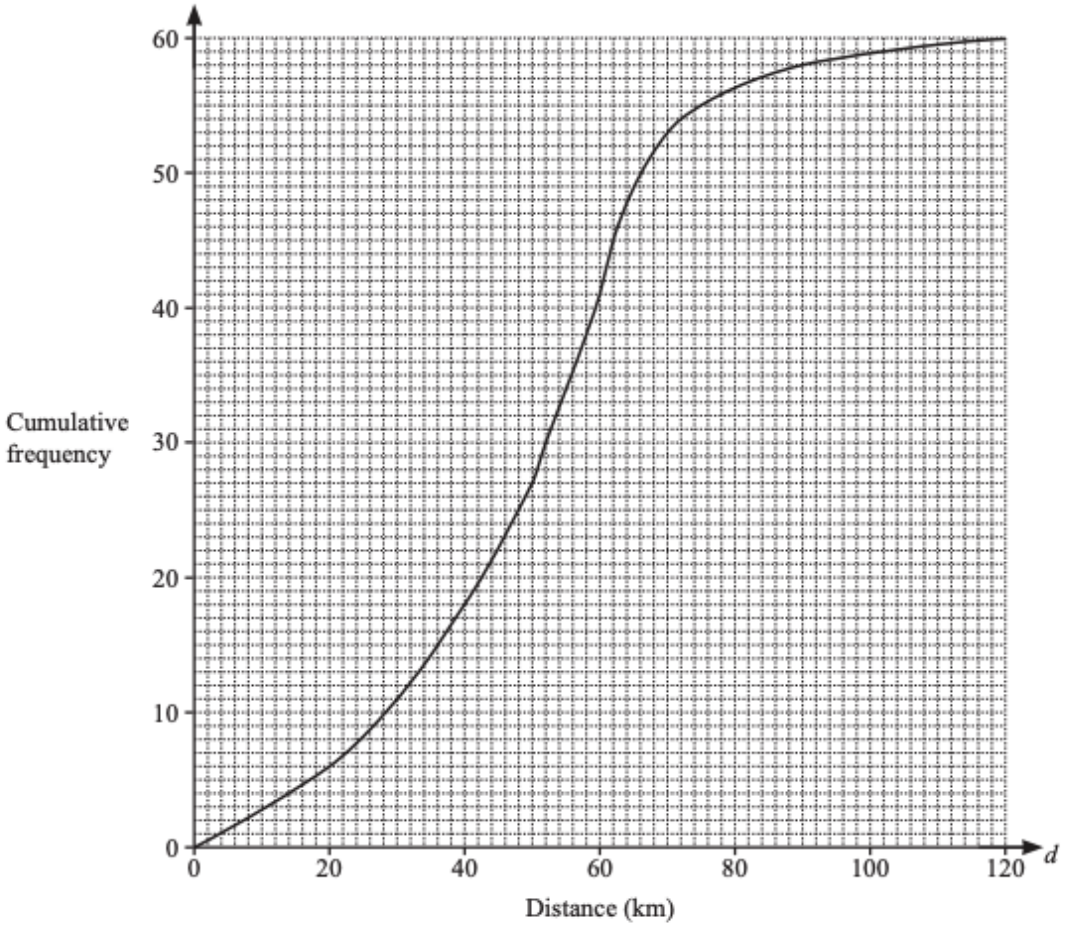
The boys' times vary more than the girls' times.

Explain why Howard is incorrect.

.....

..... [2]

5 The cumulative frequency diagram shows information about the distance, $d$km, travelled by each of 60 male cyclists in one weekend.



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

(i) the median,

..... km [1]

(ii) the lower quartile,

..... km [1]

(iii) the interquartile range.

..... km [1]

(b) For the same weekend, the interquartile range for the distances travelled by a group of female cyclists is 40 km.

Make one comment comparing the distribution of the distances travelled by the males with the distribution of the distances travelled by the females.

.....

..... [1]

(c) A male cyclist is chosen at random.

Find the probability that he travelled more than 50 km.

..... [2]

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

Distance (d km)	Number of male cyclists
$0 < d \leqslant 40$	18
$40 < d \leqslant 50$	9
$50 < d \leqslant 60$	
$60 < d \leqslant 70$	
$70 < d \leqslant 90$	
$90 < d \leqslant 120$	2

[2]

(ii) Calculate an estimate of the mean distance travelled.

..... km [4]

7 The frequency table shows information about the time, m minutes, that each of 160 people spend in a library.

Time (m minutes)	$0 < m \leqslant 10$	$10 < m \leqslant 40$	$40 < m \leqslant 60$	$60 < m \leqslant 90$	$90 < m \leqslant 100$	$100 < m \leqslant 120$
Frequency	3	39	43	55	11	9

(a) (i) Find the probability that one of these people, chosen at random, spends more than 100 minutes in the library.

..... [1]

(ii) Calculate an estimate of the mean time spent in the library.

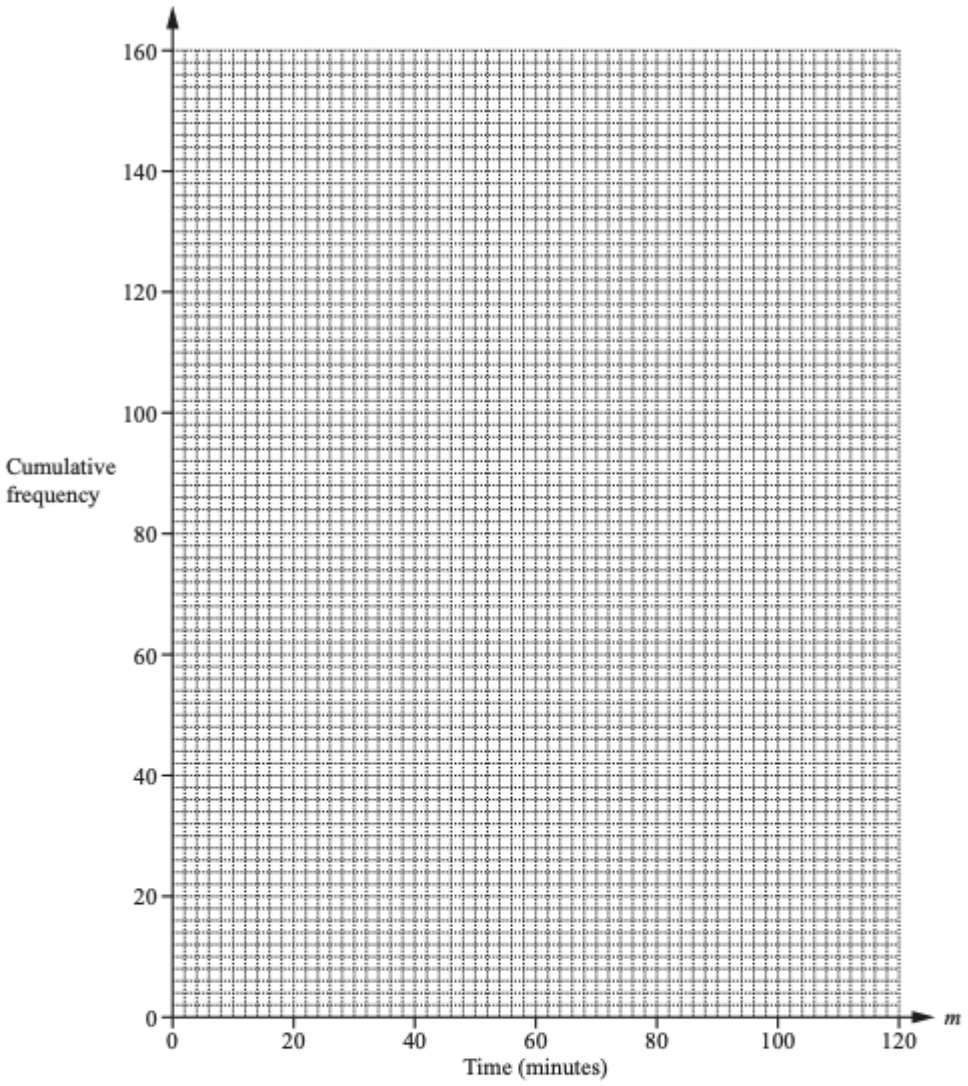
..... min [4]

(b) Complete the cumulative frequency table below.

Time (m minutes)	$m \leqslant 10$	$m \leqslant 40$	$m \leqslant 60$	$m \leqslant 90$	$m \leqslant 100$	$m \leqslant 120$
Cumulative frequency	3	42				

[2]

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



[3]

(d) Use your cumulative frequency diagram to find

(i) the median,

..... min [1]

(ii) the interquartile range,

..... min [2]

(iii) the 90th percentile,

..... min [2]

(iv) the number of people who spend more than 30 minutes in the library.

..... [2]

2 The time taken for each of 120 students to complete a cooking challenge is shown in the table.

Time (t minutes)	$20 < t \leqslant 25$	$25 < t \leqslant 30$	$30 < t \leqslant 35$	$35 < t \leqslant 40$	$40 < t \leqslant 45$
Frequency	44	32	28	12	4

(a) (i) Write down the modal time interval.

..... $< t \leqslant$ ..... [1]

(ii) Write down the interval containing the median time.

..... $< t \leqslant$ ..... [1]

(iii) Calculate an estimate of the mean time.

..... min [4]

(iv) A student is chosen at random.

Find the probability that this student takes more than 40 minutes.

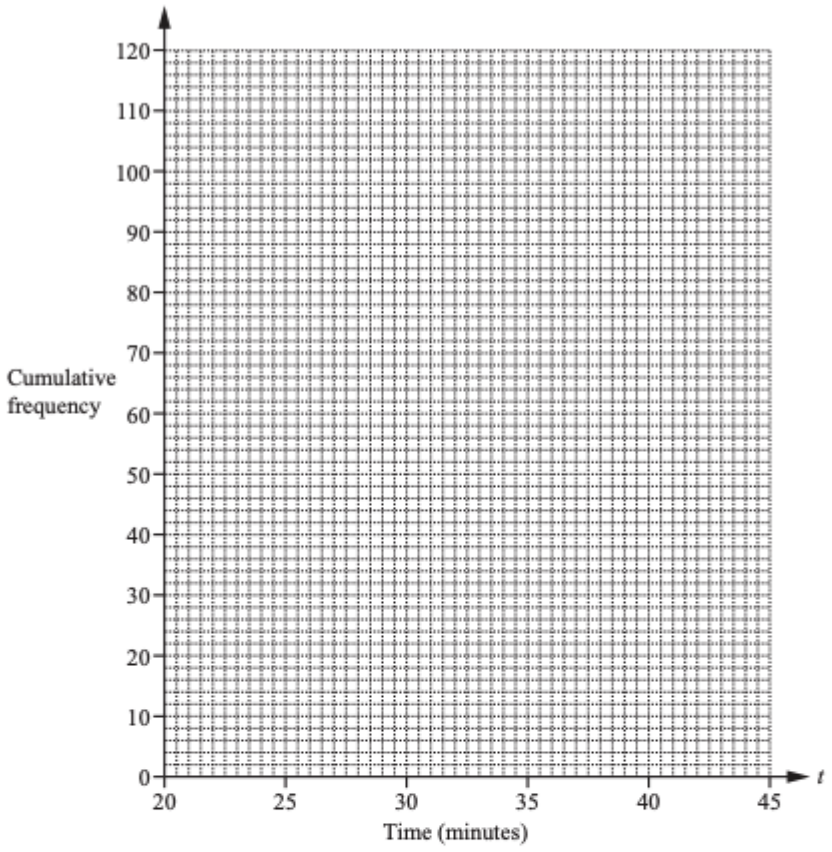
..... [1]

(b) (i) Complete the cumulative frequency table.

Time (t minutes)	$t \leqslant 20$	$t \leqslant 25$	$t \leqslant 30$	$t \leqslant 35$	$t \leqslant 40$	$t \leqslant 45$
Cumulative frequency	0	44				

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.



[3]

(iii) Find the median time.

..... min [1]

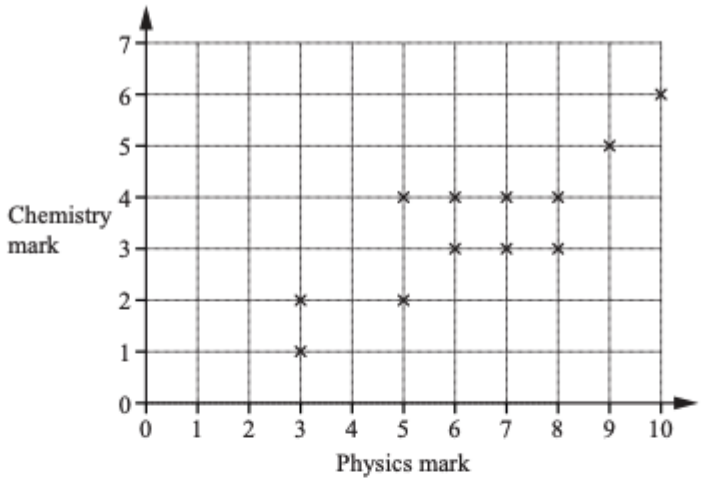
(iv) Find the interquartile range.

..... min [2]

(v) Find the number of students who took more than 37 minutes to complete the cooking challenge.

..... [2]

3 **(a)** The scatter diagram shows the physics mark and the chemistry mark for each of 12 students.



(i) What type of correlation is shown in the scatter diagram?

..... [1]

(ii) On the scatter diagram, draw a line of best fit. [1]

(iii) Find an estimate of the chemistry mark for another student who has a physics mark of 4.

..... [1]

(b) A teacher records the number of days each of the 24 students in her class are absent.
The frequency table shows the results.

Number of days	0	1	2	3	4	5
Frequency	10	8	3	2	0	1

Find the mode, the median and the mean.

Mode = ...

Median = ...

