

Lines, Angles and Shapes (H)

Intervention Booklet

Averages from Tables

Things to remember:

- The mode is the one with the highest frequency.
- To calculate the median, find where the middle value is located by using $\frac{n+1}{2}$.
- The mean is given by $\frac{\sum fx}{\sum f}$, ie. the total frequency x midpoint divided by the total frequency.
- Always look back at the data to check your answer looks realistic.

Questions:

1. Zach has 10 CDs. The table gives some information about the number of tracks on each CD.

Number of tracks	Frequency	
11	1	
12	3	
13	0	
14	2	
15	4	

- (a) Write down the mode.

.....
(1)

- (b) Work out the mean.

.....
(3)
(Total 4 marks)

2. 30 adults took part in a survey. They were each asked how much money they spent on lottery tickets last week. The table shows the results of the survey.

Money (£)	Frequency	
0	5	
2	16	
4	6	
20	2	
30	1	

Work out the mean amount of money the 30 adults spent on lottery tickets.

£
(Total 3 marks)

3. Josh asked 30 adults how many cups of coffee they each drank yesterday. The table shows his results.

Number of cups	Frequency	
0	5	
1	9	
2	7	
3	4	
4	3	
5	2	

Work out the mean.

.....
(Total 3 marks)

4. Majid carried out a survey of the number of school dinners 32 students had in one week. The table shows this information.

Number of school dinners	Frequency	
0	0	
1	8	
2	12	
3	6	
4	4	
5	2	

Calculate the mean.

.....
(Total 3 marks)

5. Fred did a survey on the areas of pictures in a newspaper. The table gives information about the areas.

Area (A cm ²)	Frequency
$0 < A \leq 10$	38
$10 < A \leq 25$	36
$25 < A \leq 40$	30
$40 < A \leq 60$	46

Work out an estimate for the mean area of a picture.

..... cm²
(Total 4 marks)

6. The table gives some information about the time taken by a group of 100 students to complete an IQ test.

Time (t seconds)	Frequency	
$60 < t < 70$	12	
$70 < t < 80$	22	
$80 < t < 90$	23	
$90 < t < 100$	24	
$100 < t < 110$	19	

- (a) Write down the modal class interval.

.....
(1)

- (b) Calculate an estimate for the mean time taken by the students.

..... seconds
(4)

(Total 5 marks)

7. The table gives some information about the time taken by a group of 100 students to complete an IQ test.

Time (t seconds)	Frequency	
$60 < t \leq 70$	12	
$70 < t \leq 80$	22	
$80 < t \leq 90$	23	
$90 < t \leq 100$	24	
$100 < t \leq 110$	19	

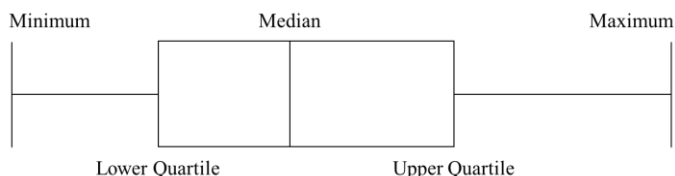
Calculate an estimate for the mean time taken by the students.

..... seconds
(Total 4 marks)

Cumulative frequency and box plots

Things to remember:

- Use a running total – adding on to complete the cumulative frequency column;
- Plot at the end of the group;
- Join up with a smooth curve;
- To find the median find the value half way down the cumulative frequency, draw across to the line and then vertically down to find the value – always show these working lines;
- To find the interquartile range find the upper quartile and the lower quartile and subtract them.
- To draw a box plot →
- When comparing box plots, use the median and the IQR and keep words consistent with the question.



Questions:

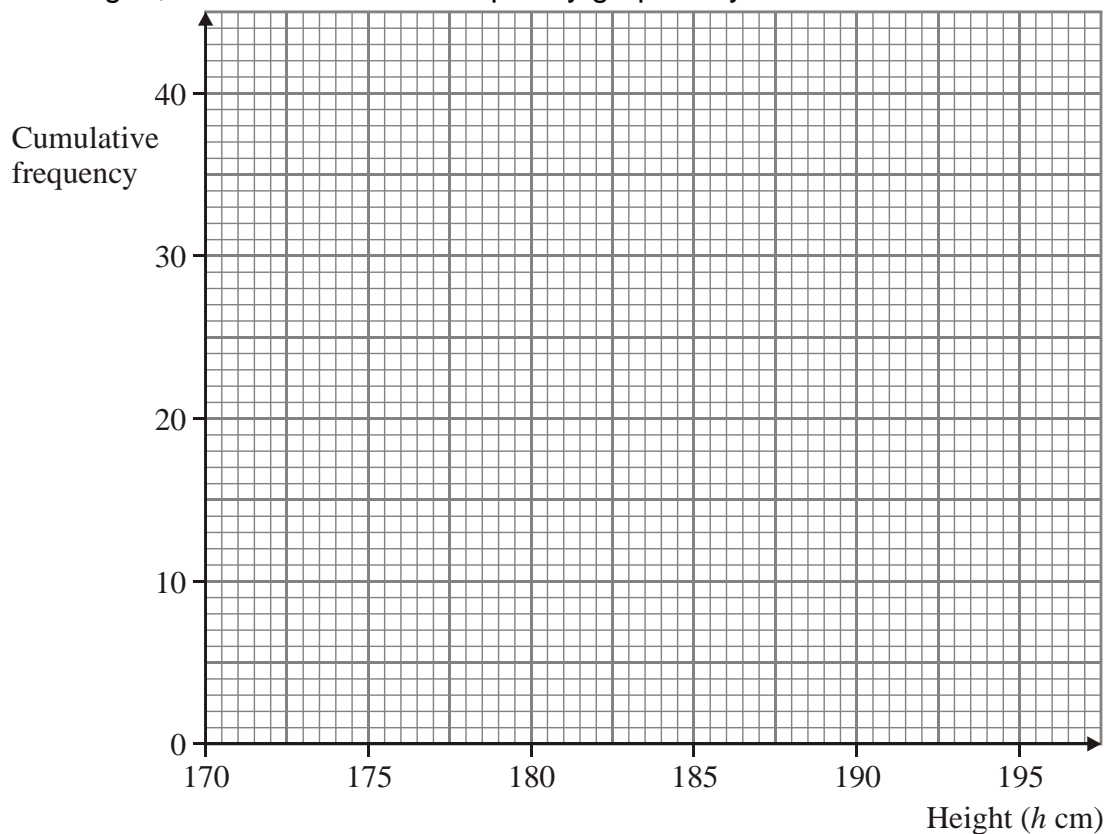
1. The table shows information about the heights of 40 bushes.

Height (h cm)	Frequency	Cumulative Frequency
$170 \leq h < 175$	5	
$175 \leq h < 180$	18	
$180 \leq h < 185$	12	
$185 \leq h < 190$	4	
$190 \leq h < 195$	1	

- (a) Complete the cumulative frequency table above.

(1)

- (b) On the grid, draw a cumulative frequency graph for your table.