Mean = ... [5]

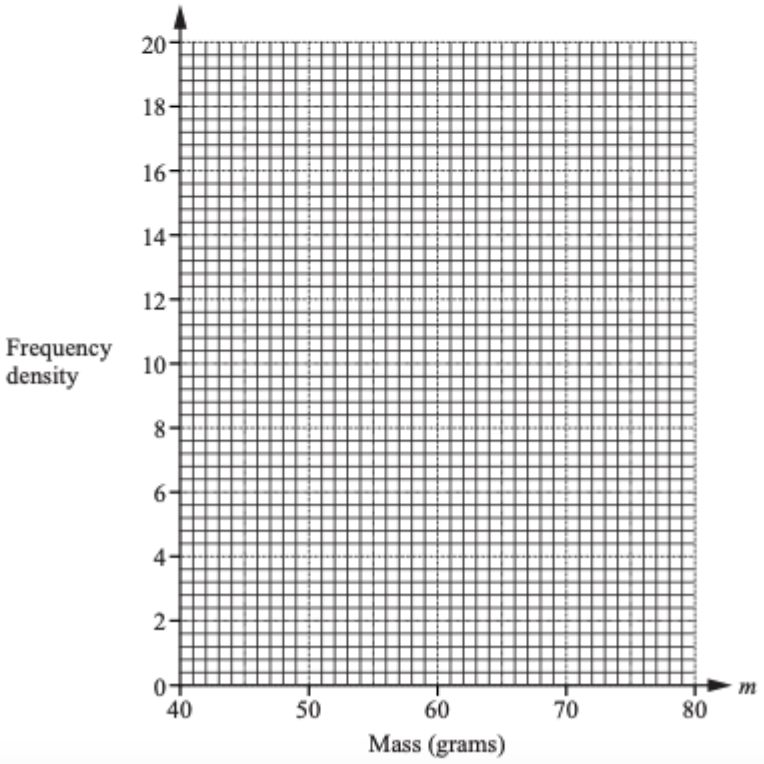
(c) Three sizes of eggs are sold in a shop.
The table shows the number of eggs of each size sold in one day.

Size	Small	Medium	Large
Mass (m grams)	$46 < m \leqslant 52$	$52 < m \leqslant 62$	$62 < m \leqslant 80$
Number of eggs sold	78	180	162

(i) Calculate an estimate of the mean mass.

..... g [4]

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



[4]

4 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

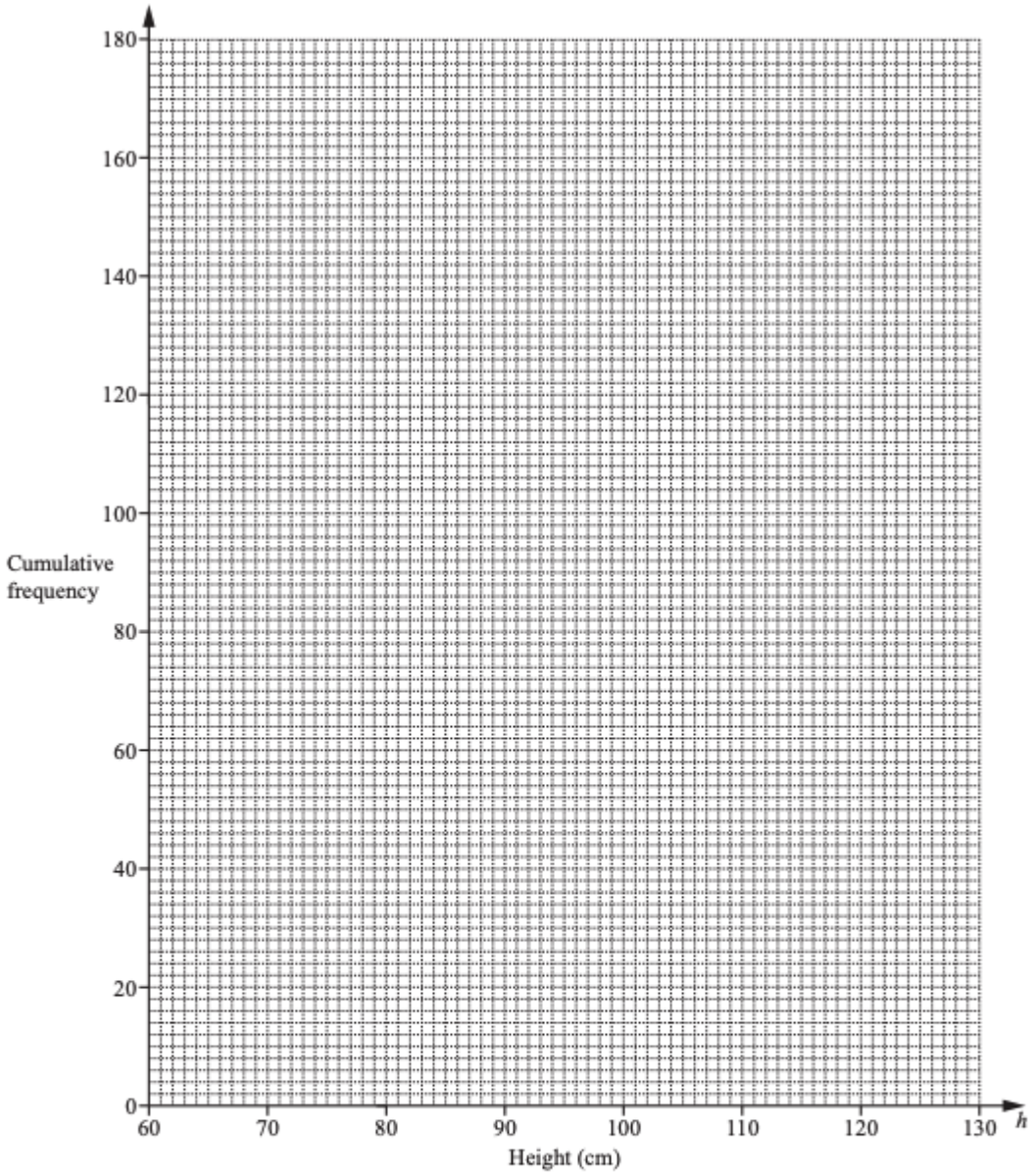
$70 < h \leqslant 90$ ..... cm [3]

(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.



[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]

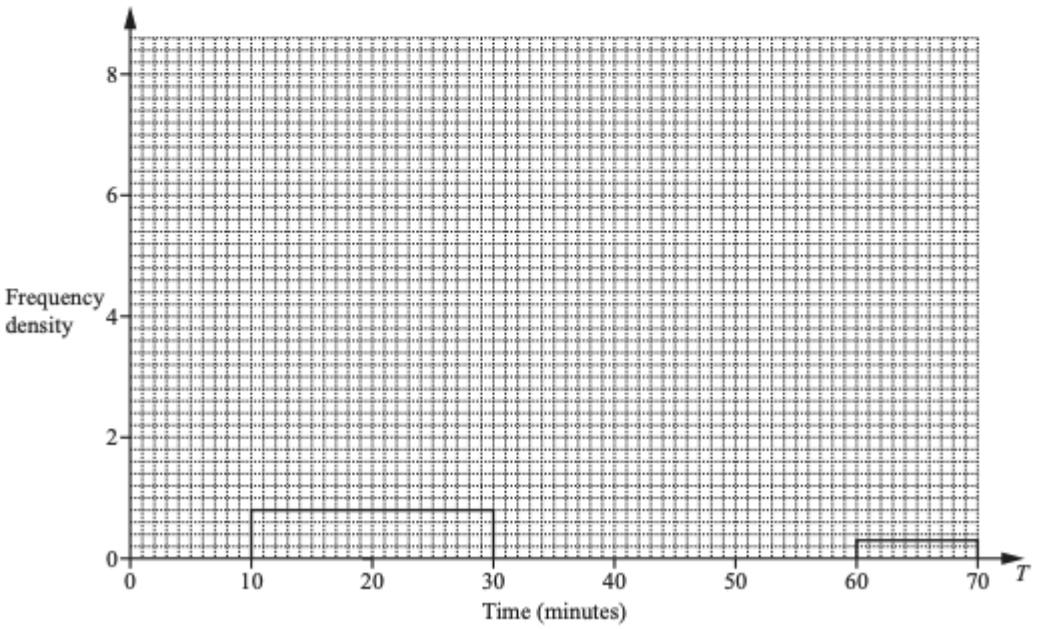
9 **(a)** The table shows the amount of time, T minutes, 120 people each spend in a supermarket one Saturday.

Time (T minutes)	Number of people
$10 < T \leqslant 30$	16
$30 < T \leqslant 40$	18
$40 < T \leqslant 45$	22
$45 < T \leqslant 50$	40
$50 < T \leqslant 60$	21
$60 < T \leqslant 70$	3

(i) Use the mid-points of the intervals to calculate an estimate of the mean.

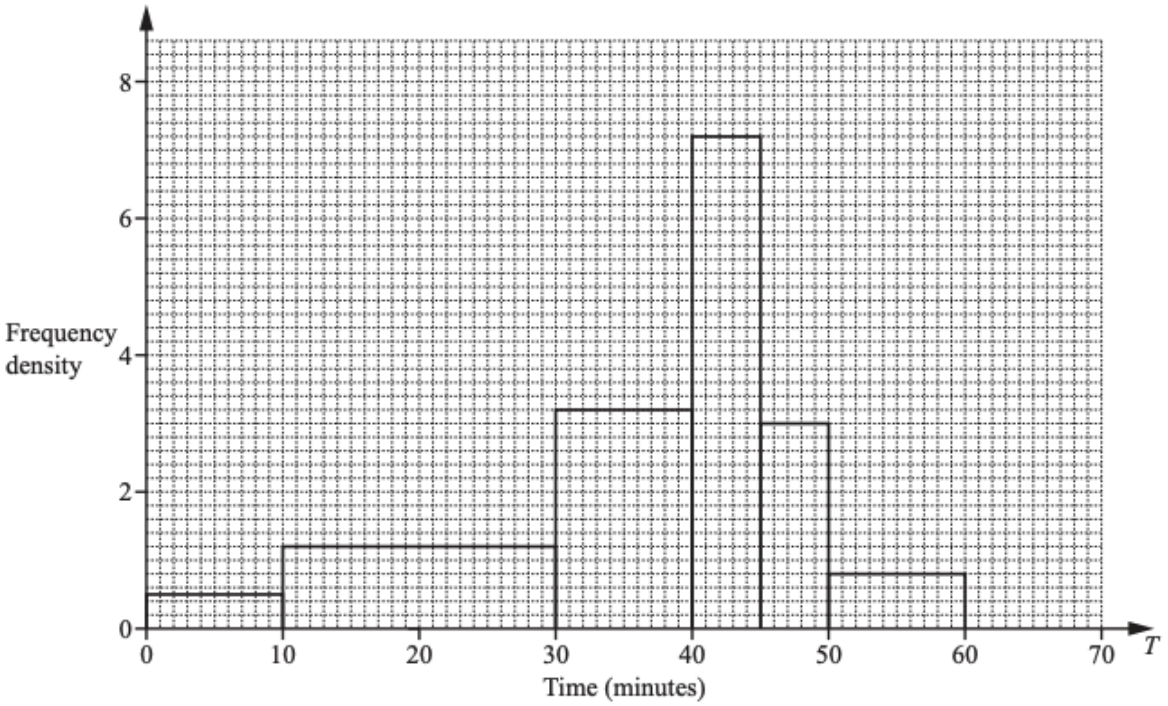
..... min [4]

(ii) Complete this histogram to show the information in the table.



[4]

(b) This histogram shows the amount of time, T minutes, 120 people each spend in the supermarket one Wednesday.



Make a comment comparing the distributions of the times for the two days.

.....

..... [1]

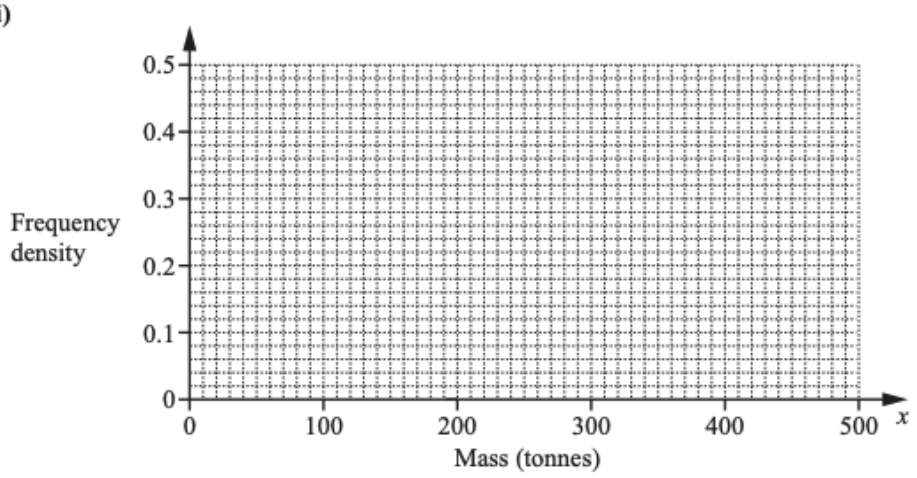
5 **(a)** A factory recycles metal.
The mass, x tonnes, of metal is measured each week.
The table shows the results for 52 weeks.

Mass (x tonnes)	$100 < x \leqslant 200$	$200 < x \leqslant 250$	$250 < x \leqslant 300$	$300 < x \leqslant 500$
Frequency	8	20	12	12

(i) Calculate an estimate of the mean.