(2)

(Total 3 marks)

2. The table gives information about the ages of 160 employees of an IT company.

Age (A) in years	Frequency	Cumulative Frequency
$15 < A \leq 25$	44	
$25 < A \leq 35$	56	
$35 < A \leq 45$	34	
$45 < A \leq 55$	19	
$55 < A \leq 65$	7	

(a) Write down the modal class interval.

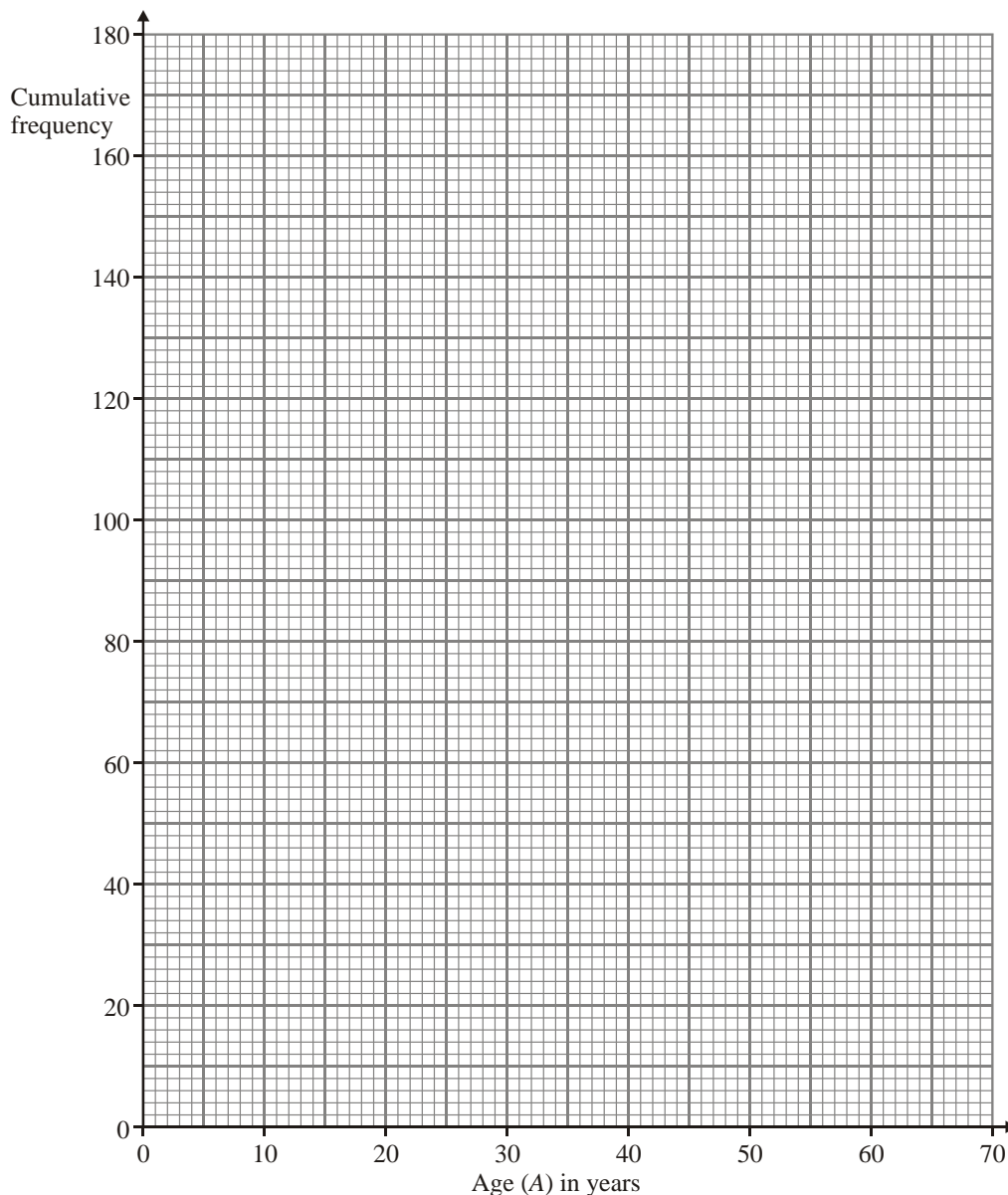
..... (1)

(b) Complete the cumulative frequency table.

(1)

(c) On the grid below, draw a cumulative frequency graph for your table.

(2)



(d) Use your graph to find an estimate for

(i) the median age of the employees,

..... years

(ii) the interquartile range of the ages of the employees.

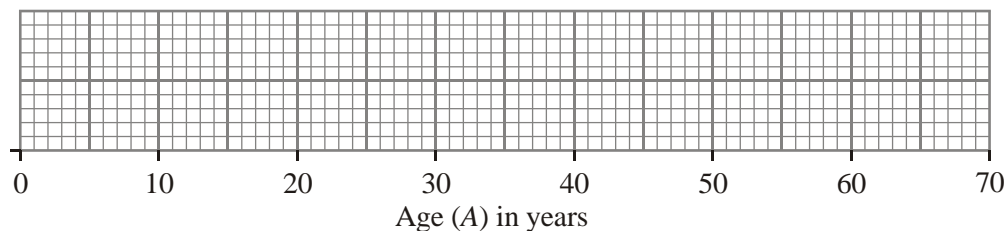
..... years

(3)

Another IT company has 80 employees. The age of the youngest employee is 24 years. The age of the oldest employee is 54 years. The median age is 38 years. The lower quartile age is 30 years. The upper quartile age is 44 years.

- (e) On the grid below, draw a box plot to show information about the ages of the employees.

(2)



(Total 9 marks)

3. A company tested 100 batteries. The table shows information about the number of hours that the batteries lasted.

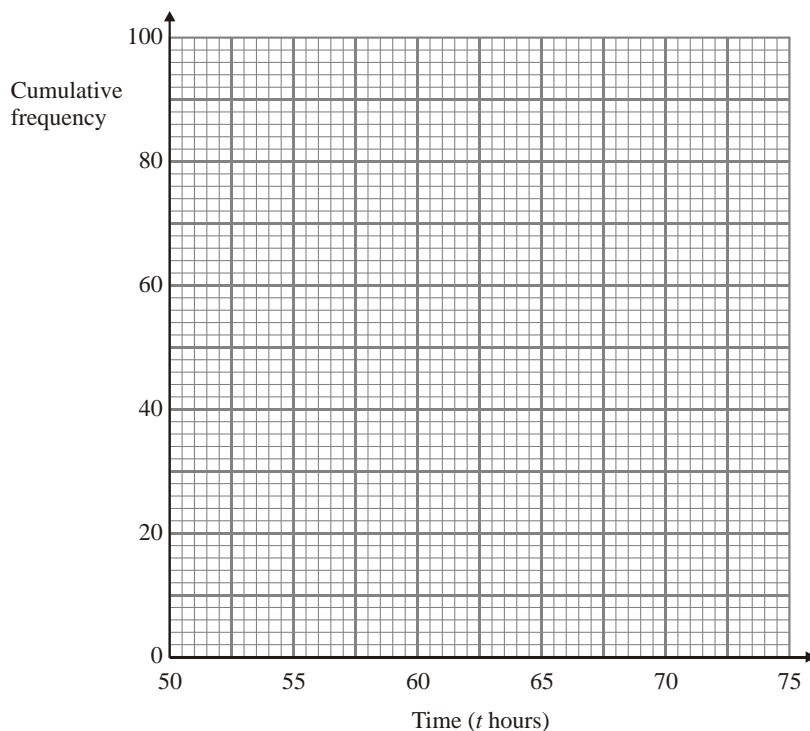
Time (t hours)	Frequency	Cumulative Frequency
$50 \leq t < 55$	12	
$55 \leq t < 60$	21	
$60 \leq t < 65$	36	
$65 \leq t < 70$	23	
$70 \leq t < 75$	8	

- (a) Complete the cumulative frequency table for this information.

(1)

- (b) On the grid, draw a cumulative frequency graph for your completed table.

(2)



- (c) Use your completed graph to find an estimate for the median time. You must state the units of your answer.

.....

(2)

(Total 5 marks)

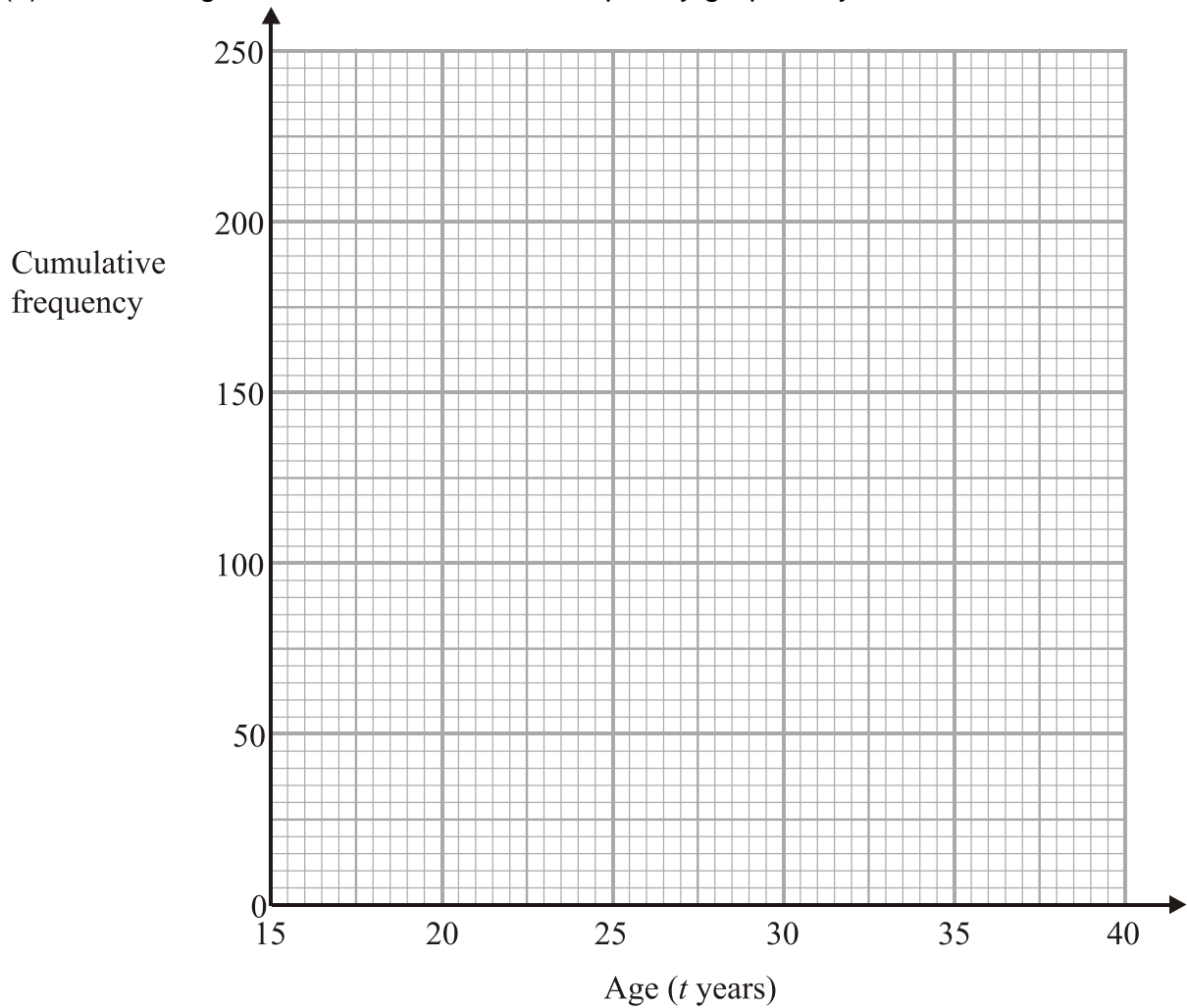
4. The table shows information about the ages of the 240 people at a club.

Age (t years)	Frequency	Cumulative Frequency
$15 \leq t < 20$	95	
$20 \leq t < 25$	90	
$25 \leq t < 30$	35	
$30 \leq t < 35$	15	
$35 \leq t < 40$	5	

(a) Complete the cumulative frequency table.

(1)

(b) On the grid, draw the cumulative frequency graph for your table.



(2)

(c) Use your graph to find an estimate for the median age of the people.

..... years

(1)

(Total 4 marks)

5. An operator took 100 calls at a call centre. The table gives information about the time (t seconds) it took the operator to answer each call.