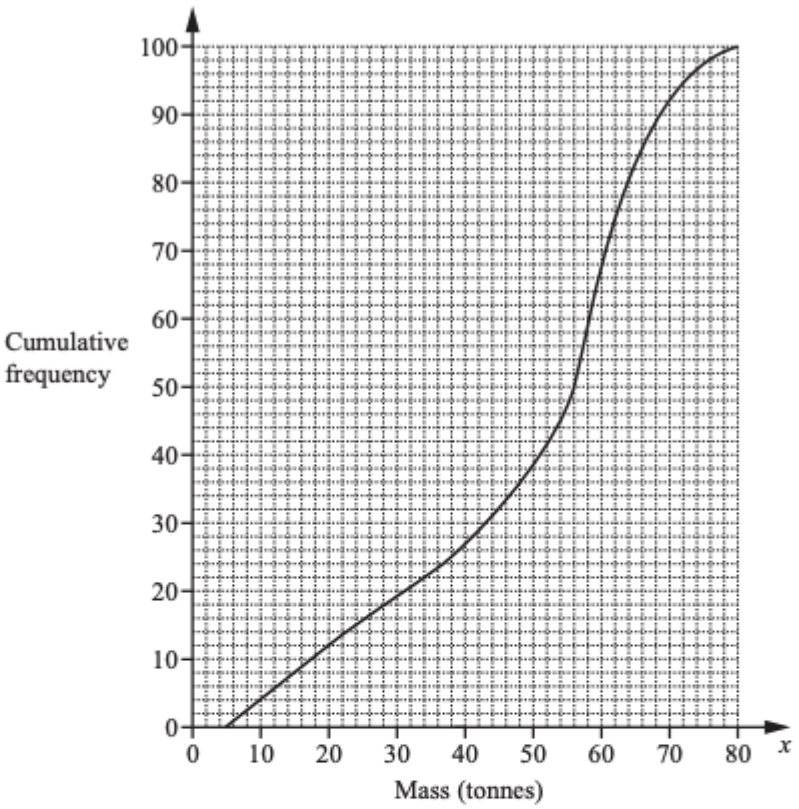
..... tonnes [4]

(ii)



On the grid, draw a histogram to show the information in the table. [4]

(b) Another factory also recycles metal.
The mass, x tonnes, of metal is measured each day for a number of days.
The cumulative frequency diagram shows the results.



(i) For how many days was the mass measured?

..... [1]

(ii) Find an estimate of the median.

..... tonnes [1]

(iii) Find an estimate of the upper quartile.

..... tonnes [1]

(iv) Find an estimate of the interquartile range.

.....tonnes [1]

(v) Find an estimate of the number of days when the mass was greater than 20 tonnes.

..... [2]

7 The table shows information about the time taken by 400 people to complete a race.

Time taken (m minutes)	$45 < m \leqslant 50$	$50 < m \leqslant 60$	$60 < m \leqslant 70$	$70 < m \leqslant 90$	$90 < m \leqslant 100$	$100 < m \leqslant 120$
Frequency	23	64	122	136	26	29

(a) Calculate an estimate of the mean time taken.

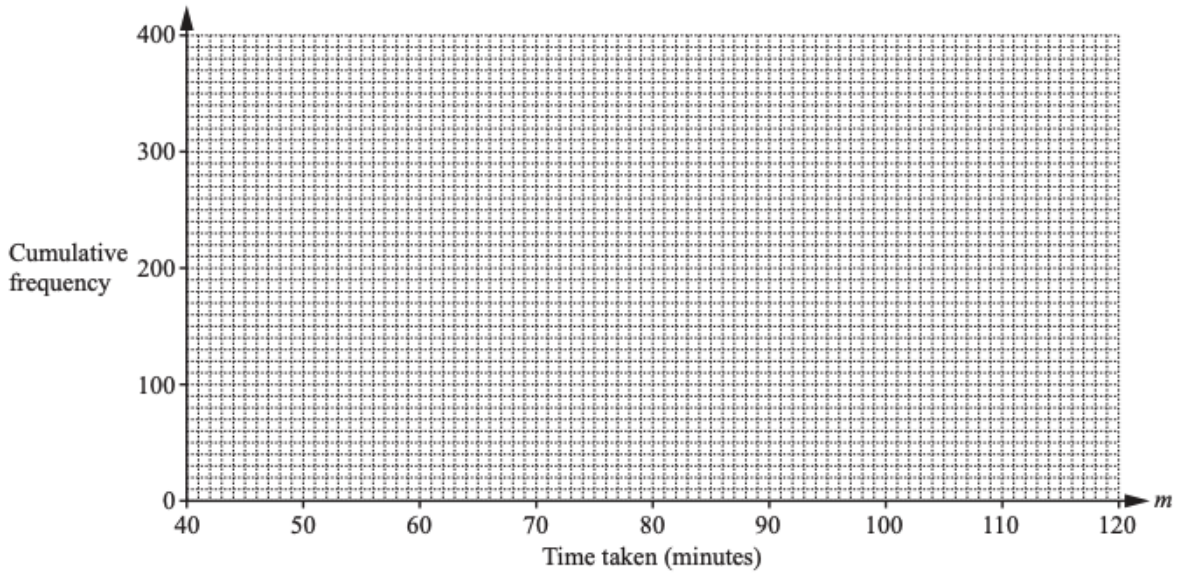
..... min [4]

(b) (i) Complete the cumulative frequency table.

Time taken (m minutes)	$m \leqslant 50$	$m \leqslant 60$	$m \leqslant 70$	$m \leqslant 90$	$m \leqslant 100$	$m \leqslant 120$
Cumulative frequency	23					400

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.



[3]

(iii) Use your diagram to estimate

(a) the median,

..... min [1]

(b) the inter-quartile range,

..... min [2]

(c) the 60th percentile.

..... min [2]

2 The time taken for each of 90 cars to complete one lap of a race track is shown in the table.

Time (t seconds)	$70 < t \leqslant 71$	$71 < t \leqslant 72$	$72 < t \leqslant 73$	$73 < t \leqslant 74$	$74 < t \leqslant 75$
Frequency	17	24	21	18	10

(a) Write down the modal time interval.

..... $< t \leqslant$ ..... [1]

(b) Calculate an estimate of the mean time.

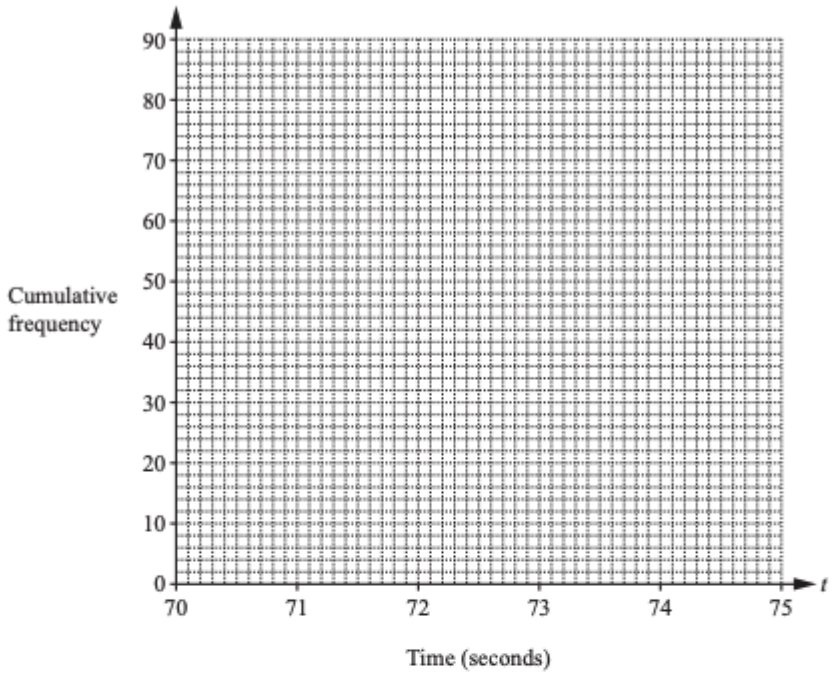
..... s [4]

(c) **(i)** Complete the cumulative frequency table.

Time (t seconds)	$t \leqslant 71$	$t \leqslant 72$	$t \leqslant 73$	$t \leqslant 74$	$t \leqslant 75$
Cumulative frequency	17				

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.



[3]

(iii) Find the median time.

..... s [1]

(iv) Find the inter-quartile range.

..... s [2]

(d) One lap of the race track measures 3720 metres, correct to the nearest 10 metres.
A car completed the lap in 75 seconds, correct to the nearest second.

Calculate the upper bound for the average speed of this car.
Give your answer in kilometres per hour.

..... km/h [4]

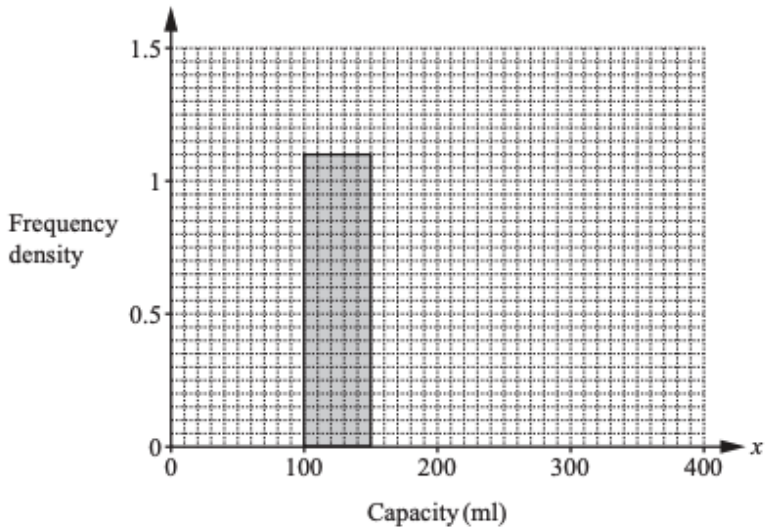
3 **(a)** 200 students estimate the capacity, x millilitres, of a cup.
The results are shown in the frequency table.

Capacity (x ml)	$0 < x \leqslant 100$	$100 < x \leqslant 150$	$150 < x \leqslant 200$	$200 < x \leqslant 250$	$250 < x \leqslant 400$
Frequency	20	55	66	35	24

(i) Calculate an estimate of the mean.

..... ml [4]

(ii) Complete the histogram.

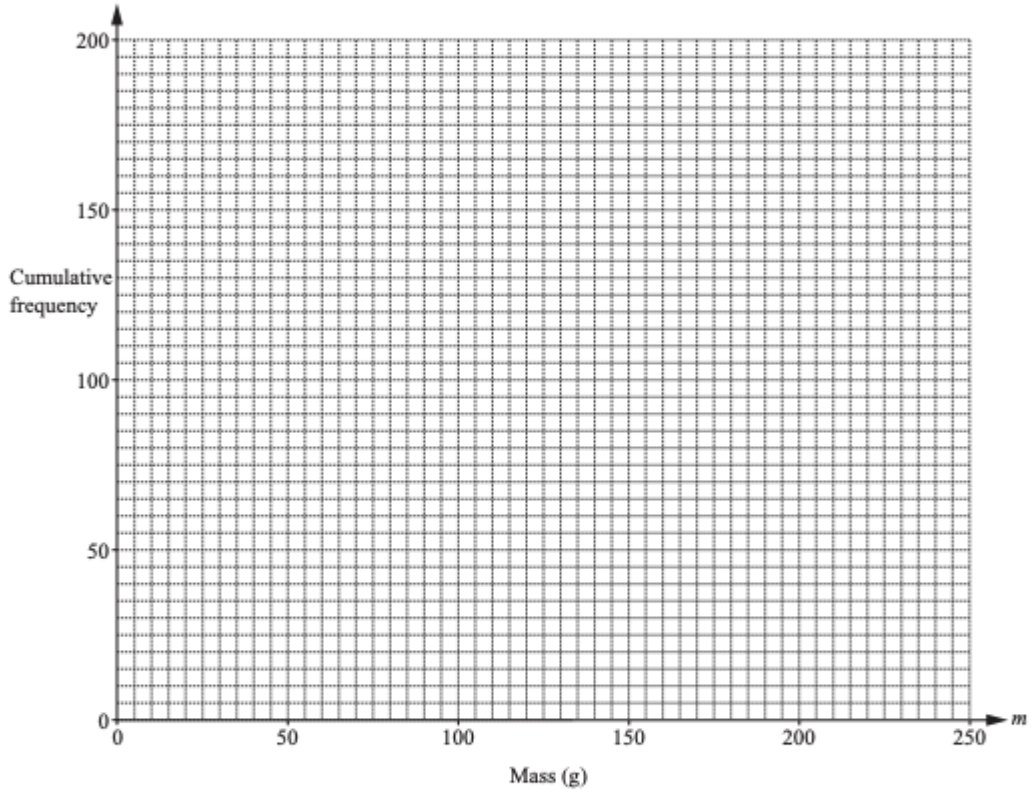


[4]

(b) The 200 students also estimate the mass, m grams, of a small rock.
The results are shown in the cumulative frequency table.

Mass (m grams)	$m \leqslant 50$	$m \leqslant 100$	$m \leqslant 150$	$m \leqslant 200$	$m \leqslant 250$
Cumulative frequency	28	64	104	168	200

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



[3]

(ii) Find

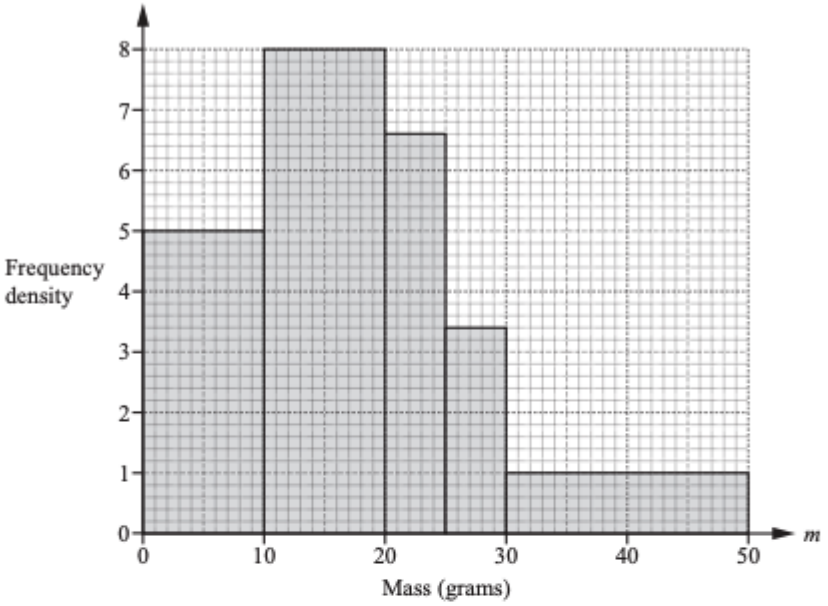
(a) the 65th percentile,

..... g [1]

(b) the number of students who estimated more than 75 g.

..... [2]

5 **(a)** Haroon has 200 letters to post.
The histogram shows information about the masses, m grams, of the letters.



(i) Complete the frequency table for the 200 letters.

Mass (m grams)	$0 < m \leqslant 10$	$10 < m \leqslant 20$	$20 < m \leqslant 25$	$25 < m \leqslant 30$	$30 < m \leqslant 50$
Frequency	50			17	

[3]

(ii) Calculate an estimate of the mean mass.

..... g [4]

(b) Haroon has 15 parcels to post.
The table shows information about the sizes of these parcels.

Size	Small	Large
Frequency	9	6

Two parcels are selected at random.

Find the probability that

(i) both parcels are large,

..... [2]

(ii) one parcel is small and the other is large.

..... [3]

(c) The probability that a parcel arrives late is $\frac{3}{80}$.
4000 parcels are posted.

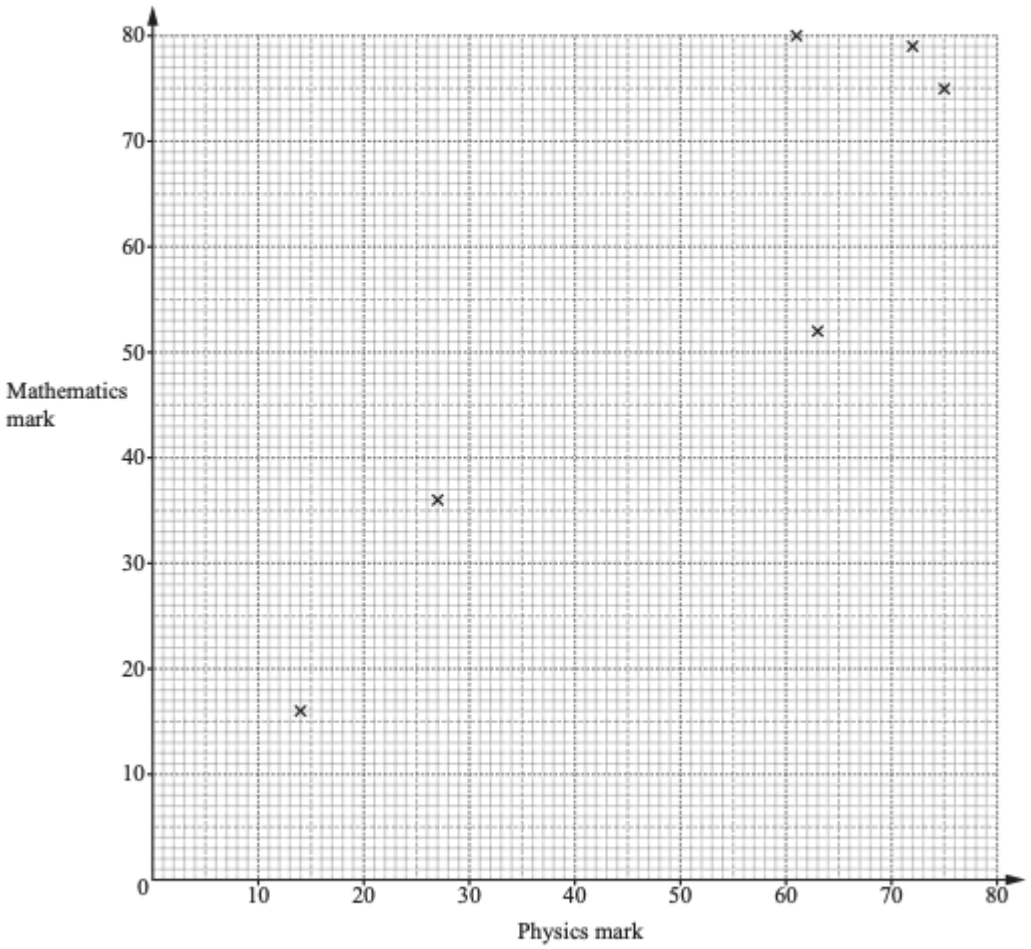
Calculate an estimate of the number of parcels expected to arrive late.

..... [1]

8 **(a)** The table shows the marks gained by 10 students in their physics test and their mathematics test.

Physics mark	63	61	14	27	72	75	44	40	28	50
Mathematics mark	52	80	16	36	79	75	51	35	24	63

(i) Complete the scatter diagram below.
The first six points have been plotted for you.



[2]

(ii) What type of correlation is shown in the scatter diagram?

.....[1]

(b) The marks of 30 students in a spelling test are shown in the table below.

Mark	0	1	2	3	4	5
Frequency	2	4	5	5	6	8

Find the mean, median, mode and range of these marks.

Mean = ...

Median = ...

Mode = ...

Range = ... [7]

(c) The table shows the marks gained by some students in their English test.

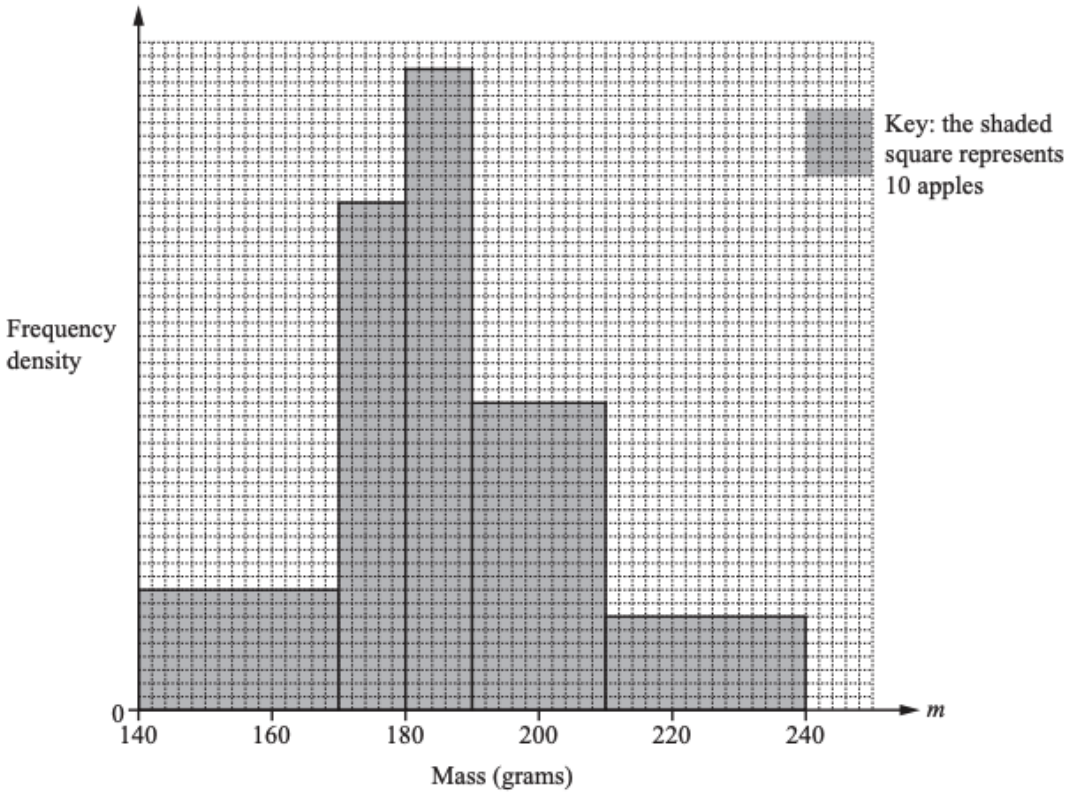
Mark	52	75	91
Number of students	x	45	11

The mean mark for these students is 70.3 .

Find the value of x.

x = ... [3]

5 The histogram shows the distribution of the masses, m grams, of 360 apples.



(a) Use the histogram to complete the frequency table.

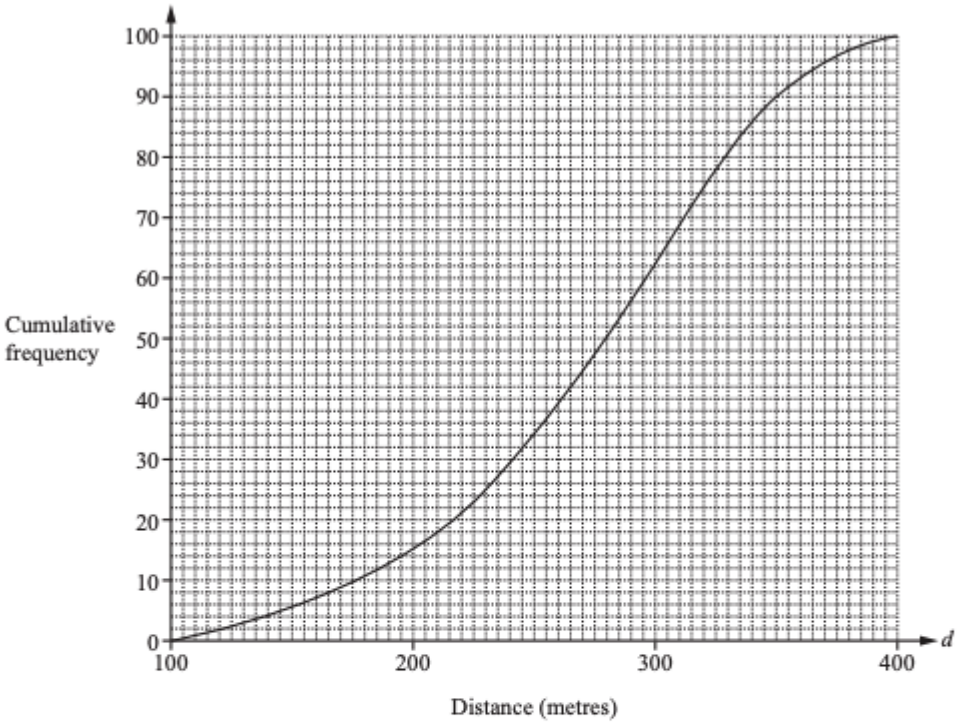
Mass (m grams)	Number of apples
$140 < m \leqslant 170$	
$170 < m \leqslant 180$	
$180 < m \leqslant 190$	
$190 < m \leqslant 210$	92
$210 < m \leqslant 240$	42

[3]

(b) Calculate an estimate of the mean mass of the 360 apples.

..... g [4]

6 **(a)** There are 100 students in group A.
The teacher records the distance, d metres, each student runs in one minute.
The results are shown in the cumulative frequency diagram.



Find

(i) the median,

..... m [1]

(ii) the upper quartile,

..... m [1]

(iii) the inter-quartile range,

..... m [1]

(iv) the number of students who run more than 350 m.

..... [2]

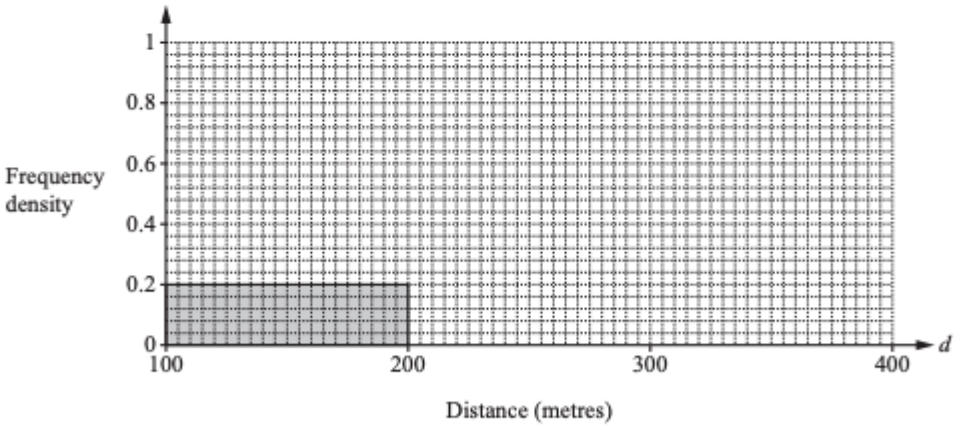
(b) There are 100 students in group *B*.
The teacher records the distance, *d* metres, each of these students runs in one minute.
The results are shown in the frequency table.

Distance (d metres)	$100 < d \leqslant 200$	$200 < d \leqslant 250$	$250 < d \leqslant 280$	$280 < d \leqslant 320$	$320 < d \leqslant 400$
Number of students	20	22	30	16	12

(i) Calculate an estimate of the mean distance for group *B*.

..... m [4]

(ii) Complete the histogram to show the information in the frequency table.



[4]

(c) For the 100 students in group *B*, the median is 258 m.

Complete the statement.

On average, the students in group *A* run ..... than the students in group *B*. [1]

4 The table shows information about the time, t minutes, taken for each of 150 girls to complete an essay.

Time (t minutes)	$60 < t \leqslant 65$	$65 < t \leqslant 70$	$70 < t \leqslant 80$	$80 < t \leqslant 100$	$100 < t \leqslant 150$
Frequency	10	26	34	58	22

(a) Write down the interval that contains the median time.

..... $< t \leqslant$ ..... [1]

(b) Calculate an estimate of the mean time.

.....min [4]

(c) Rafay looks at the frequency table.

(i) He says that it is not possible to work out the range of the times.

Explain why he is correct.

.....

..... [1]

(ii) He draws a pie chart to show this information.

Calculate the sector angle for the interval $65 < t \leqslant 70$ minutes.

..... [2]

(d) A girl is chosen at random.

Work out the probability that she took more than 100 minutes to complete the essay.

..... [1]

(e) Two girls are chosen at random.

Work out the probability that, to complete the essay,

(i) they both took 65 minutes or less,

..... [2]

(ii) one took 65 minutes or less and the other took more than 100 minutes.