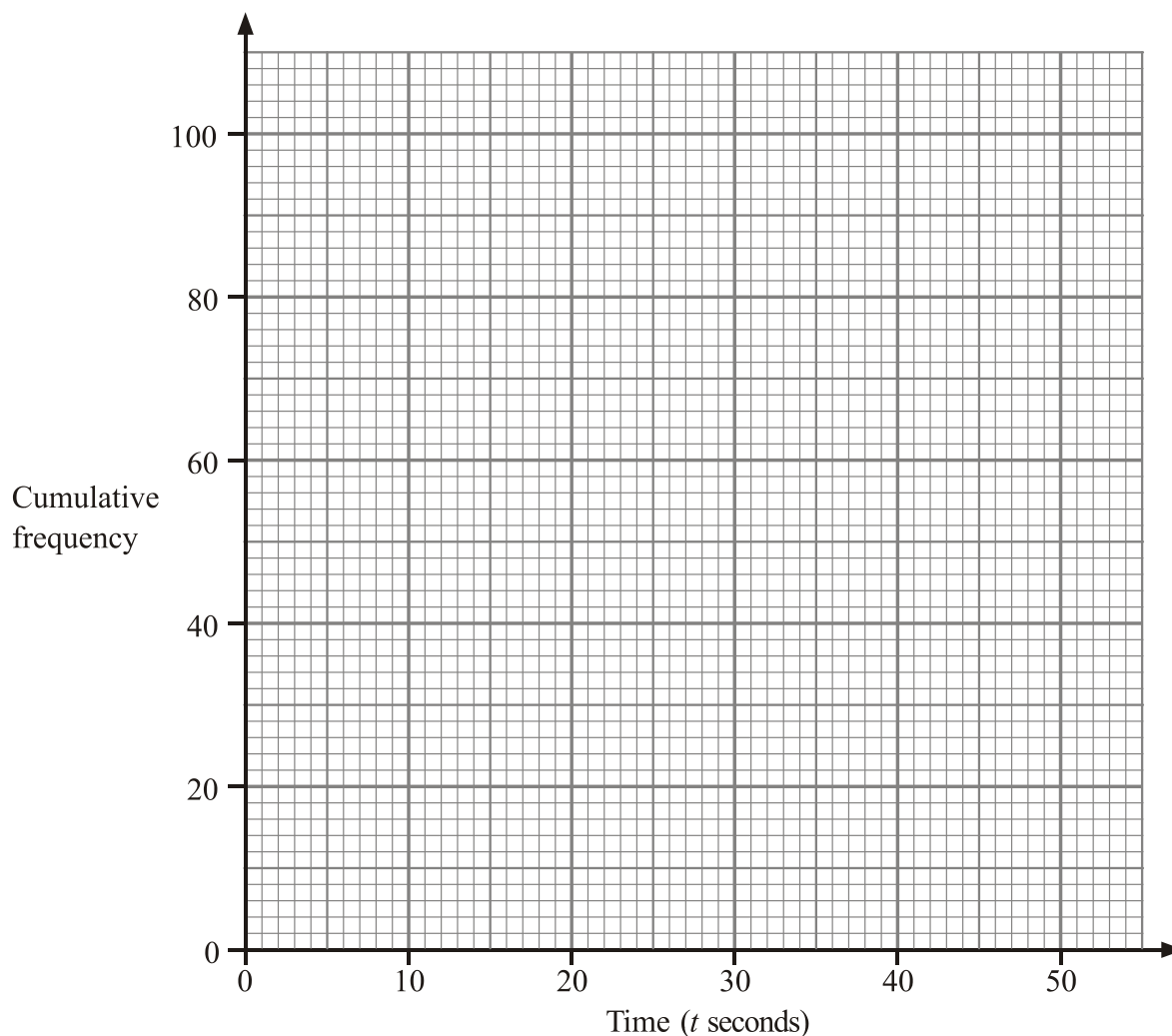
Time (t seconds)	Frequency	Cumulative Frequency
$0 < t \leq 10$	16	
$10 < t \leq 20$	34	
$20 < t \leq 30$	32	
$30 < t \leq 40$	14	
$40 < t \leq 50$	4	

(a) Complete the cumulative frequency table.

(1)

(b) On the grid, draw a cumulative frequency graph for your table.

(2)



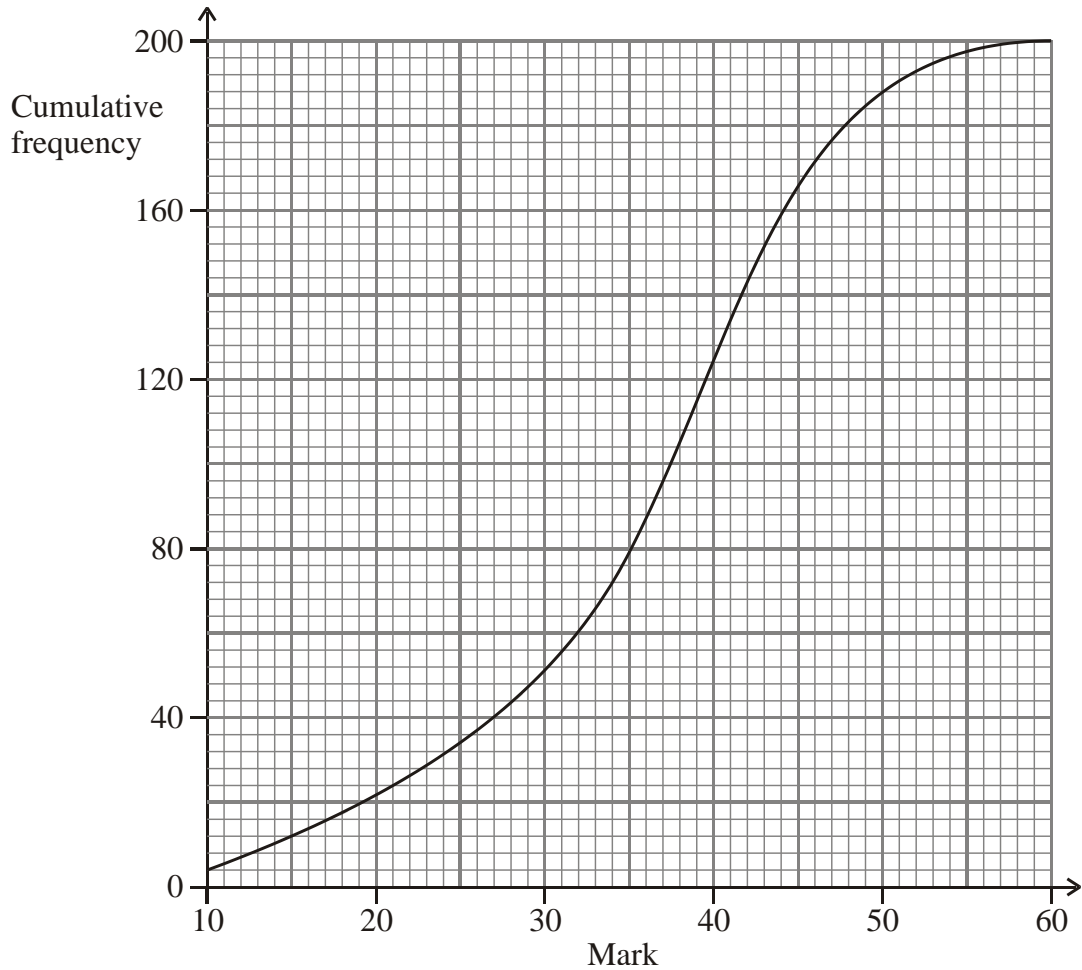
(c) Use your graph to find an estimate for the number of calls the operator took **more** than 18 seconds to answer.

.....

(2)

(Total 5 marks)

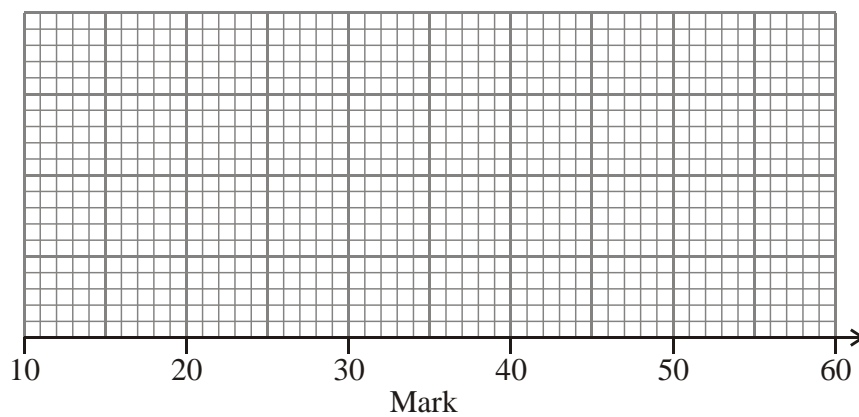
6. 200 students took a test. The cumulative frequency graph gives information about their marks.



The lowest mark scored in the test was 10.

The highest mark scored in the test was 60.

Use this information and the cumulative frequency graph to draw a box plot showing information about the students' marks.

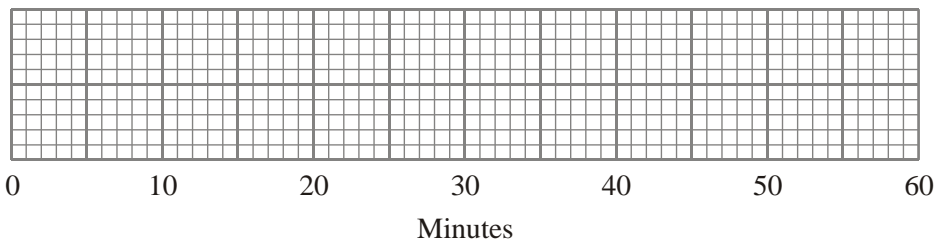


(Total 3 marks)

7. On Friday, Peter went to the airport. He recorded the number of minutes that each plane was delayed. He used his results to work out the information in this table.

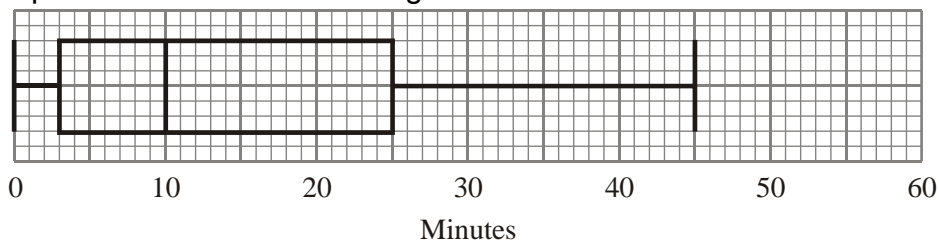
	Minutes
Shortest delay	0
Lower quartile	2
Median	8
Upper quartile	18
Longest delay	41

- (a) On the grid, draw a box plot to show the information in the table.



(2)

Peter also went to the airport on Saturday. He recorded the number of minutes that each plane was delayed. The box plot below was drawn using this information.



- (b) Make two comparisons between the distributions of plane delays on Friday and on Saturday.

.....

.....

.....

.....

(2)

(Total 4 marks)

Histograms

Things to remember:

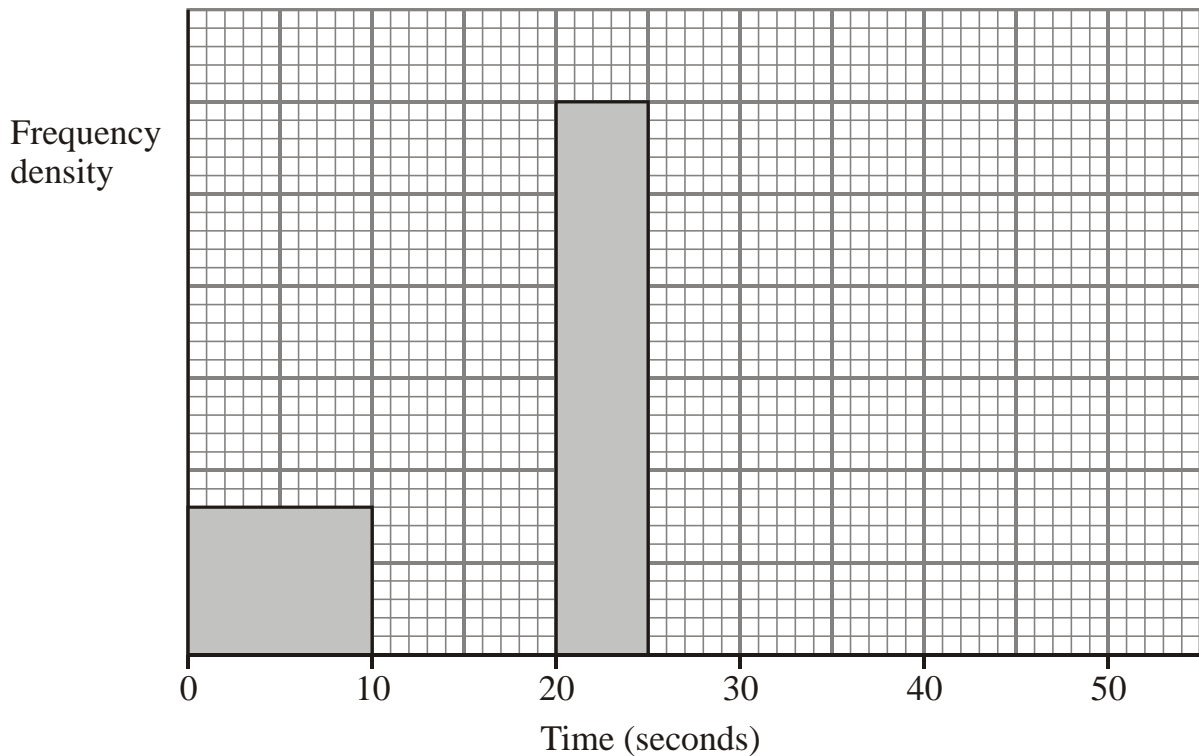
- Frequency = Frequency Density \times Class Width;
- The y-axis will always be labelled “frequency density”;
- The x-axis will have a continuous scale.

Questions:

1. One Monday, Victoria measured the time, in seconds, that individual birds spent on her bird table. She used this information to complete the frequency table.