..... [3]

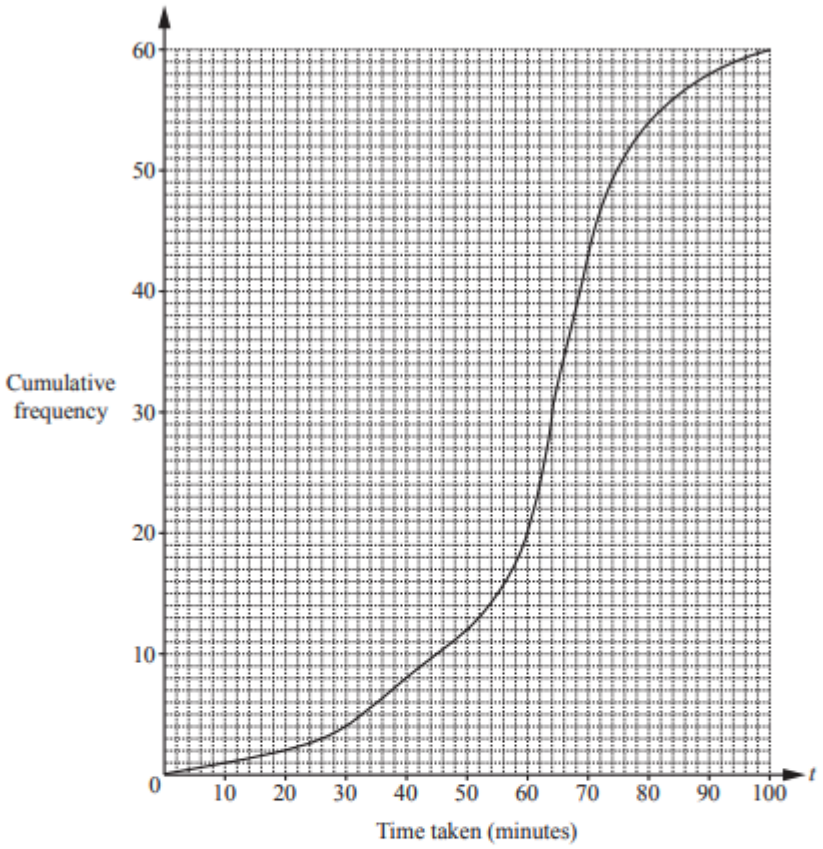
(f) The information in the frequency table is shown in a histogram.
The height of the block for the $60 < t \leqslant 65$ interval is 5 cm.

Complete the table.

Time (t minutes)	$60 < t \leqslant 65$	$65 < t \leqslant 70$	$70 < t \leqslant 80$	$80 < t \leqslant 100$	$100 < t \leqslant 150$
Height of block (cm)	5				

[3]

4 The cumulative frequency diagram shows information about the time taken, t minutes, by 60 students to complete a test.



(a) Find

(i) the median,

..... min [1]

(ii) the inter-quartile range,

..... min [2]

(iii) the 40th percentile,

..... min [2]

(iv) the number of students who took more than 80 minutes to complete the test.

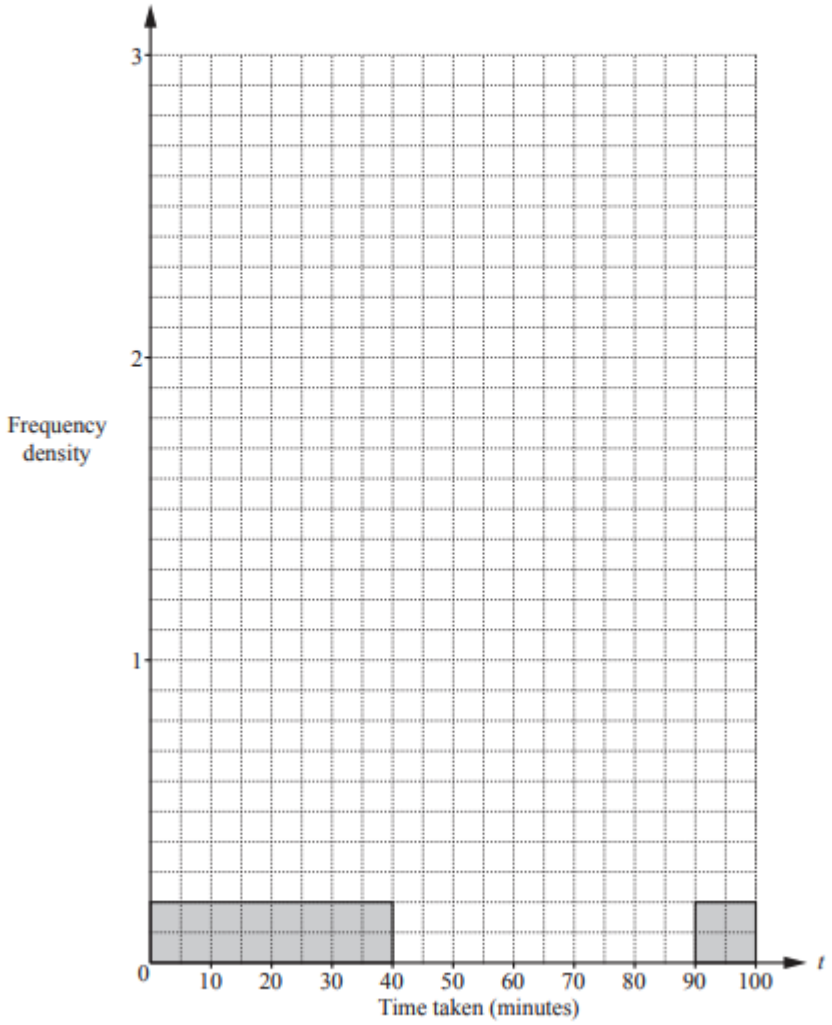
..... [2]

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

Time taken (t minutes)	$0 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 70$	$70 < t \leqslant 80$	$80 < t \leqslant 90$	$90 < t \leqslant 100$
Frequency	8				4	

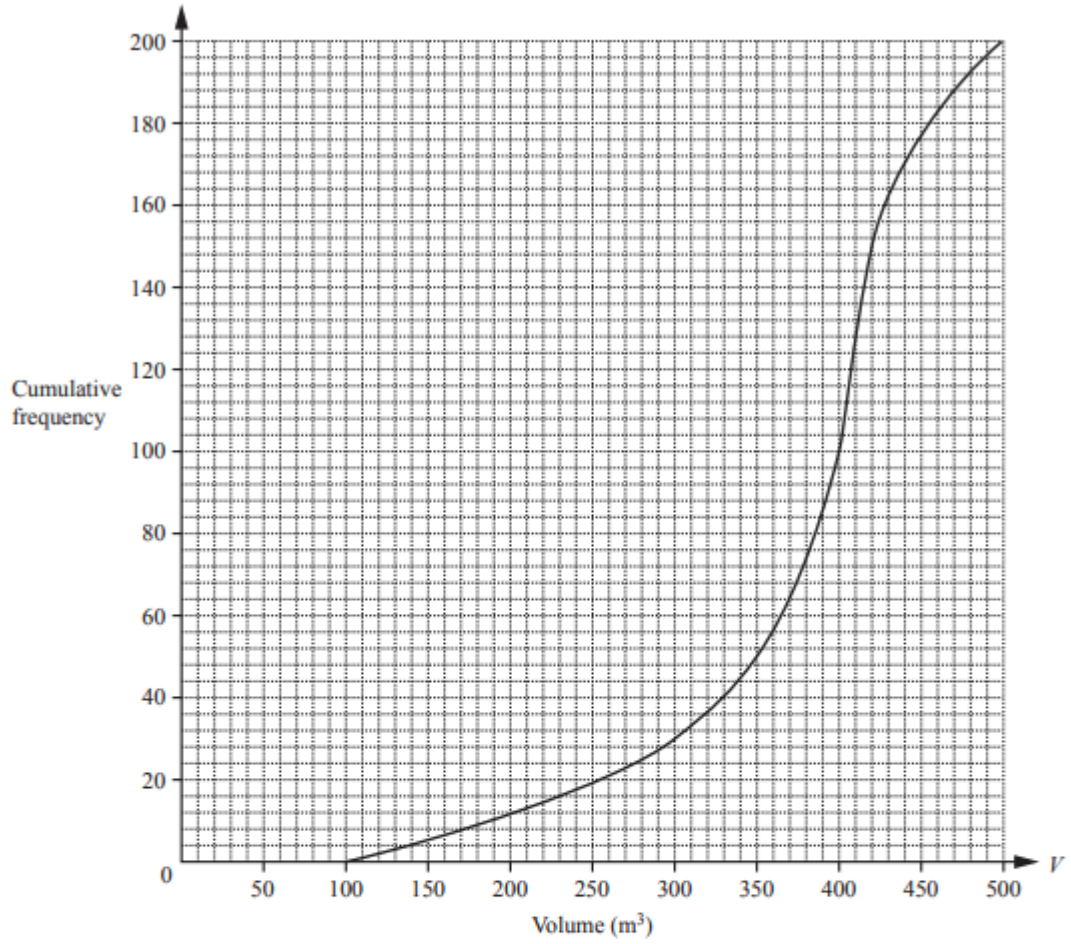
[3]

(c) On the grid below, complete the histogram to show the information in the table in **part (b)**.



[4]

3 **(a)** 200 students estimate the volume, $V\,m^3$, of a classroom.
The cumulative frequency diagram shows their results.



Find

(i) the median,

..... m^3 [1]

(ii) the lower quartile,

..... m^3 [1]

(iii) the inter-quartile range,

..... m^3 [1]

(iv) the number of students who estimate that the volume is greater than $300\,m^3$.

..... [2]

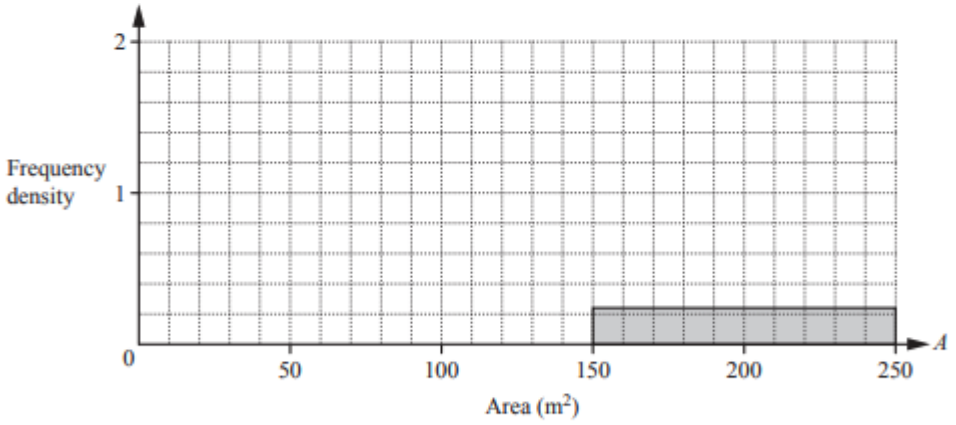
(b) The 200 students also estimate the total area, $A\,m^2$, of the windows in the classroom.
The results are shown in the table.

Area ($A\,m^2$)	$20 < A \leqslant 60$	$60 < A \leqslant 100$	$100 < A \leqslant 150$	$150 < A \leqslant 250$
Frequency	32	64	80	24

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

..... m^2 [4]

(ii) Complete the histogram to show the information in the table.



[4]

(iii) Two of the 200 students are chosen at random.

Find the probability that they both estimate that the area is greater than $100\,m^2$.

..... [2]

4 Coins are put into a machine to pay for parking cars.
The probability that the machine rejects a coin is 0.05 .

(a) Adhira puts 2 coins into the machine.

(i) Calculate the probability that the machine rejects **both** coins.

.....[2]

(ii) Calculate the probability that the machine accepts at **least one** coin.

.....[1]

(b) Raj puts 4 coins into the machine.

Calculate the probability that the machine rejects **exactly one** coin.

.....[3]

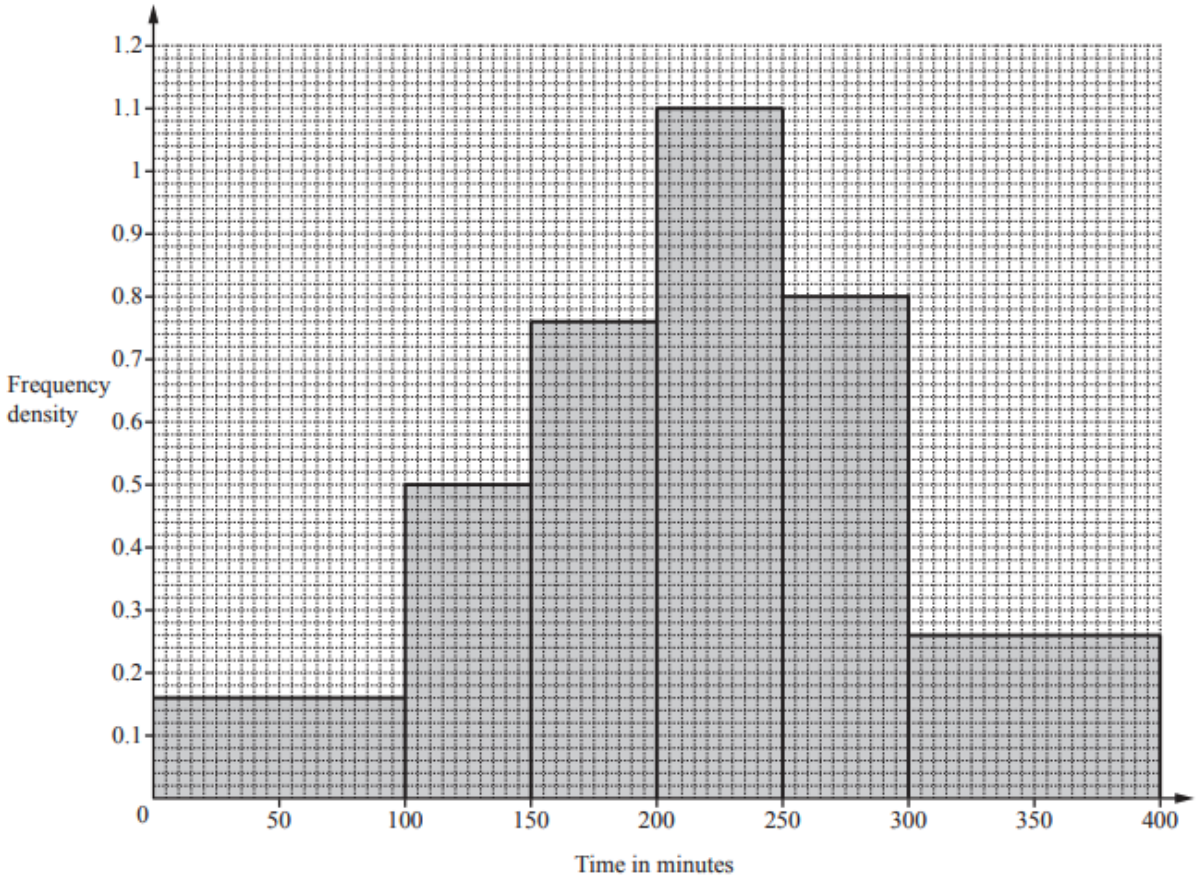
(c) The table shows the amount of money, $\$a$, received for parking each day for 200 days.