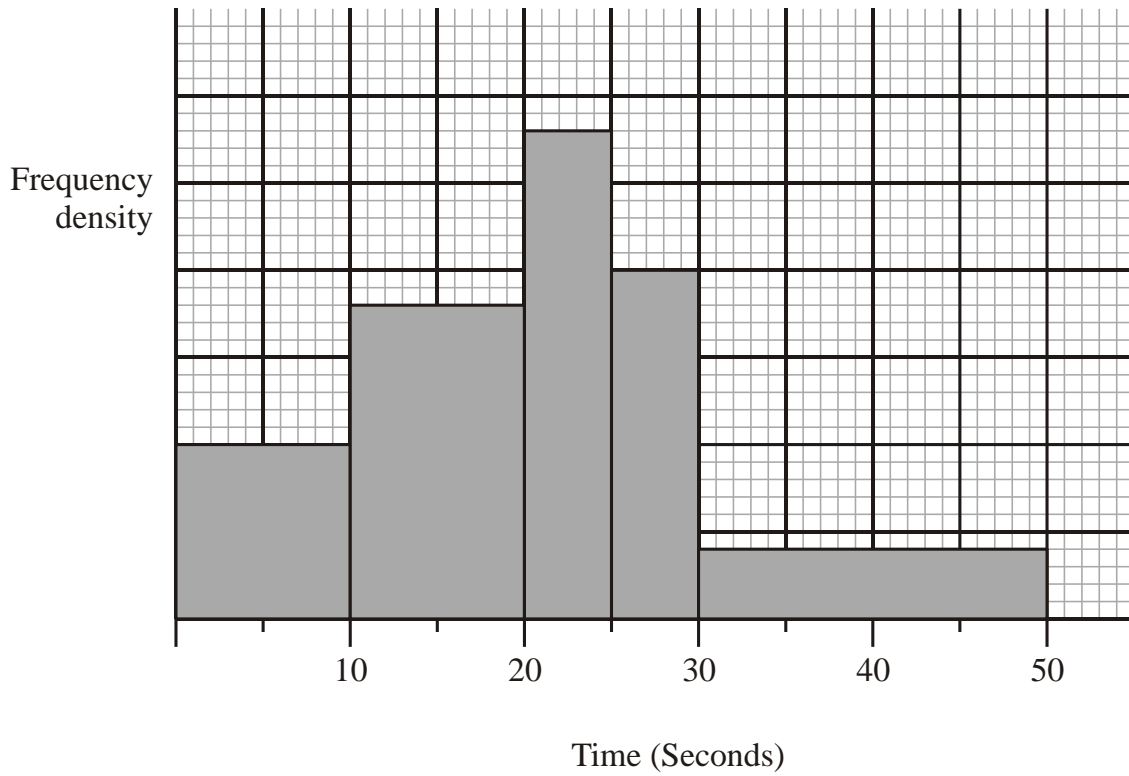
Time (t seconds)	Frequency
$0 < t \leq 10$	8
$10 < t \leq 20$	16
$20 < t \leq 25$	15
$25 < t \leq 30$	12
$30 < t \leq 50$	6

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



(3)

On Tuesday she conducted a similar survey and drew the following histogram from her results.

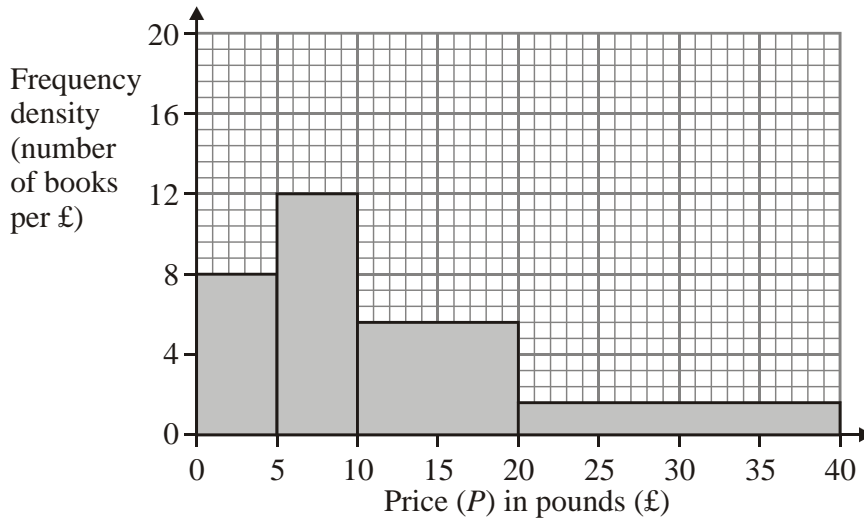


(b) Use the histogram for Tuesday to complete the table.

Time (t seconds)	Frequency
$0 < t \leq 10$	10
$10 < t \leq 20$	
$20 < t \leq 25$	
$25 < t \leq 30$	
$30 < t \leq 50$	

(2)
(Total 5 marks)

2. This histogram gives information about the books sold in a bookshop one Saturday.



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

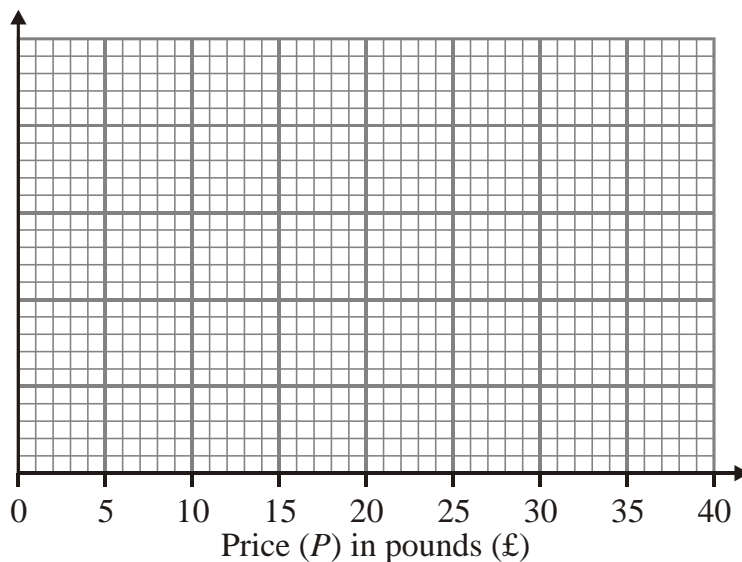
Price (P) in pounds (£)	Frequency
$0 < P \leq 5$	
$5 < P \leq 10$	
$10 < P \leq 20$	
$20 < P \leq 40$	

(2)

The frequency table below gives information about the books sold in a second bookshop on the same Saturday.

Price (P) in pounds (£)	Frequency
$0 < P \leq 5$	80
$5 < P \leq 10$	20
$10 < P \leq 20$	24
$20 < P \leq 40$	96

- (b) On the grid below, draw a histogram to represent the information about the books sold in the second bookshop.



(3)

(Total 5 marks)