Amount ($\$a$)	$200 < a \leqslant 250$	$250 < a \leqslant 300$	$300 < a \leqslant 350$	$350 < a \leqslant 400$	$400 < a \leqslant 450$	$450 < a \leqslant 500$
Frequency	13	19	27	56	62	23

Calculate an estimate of the mean amount of money received each day.

$.....[4]

(d) The histogram shows the length of time that 200 cars were parked.



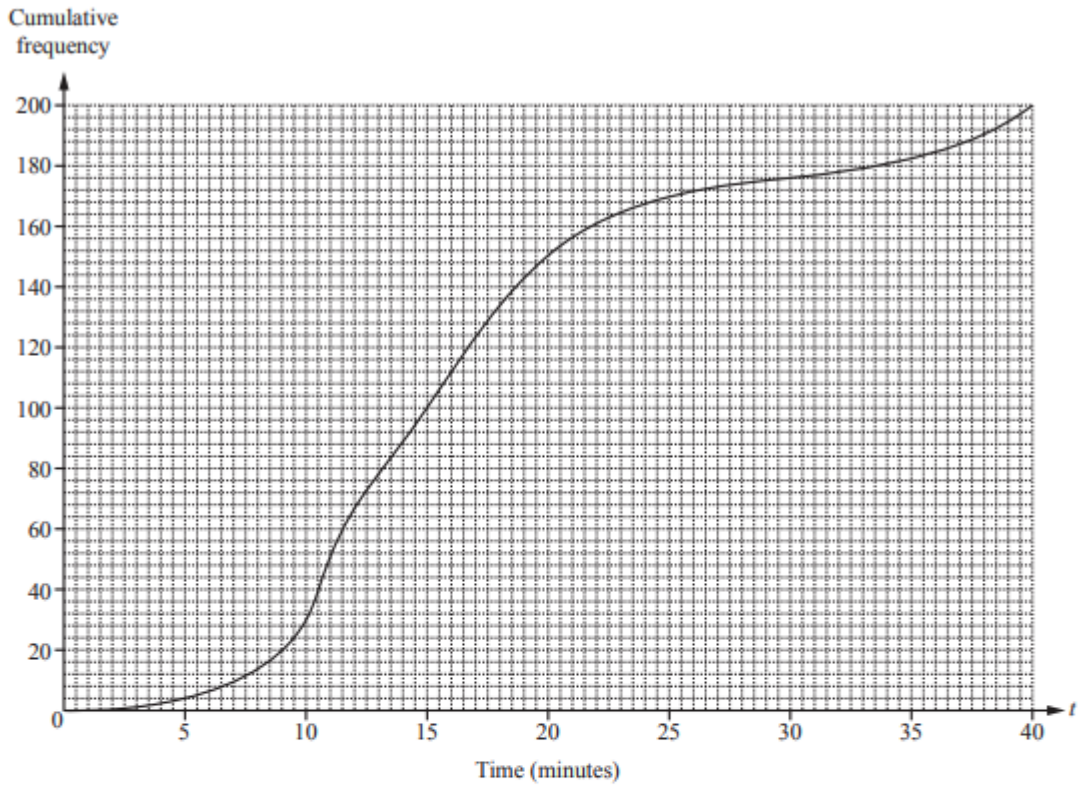
(i) Calculate the number of cars that were parked for 100 minutes or less.

..... [1]

(ii) Calculate the percentage of cars that were parked for more than 250 minutes.

.....% [2]

2 **(a)** 200 students record the time, t minutes, for their journey from home to school.
The cumulative frequency diagram shows the results.



Find

(i) the median,

.....min [1]

(ii) the lower quartile,

.....min [1]

(iii) the inter-quartile range,

.....min [1]

(iv) the 15th percentile,

.....min [1]

(v) the number of students whose journey time was more than 30 minutes.

..... [2]

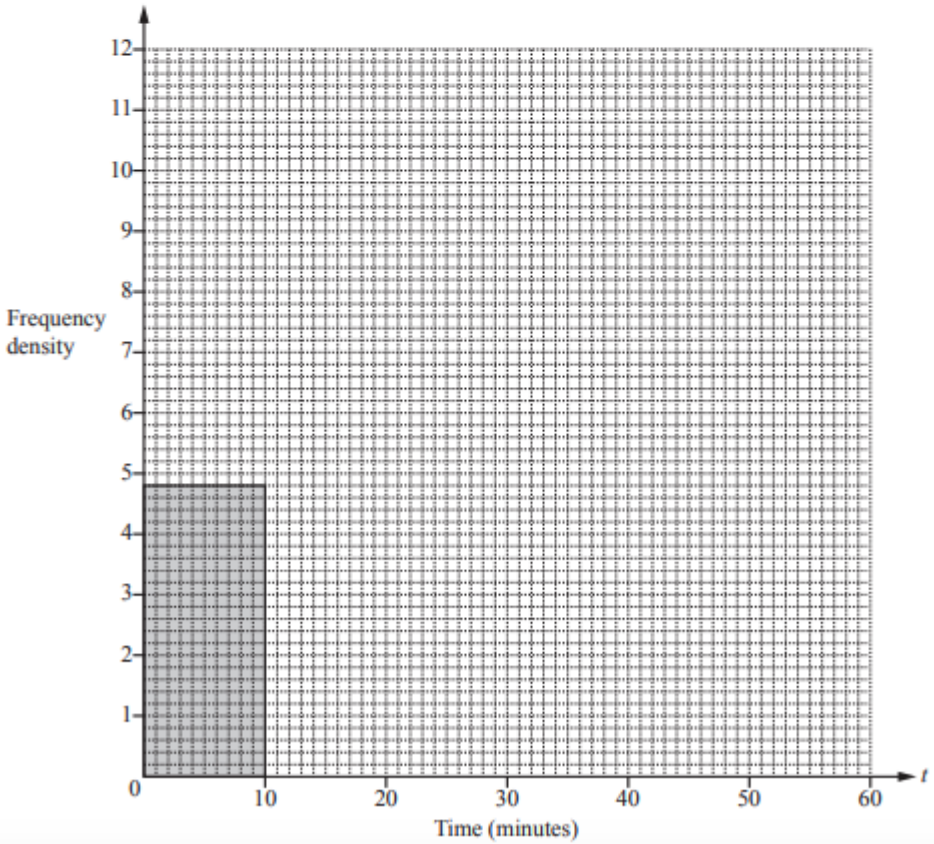
(b) The 200 students record the time, t minutes, for their journey from school to home.
The frequency table shows the results.

Time (t minutes)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 30$	$30 < t \leqslant 60$
Frequency	48	48	60	26	18

(i) Calculate an estimate of the mean.

.....min [4]

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



[4]

4 200 people run 10 km.
The table shows some information about the times, t minutes, taken to run the 10 km.

Time (t minutes)	$30 < t \leqslant 40$	$40 < t \leqslant 45$	$45 < t \leqslant 50$	$50 < t \leqslant 55$	$55 < t \leqslant 60$	$60 < t \leqslant 80$
Frequency	8	22	95	55	14	6

(a) Howard takes 40 minutes to run the 10 km.

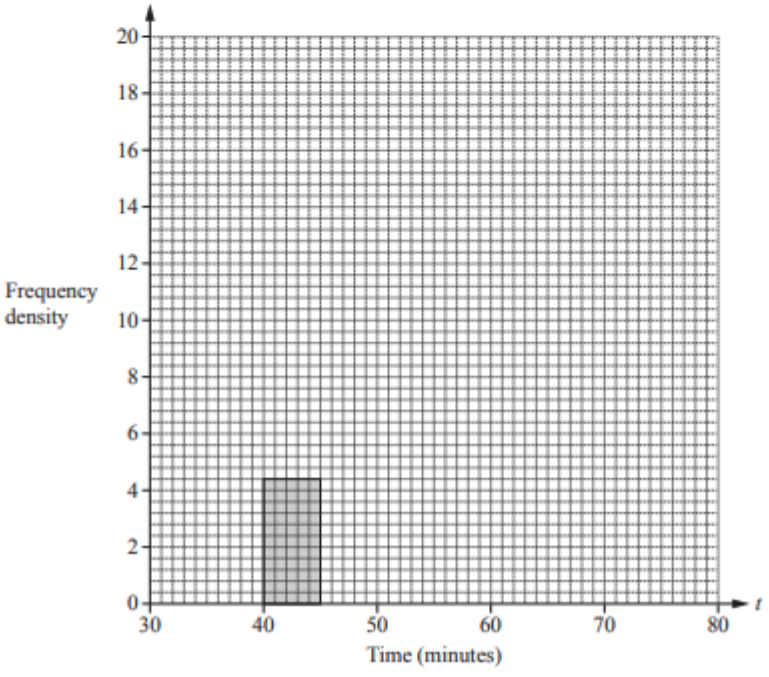
Calculate his average speed in kilometres per hour.

.....km/h [2]

(b) Calculate an estimate of the mean time.

.....min [4]

(c) Complete the histogram to show the information in the table.



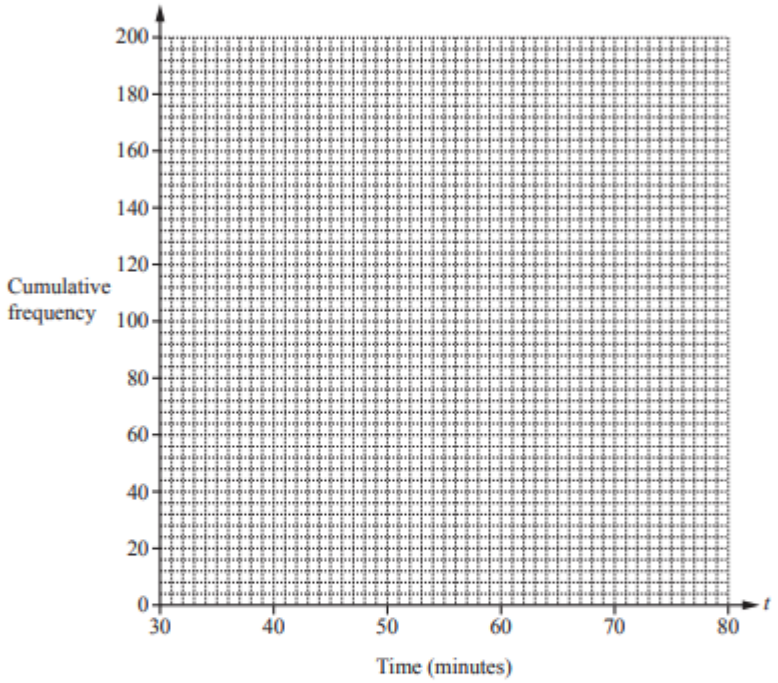
[4]

(d) **(i)** Use the frequency table opposite to complete the cumulative frequency table.

Time (t minutes)	$t \leqslant 40$	$t \leqslant 45$	$t \leqslant 50$	$t \leqslant 55$	$t \leqslant 60$	$t \leqslant 80$
Cumulative frequency	8	30			194	200

[1]

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



[3]

(iii) Use your diagram to find

(a) the median,

.....min [1]

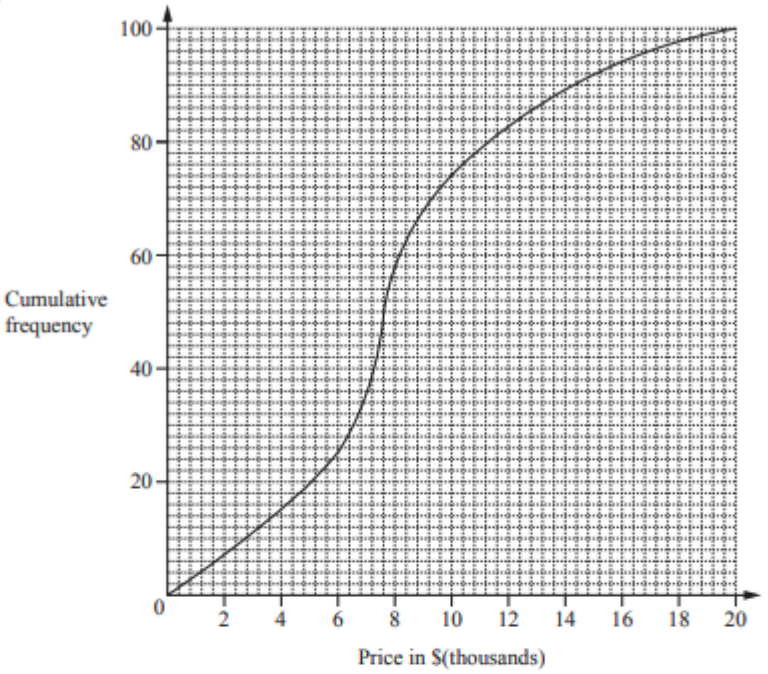
(b) the 90th percentile,

.....min [1]

(c) the number of people who took more than 58 minutes to run the 10 km.

..... [2]

7 (a) (i)



The cumulative frequency diagram shows information about the prices of 100 cars on Website A.
Use the information to complete this table.

Lower quartile	Median	Upper quartile	Inter-quartile range
$	$7600	$	$

[2]

(ii) This table shows information about the prices of cars on Website B.