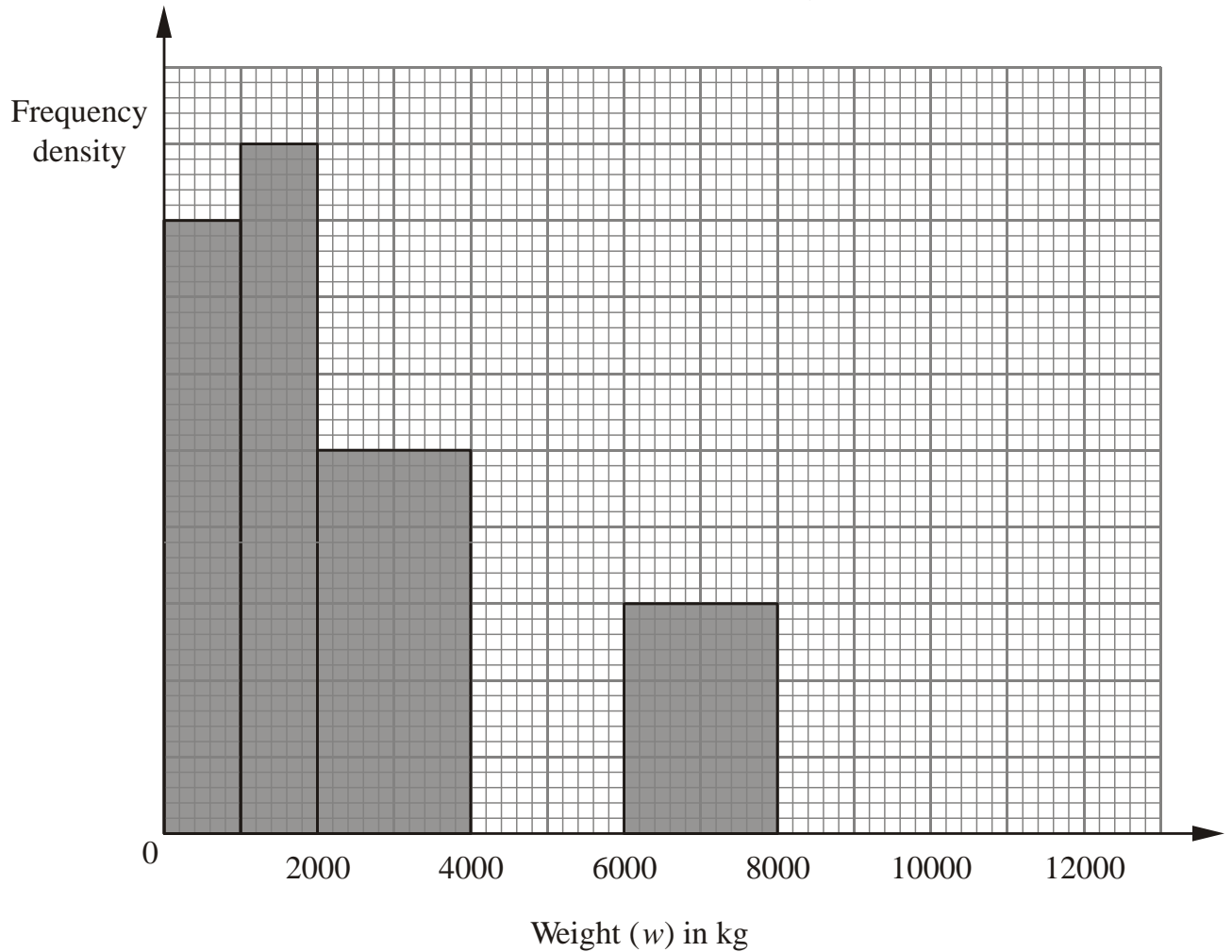
3. The incomplete histogram and table show information about the weights of some containers.

Weight (w) in kg	Frequency
$0 < w \leq 1000$	16
$1000 < w \leq 2000$	
$2000 < w \leq 4000$	
$4000 < w \leq 6000$	16
$6000 < w \leq 8000$	
$8000 < w \leq 12000$	8

(a) Use the information in the histogram to complete the table.

(2)

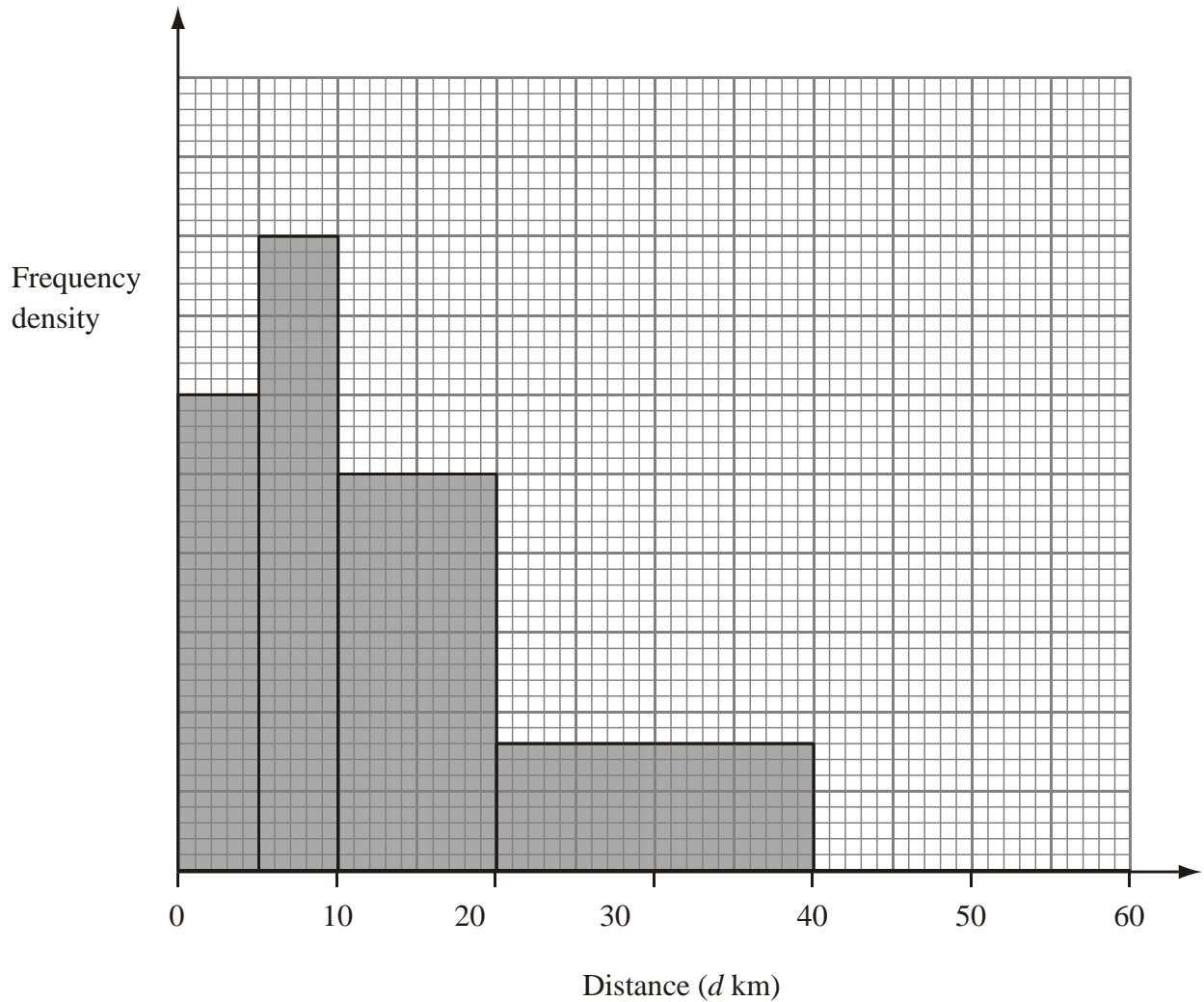
(b) Use the information in the table to complete the histogram.



(2)

(Total 4 marks)

4. The incomplete histogram and table give some information about the distances some teachers travel to school.



- (a) Use the information in the histogram to complete the frequency table.

Distance (d km)	Frequency
$0 < d \leq 5$	15
$5 < d \leq 10$	20
$10 < d \leq 20$	
$20 < d \leq 40$	
$40 < d \leq 60$	10

- (b) Use the information in the table to complete the histogram.