Lower quartile	Median	Upper quartile	Inter-quartile range
$7600	$10 800	$13 600	$6000

Here are two statements comparing the distributions of the prices of cars on Website A and Website B.

For each statement write True or False.
Give a reason for each answer, stating clearly which statistic you use to make your decision.

(a) The prices of cars on Website A are lower than the prices of cars on Website B.

..... because .....

..... [1]

(b) A greater percentage of cars have a price more than \$13 600 on Website A compared to Website B.

..... because .....

..... [1]

(b) The table shows the prices of cars on Website B.

Price (\$$P$)	Number of cars
$0 < P \leqslant 6000$	9
$6000 < P \leqslant 8000$	29
$8000 < P \leqslant 10000$	20
$10000 < P \leqslant 12000$	14
$12000 < P \leqslant 14000$	21
$14000 < P \leqslant 22000$	27

Calculate an estimate of the mean price of the 120 cars.

\$..... [4]

(c) The price of a car is \$8760.
Bryan pays a deposit of 25% of this price and then 24 equal monthly payments.
After 24 months, he will have paid a total of \$9948.

Calculate the cost of one monthly payment.

\$..... [3]

2(a)(i)	$1.5 < h \leqslant 1.6$	**1**	
2(a)(ii)	1.62 or 1.623… nfww	**4**	**M1** for 1.35, 1.45, 1.55, 1.65, 1.75 1.85 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div 120$

2(c)(i)	55, 79, 106, 120	**2**	**B1** for 2 or 3 correct
2(c)(ii)	Correct diagram	**3**	**B1** for correct horizontal plots **B1FT** for correct vertical plots **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 6 points If 0 scored **SC1** for 5 out of 6 points correctly plotted
2(d)(i)	1.62 to 1.63	**1**	
2(d)(ii)	1.57 to 1.58	**2**	**B1** for 48 soi

3(a)	41.4	**4**	**M1** for 10, 30, 42.5, 47.5, 55, 70 **M1** for Σfx where x lies in or on the boundary of each interval. **M1 dep** for $\frac{\Sigma fx}{200}$ dep on second M1
3(b)(i)	112, 170	**1**	
3(b)(ii)	Correct diagram	**3**	**B1** for correct horizontal plot **B1FT** for correct vertical plots **B1 FT** dep on at least B1 earned for reasonable increasing curve or polygon through their 6 points If 0 scored **SC1FT** for 5 out of 6 points plotted correctly
3(b)(iii)(a)	48	**1**	
3(b)(iii)(b)	160	**2**	**M1** for 40 seen

3(d)	Correct histogram	**3**	**B1** for each column If 0 scored **SC1** for correct frequency densities soi 1.25, 12, 1

3(a)	correct diagram	**4**	**B1** for median line correctly drawn at 148 **B1** for 105 soi **B1** for whisker at 159 soi
3(b)	6.48	**3**	**M1** for $(5 \times 8) + (6 \times 2) + (12 \times 7) + \ldots$ **M1dep** for *their* $\sum fx \div$ *their* $(8 + 2 + 12 + 2 + 0 + 1)$

3(a)	Disagree: the median for the women is greater (than the median for the men) oe Disagree: the men have a smaller [interquartile] range of times oe	**2**	**B1** for each correct statement oe
3(b)(i)	87.4 nfww	**4**	**M1** for mid-points **soi** (30, 80, 130, 190, 270) **M1** for use of Σfm with m in correct interval including both boundaries **M1** (dep on 2nd M1) for $\Sigma fm \div (41 + 24 + 23 + 8 + 4)$
3(b)(ii)(a)	90	**1**	
3(b)(ii)(b)	8	**2**	**B1** for 92 seen

3(b)(iii)	2.4	**2**	**M1** for $\frac{24}{40}$ or $\frac{8}{60}$ Or **B1** for [multiplier] 18 or $\frac{1}{18}$

4(a)(i)	25	**1**	
4(a)(ii)	10 nfww	**2**	**B1** for [lq =] 22 or [uq =] 32
4(a)(iii)	27	**1**	
4(a)(iv)	6	**2**	**B1** for 114 written
4(b)(i)	27.9 or 27.91 to 27.92 nfww	**4**	**M1** for mid-values **M1** for $\sum fx$ where x lies within or on boundary of correct interval **M1 dep** $\sum fx \div 120$ dep on second M1
4(b)(ii)	7.6	**2**	**M1** for $\frac{18}{10}$ oe or $\frac{38}{20}$ oe or **B1** for [multiplier] 4 or ¼

3(a)(i)	43	**1**	
3(a)(ii)	65	**1**	
3(a)(iii)	13	**1**	

3(b)	80	**3**	**M2** for $\frac{400}{18}\times\frac{60\times60}{1000}$ oe Or **M1** for $\frac{400}{18}$ or for *their* speed in m/s $\times\frac{60\times60}{1000}$ or for $\frac{400}{1000}$ and $\frac{18}{60\times60}$ soi

3(a)	$\frac{5}{9}$ oe	**1**	
3(b)	$\frac{80}{153}$ oe	**3**	**M2** for $2\times\frac{10}{18}\times\frac{8}{17}$ oe or **M1** for $\frac{10}{18}\times\frac{8}{17}$ oe If 0 scored, **SC1** for $\frac{160}{324}$ oe
3(c)	$\frac{11}{51}$ oe	**4**	**M3** for $\frac{10}{18}\times\frac{9}{17}\times\frac{8}{16}+\frac{8}{18}\times\frac{7}{17}\times\frac{6}{16}$ oe or **M2** for $\frac{10}{18}\times\frac{9}{17}\times\frac{8}{16}$ oe or $\frac{8}{18}\times\frac{7}{17}\times\frac{6}{16}$ oe or **M1** for $\frac{10}{18},\frac{9}{17},\frac{8}{16}$ or $\frac{8}{18},\frac{7}{17},\frac{6}{16}$ If 0 scored, **SC1** for $\frac{1512}{5832}$ oe

7(a)(i)	111.25	**4**	**M1** for midpoints **soi** (25, 75, 112.5, 137.5, 175) **M1** for $\sum fx$ with x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 20$
7(a)(ii)	2 7 11 17	**2**	**B1** for three correct
7(a)(iii)	$\frac{3}{20}$ oe	**1**	
7(b)	20 6	**2**	**B1** for one correct value or [SF =] 5 or $\frac{1}{5}$ oe
7(c)(i)	5 nfww	**3**	**M2** for $\sum fx \div \sum f = 4.28$ oe or **M1** for $179 + 7x$ oe or $4.28 \times (45 + x)$ oe seen
7(c)(ii)	3	**1**	
7(c)(iii)	4	**1**	

7(a)(i)	111.25	**4**	**M1** for midpoints **soi** (25, 75, 112.5, 137.5, 175) **M1** for $\sum fx$ with x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 20$
7(a)(ii)	2 7 11 17	**2**	**B1** for three correct
7(a)(iii)	$\frac{3}{20}$ oe	**1**	
7(b)	20 6	**2**	**B1** for one correct value or [SF =] 5 or $\frac{1}{5}$ oe
7(c)(i)	5 nfww	**3**	**M2** for $\sum fx \div \sum f = 4.28$ oe or **M1** for $179 + 7x$ oe or $4.28 \times (45 + x)$ oe seen
7(c)(ii)	3	**1**	
7(c)(iii)	4	**1**	

4(a)(i)	range = 7	**1**	
	mode = 21	**1**	
	median = 22.5	**2**	**M1** for evidence of middle value
	mean = 22.7 or 22.71…	**2**	**M1** for use of $\Sigma x \div 14$
4(a)(ii)	$\frac{3}{14}$ oe	**1**	
4(b)	$x - n + 1$ final answer	**3**	**M2** for $nx - (n-1)(x+1)$ or **M1** for $(n-1)(x+1)$
4(c)(i)	16.6 or 16.60 to 16.61 nfww	**4**	**M1** for 5, 12.5, 17.5, 22.5, 30 soi **M1** for Σfx where x is in correct interval, including boundaries **M1 dep** on second M1 for $\frac{\Sigma fx}{50+85+100+120+10}$
4(c)(ii)	Correct histogram	**4**	**B1** for each correct block If 0 scored, **SC1** for 5, 20, 24, 1 seen
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

6(a)	40.5 or 40.45[8..] or 40.46 nfww	**4**	**M1** for 25, 32.5, 37.5, 50, 80 soi **M1** for Σft **M1 dep** for their $\Sigma ft \div 120$
6(b)	Fully correct histogram	**4**	**B1** for each correct bar If 0 scored, **SC1** for frequency densities of 5.4, 4.2, 0.8 and 0.45 seen

6(a)(i)	34	**1**	
6(a)(ii)	18	**2**	**B1** for [l.q. =] 25 or [u.q. =] 43 seen
6(a)(iii)	60	**2**	**M1** for 140 written
6(b)(i)	49	**1**	
6(b)(ii)	20	**1**	
6(b)(iii)	10	**1**	
6(b)(iv)	220	**2**	**M1** for $3 \times 1 + 1 \times 2 + 3 \times 5 + 2 \times 10 + 4 \times 20 + 2 \times 50$
6(b)(v)	14.7 or 14.66 to 14.67	**1**	**FT** *their* (iv) ÷ 15

6(c)	13.25 nfww	**6**	**B2** for frequencies 30, 40, 30 soi or **B1** for 2 of these **M1** for 5, 12.5, 22.5 **M1** Σfx with *their* frequencies (if seen) and each x in correct interval including boundaries **M1 dependent** for $\frac{\Sigma fx}{100}$ (dependent on second M1) **OR** **Alternative Method** **B2** for frequencies 15, 15, 40, 10, 10, 10 soi or **B1** for 2 of 15, 40, 10 **M1** for 2.5, 7.5, 12.5, 17.5, 22.5, 27.5 **M1** Σfx with *their* frequencies (if seen) and each x in correct interval including boundaries **M1 dependent** for $\frac{\Sigma fx}{100}$ (dependent on second M1)

2(a)(i)	54	**1**	
2(a)(ii)	29	**2**	**M1** for [UQ =] 65 or [LQ =] 36
2(a)(iii)	32	**1**	
2(a)(iv)	17, 18 or 19	**2**	**M1** for 61 to 63 written or for decimal answer in range 17 to 19
2(b)(i)	18, 26, 26	**2**	**B1** for 1 or 2 correct
2(b)(ii)	51 nfww	**4**	**M1** for 10 , 30 , 50 , 70 , 90 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div \Sigma f$
2(c)(i)	75	**1**	
2(c)(ii)	IQR is bigger for the girls with [boys =] 20 seen oe	**2**	**FT** *their* IQR from (a)(ii) **M1** for IQR for boys = 20 isw or for girls IQR is bigger than boys IQR oe isw **FT** *their* IQR from (a)(iii)

5(a)(i)	52	**1**	
5(a)(ii)	36	**1**	
5(a)(iii)	26	**1**	**FT** 62 – *their* (a)(ii) evaluated correctly
5(b)	Valid comment	**1**	Strict **FT** *their* (a)(iii), e.g. distances for females are more varied
5(c)	$\frac{11}{20}$ oe	**2**	**M1** for 27 written or answer of $\frac{27}{60}$ oe
5(d)(i)	[18 9] 14 12 5 [2]	**2**	**B1** for 1 correct value
5(d)(ii)	48.75 nfww	**4**	**M1** for midpoints soi **M1** for use of $\sum fx$ with *their* frequencies **M1** (dep on 2nd M1) for $\sum fx \div$ (60 or by *their* $\sum f$)

7(a)(i)	$\frac{9}{160}$ oe	**1**	
7(a)(ii)	58.125 nfww	**4**	**M1** for mid-points soi **M1** for use of Σfx with x in correct interval including both boundaries **M1** (dep on 2nd M1) for $\Sigma fx \div 160$
7(b)	[3 42] 85 140 151 160	**2**	**B1** for 1 error **FT** other values

7(c)	correct curve	**3**	**B1FT** *their* **(b)** for 6 correct heights **B1** for 6 points at upper ends of intervals on correct vertical line **B1FT dep on at least B1** for increasing curve through *their* 6 points After 0 scored, **SC1** for *their* 5 correct points plotted
7(d)(i)	57 to 59	**1**	
7(d)(ii)	36 to 42	**2**	**B1** for UQ = 76 to 80 or LQ = 38 to 40 soi
7(d)(iii)	92 to 94	**2**	**B1** for 144 seen
7(d)(iv)	130 to 137	**2**	**B1** for 23 to 30 seen

2(a)(i)	$20 [< t \leqslant] 25$	**1**	
2(a)(ii)	$25 [< t \leqslant] 30$	**1**	
2(a)(iii)	28.3 or 28.33..	**4**	**M1** for 22.5, 27.5, 32.5, 37.5, 42.5 soi **M1** for Σfx where x is in the correct interval including boundaries **M1**dep for $\Sigma fx \div 120$ or $\Sigma fx \div (44 + 32 + 28 + 12 + 4)$
2(a)(iv)	$\frac{4}{120}$ oe isw	**1**	
2(b)(i)	76, 104, 116, 120	**2**	**B1** for one error FT other values or for 3 correct
2(b)(ii)	Correct curve	**3**	**B1** for correct horizontal placement for 6 plots **B1FT** 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)(iii)	27 to 27.5	**1**	
2(b)(iv)	8.5 to 9.5	**2**	**B1** for [UQ=] 32 to 32.5 or [LQ=] 23 to 23.5
2(b)(v)	8, 9, 10, 11 or 12	**2**	**B1** for 108 to 112 seen or **B1FT** *their* graph reading at 37 mins seen

3(a)(i)	Positive	**1**	Ignore strong, weak, etc.
3(a)(ii)	Correct ruled line	**1**	
3(a)(iii)	2	**1**	
3(b)	[mode =] 0 [median =] 1 [mean =] 1.04 or 1.041 to 1.042	**5**	**B1** **B1** **B3** or **M2** for ([10 × 0] + 8 × 1 + 3 × 2 + 2 × 3 + [0 × 4] + 1 × 5) ÷ 24 oe or **M1** for [10 × 0] + 8 × 1 + 3 × 2 + 2 × 3 + [0 × 4] + 1 × 5 oe
3(c)(i)	60.9 or 60.91... nfww	**4**	**M1** for 49, 57, 71 correct **M1** for use of Σfx with x in the correct interval including both boundaries **M1** (dep on 2nd **M1**) for *their* (78 × 49 + 180 × 57 + 162 × 71) ÷ (78 + 180 + 162)
3(c)(ii)	Correct histogram	**4**	**B1** for correct widths in correct position **B1** height 13 **B1** height 18 **B1** height 9 If 0 scored **B1** for 13, 18 and 9 seen

4(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**
4(b)	0.8 2.8 0.65	**3**	**B1** for each If zero scored, **SC1** for 1.6, 5.6 and 1.3 seen

4(c)	8 34 69 136 164	**2**	**B1** for one error **FT** other values or for 3 or 4 correct
4(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
4(e)(i)	15 to 17	**2**	**B1** for [LQ =] 93 to 94 or [UQ =] 109 to 110
4(e)(ii)	107 to 109	**2**	**B1** for 126 seen
4(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

9(a)(i)	42.8 or 42.79 … nfww	**4**	**M1** for mid-values soi **M1** for Σfm where m is any value in interval including boundaries **M1** (dep on second **M1**) for *their* $\Sigma fm \div 120$
9(a)(ii)	Blocks of height 1.8 4.4 8 2.1 with correct widths	**4**	**B1** for each correct block If **B0**, **SC1** for correct frequency densities seen
9(b)	Valid general comment about distributions	**1**	e.g. [On average], shoppers spend less time shopping on Wednesday oe

5(a)(i)	265 or 265.3 to 265.4 nfww	**4**	**M1** for mid-values 150, 225, 275, 400 soi **M1** for Σfx where x is in correct interval including boundaries **M1 dep** for $\Sigma fx \div 52$ dependent on second **M1**
5(a)(ii)	Correct histogram	**4**	**B1** for each correct block If 0 scored, **SC1** for the four frequency densities seen
5(b)(i)	100	**1**	
5(b)(ii)	56	**1**	
5(b)(iii)	62	**1**	
5(b)(iv)	24	**1**	
5(b)(v)	88	**2**	**M1** for evidence of 12 written

7	**(a)**	72.7 or 72.70 to 72.71 nfww	**4**	**M1** for midpoints **soi** (condone 1 error or omission) (47.5, 55, 65, 80, 95, 110) **M1** for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) (1092.5, 3520, 7930, 10880, 2470, 3190) **M1** (dep on 2nd M1) for $\sum fx \div 400$
	(b) (i)	[23] 87 209 345 371 [400]	**2**	**B1** for 2 or 3 correct
	(ii)	Correct graph	**3**	**B1FT** *their* **(b)(i)** for 6 correct heights **B1** for 6 points at upper ends of intervals on correct vertical line **B1FT** (dep on at least B1) for increasing curve or polygon through 6 points After 0 scored, **SC1FT** *their* **(b)(i)** for 5 correct points plotted
	(iii) (a)	69 to 70	**1**	
	(b)	20 to 23	**2FT**	**FT** *their* cumulative freq curve **M1** for correct UQ or LQ for *their* cumulative freq curve
	(c)	72 to 72	**2**	**M1** for 240 soi

2(a)	$71 < t \leqslant 72$	**1**	
2(b)	72.3 or 72.27 to 72.28 nfww	**4**	**M1** for midpoints soi (condone 1 error or omission) **M1** for use of $\sum fx$ with x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 90$
2(c)(i)	41, 62, 80, 90	**2**	**B1** for 2 correct values

2(c)(ii)	Correct curve	**3**	**B1FT** *their* **(c)(i)** for 5 correct heights **B1** for 5 points plotted at upper ends of intervals **B1FT** (dep on at least **B1**) for increasing curve or increasing polygon through 5 points If zero scored, **SC1FT** for 4 correct points plotted
2(c)(iii)	72.1 to 72.4	**1**	
2(c)(iv)	1.9 to 2.2	**2**	**M1** for UQ = 73.2 to 73.4 or LQ = 71.2 to 71.3
2(d)	180 cao nfww	**4**	**B3** for 50 [m/s] nfww OR **M3** for $\frac{3725 \div 1000}{74.5 \div 3600}$ OR **M2** for 3725 ÷ 74.5 or **M1** for 3725 or 74.5 seen or for (3715 to 3725) ÷ (74.5 to 75.5) **M1** indep for multiply by 3.6 oe

3(a)(i)	175.5 nfww	**4**	**M1** for at least four of 50, 125, 175, 225, 325 soi **M1** for Σfx with x inside or on boundary of each interval **M1** (dep on second **M1**) for $\frac{\textit{their } \Sigma fx}{200}$
3(a)(ii)	Fully correct histogram	**4**	**B1** for each correct bar If zero scored, **B1** for 0.2, 1.32, 0.7, 0.16 seen
3(b)(i)	Fully correct cumulative frequency diagram	**3**	**B1** for correct horizontal plots **B1** for correct vertical plots **B1FT** dep on at least **B1** earned for points joined with smooth increasing curve or polygon If zero scored, **SC1** for 4 correct plotted points
3(b)(ii)(a)	170 to 175	**1**	
3(b)(ii)(b)	152 to 158	**2**	**M1** for 42 to 48 written

5(a)(i)	80 33 20	**1, 1, 1**	
5(a)(ii)	17.3 nfww	**4**	**M1** for 5, 15, 22.5, 27.5, 40 soi **M1** for $\sum fx$ with *their f* 's and x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 200$

5(b)(i)	$\frac{30}{210}$ oe	**2**	**M1** for $\frac{6}{15}\times\frac{5}{14}$ If zero scored, **SC1** for answer $\frac{36}{225}$ oe
5(b)(ii)	$\frac{108}{210}$ oe	**3**	**M2** for $\frac{6}{15}\times\frac{9}{14}+\frac{9}{15}\times\frac{6}{14}$ oe or $1-\frac{9}{15}\times\frac{8}{14}-\frac{6}{15}\times\frac{5}{14}$ or **M1** for $\frac{6}{15}\times\frac{9}{14}$ or $\frac{9}{15}\times\frac{6}{14}$ or $\frac{9}{15}\times\frac{8}{14}+\frac{6}{15}\times\frac{5}{14}$ If zero scored, **SC1** for answer $\frac{108}{225}$ oe
5(c)	150	**1**	

8(a)(i)	4 points correctly plotted	**2**	**B1** for 2 or 3 points correctly plotted
8(a)(ii)	Positive	**1**	
8(b)	mean 3.1	**3**	**M2** for $\frac{\text{sum of products}}{30}$ or **M1** for at least 4 correct products soi
	median 3	**2**	**M1** for 15.5 oe indicated
	mode 5	**1**	
	range 5	**1**	
8(c)	24 nfww	**3**	**M1** for $\frac{x\times52+45\times75+11\times91}{x+45+11}$ [= 70.3] **M1** for clearing *their* fraction

5(a)	54, 76, 96	**3**	**B1** for each
5(b)	187 or 186.8 to 186.9 nfww	**4**	**M1** for 155, 175, 185, 200, 225 soi **M1** for Σfm with *their* frequencies from **(a)** 155 × *their* 54 + 175 × *their* 76 + 185 × *their* 96 + 200 × 92 + 225 × 42 **M1** (dep on second **M1**) for *their* $\Sigma fm \div 360$

6(a)(i)	280	**1**	
6(a)(ii)	320	**1**	
6(a)(iii)	90	**1**	
6(a)(iv)	10	**2**	**M1** for 90 written
6(b)(i)	250.2 nfww cao	**4**	**M1** for at least 4 correct mid-values **M1** for Σfx **M1 dep on second M1** for $\Sigma fx \div 100$
6(b)(ii)	Correct completion of histogram	**4**	**B1** for each correct block If zero scored, then **SC1** for correct frequency densities seen
6(c)	[22 m] further oe	**1**	

4(a)	$80 < t \leqslant 100$	**1**	
4(b)	86 nfww	**4**	**M1** for midpoints soi **M1** for use of Σfx with x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\Sigma fx \div 150$
4(c)(i)	Reference to not knowing the individual values so we do not know the highest or the lowest values	**1**	
4(c)(ii)	62.4	**2**	**M1** for $26 \div 150$ or $360 \div 150$ soi
4(d)	$\frac{22}{150}$ oe	**1**	

4(e)(i)	$\frac{90}{22350}$ oe	**2**	**M1** for $\frac{10}{150} \times \frac{9}{149}$ After zero scored, **SC1** for answer $\frac{100}{22500}$ oe
4(e)(ii)	$\frac{440}{22350}$ oe	**3**	**M2** for $\frac{10}{150} \times \frac{22}{149} + \frac{22}{150} \times \frac{10}{149}$ oe or **M1** for $\frac{10}{150} \times \frac{22}{149}$ or $\frac{22}{150} \times \frac{10}{149}$ oe After zero scored, **SC1** for answer $\frac{440}{22500}$ oe
4(f)	13, 8.5, 7.25, 1.1	**3**	**B2** for 3 correct or **B1** for 1 correct or for 3 correct FD.s 5.2, 3.4, 2.9, 0.44 oe

4 (a) (i)	64	1	
(ii)	16 to 16.5	2	**M1** for UQ = 71 to 71.5 or LQ =55
(iii)	62	2	**B1** for 24 indicated
(iv)	6	2	**B1** for 54 seen
(b)	[8] 12 23 11 [4] 2	3	**B2** for 1 incorrect reading FT others **B1** for 2 correct
(c)	Blocks of height 0.6 2.3 1.1 0.4 with correct widths	4FT	**FT** *their* **(b)** for heights **B1FT** for each correct block If **B0, SC1** for blocks of widths 20, 10, 10, 10 or for *their* correct frequency densities

3 (a) (i)	400	1	
(ii)	350	1	
(iii)	70	1	
(iv)	170	2	**B1** for 30 seen
(b) (i)	Mid-values 40, 80, 125, 200 soi	M1	
	Σfx with correct frequencies and x's in correct intervals or on boundaries of correct intervals	M1	
	÷ 200	M1(dep)	Dependent on second M1
	106 nfww	A1	**SC2** for correct answer without working
(ii)	Correct histogram	4	**B1** for correct widths **and B1** for each rectangle of correct height at 0.8, 1.6, 1.6 (up to **B3**) After 0 scored, **SC1** for 3 correct frequency densities seen
(iii)	$\frac{10712}{39800}$ oe isw	2	**M1** for $\frac{104}{200}\times\frac{103}{199}$ oe

4 (a) (i)	0.0025 or $\frac{1}{400}$ oe	2	**M1** for 0.05^2 oe
(ii)	0.9975 or $\frac{399}{400}$ oe	1FT	**FT** for 1 – (*their* (a)(i)) oe
(b)	0.171 or 0.1714 to 0.1715 or $\frac{6859}{40\,000}$	3	**M2** for $4(0.05 \times 0.95^3)$ oe **M1** for 0.05×0.95^3 oe seen or for the 4 combinations correctly identified

	(c)	376 nfww	**4**	**M1** for midpoints soi (condone 1 error or omission) (225, 275, 325, 375, 425, 475) and **M1** for use of Σfx with x in correct interval including both boundaries (condone 1 further error or omission) and **M1** (dependent on second M) for $\Sigma fx \div 200$
	(d) (i)	16	**1**	
	(ii)	33	**2**	**M1** for $0.8 \times 50 + 0.26 \times 100$

2	**(a) (i)**	15 to 15.2	**1**	
	(ii)	10.8 to 11	**1**	
	(iii)	9 to 9.2	**1FT**	**FT** 20 – *their* **(a)(ii)**
	(iv)	10	**1**	
	(v)	24	**2**	**B1** for 176 written
	(b) (i)	16.75 nfww	**4**	isw attempted time conversion after correct answer **M1** for 5, 12.5, 17.5, 25, 45 soi **M1** for Σfx **M1 dep** for their $\Sigma fx \div 200$
	(ii)	Fully correct histogram	**4**	**B1** for each correct block If zero scored, **SC1** for frequency densities of 9.6, 12, 2.6 and 0.6 seen

4	(a)		15	2	**M1** for $10 \div 40$ [$\times 60$]
	(b)		49.2 nfww	4	**M1** for 35, 42.5, 47.5, 52.5, 57.5, 70 soi **M1** for Σfx $8 \times 35 + 22 \times 42.5 + 95 \times 47.5 + 55 \times 52.5 + 14 \times 57.5 + 6 \times 70$ **M1 dep** for *their* $\Sigma fx \div 200$
	(c)		Fully correct histogram	4	**B3** for 4 correct blocks or **B2** for 2 or 3 correct blocks or **B1** for 1 correct block If zero scored, **SC1** for correct frequency densities 0.8, 19, 11, 2.8, 0.3 soi
	(d)	(i)	125, 180	1	
		(ii)	Correct diagram	3	**B1FT** *their* **(d)(i)** for 6 correct heights within correct square(including boundaries) or touching correct line if should be on a grid line and **B1** for 6 points at upper ends of intervals on correct vertical line and **B1FT** (dep on at least B1) for increasing curve or polygon through 6 points If zero scored, **SC1FT** for 5 correct points plotted
		(iii) (a)	48 to 49	1	
		(b)	55	1	
		(c)	8 to 14	2FT	**B1FT** for 186 to 192 seen

7	(a)	(i)	6000 [7600] 10200 4200	2	**B1** for 6000 or 10200 If **B0** then **B1FT** for *their* (UQ – LQ)
		(ii)(a)	True, median price is lower	1	No inclusion of other statistic
		(ii)(b)	False, A's UQ < 13 600 oe	1FT	**FT** *their* UQ in **(a)(i)**
	(b)		11 025	4	Listed values are in thousands **M1** for 3, 7, 9, 11, 13, 18 soi **M1** for Σfm [1323] **M1** (dep on second **M1**) for *their* $\Sigma fm \div 120$
	(c)		323.25 nfww	3	**M2** for $9948 - 0.25 \times 8760$ or **M1** for 0.25×8760