(2)

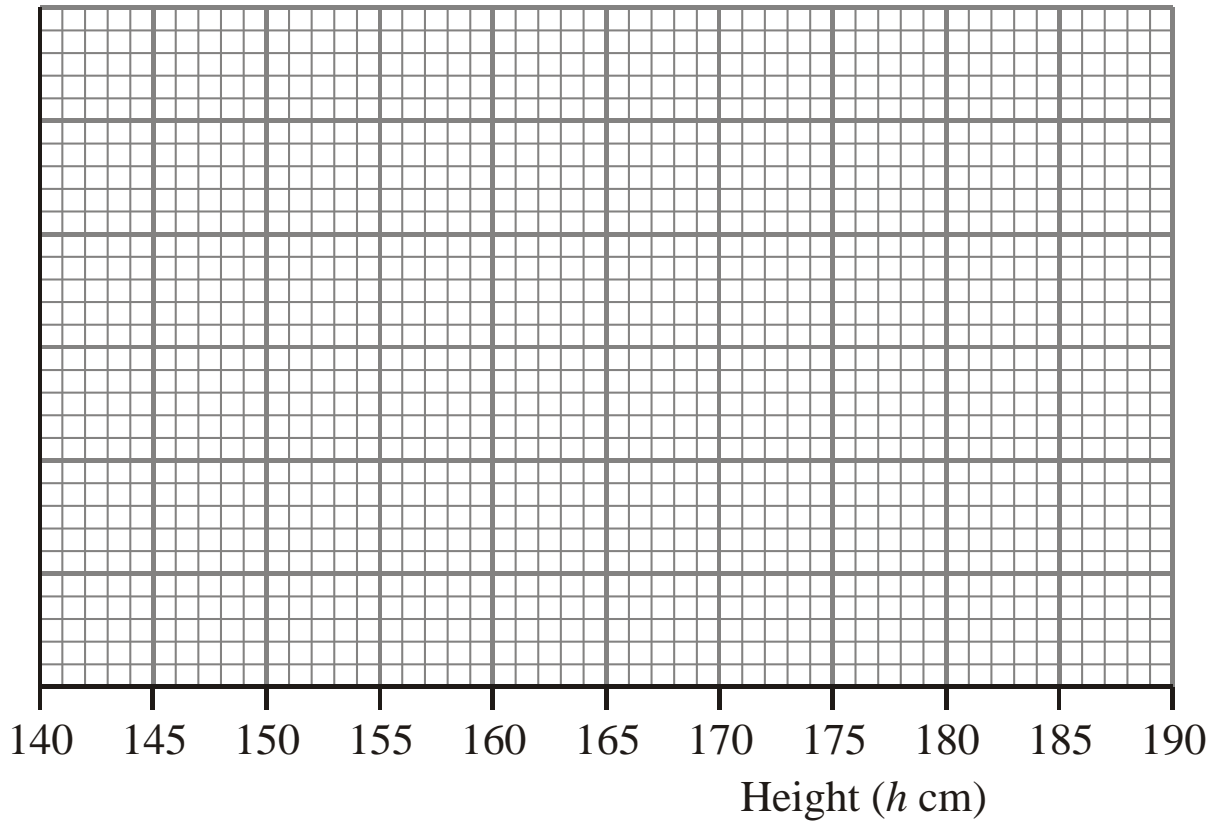
(1)

(Total 3 marks)

5. The table gives information about the heights, in centimetres, of some 15 year old students.

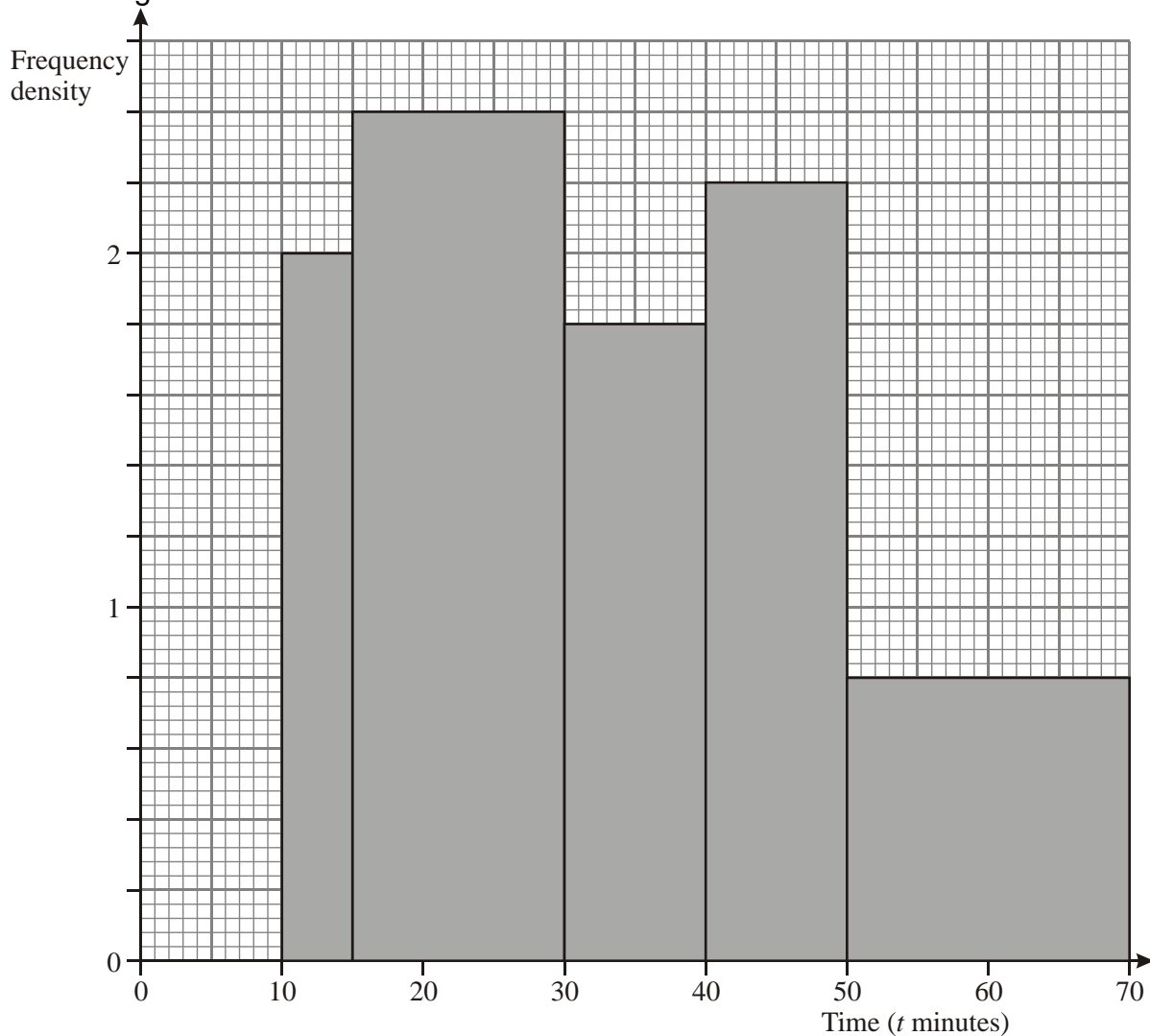
Height (h cm)	$145 < h \leq 155$	$155 < h \leq 175$	$175 < h \leq 190$
Frequency	10	80	24

Use the table to draw a histogram.



(Total 3 marks)

6. A teacher asked some year 10 students how long they spent doing homework each night. The histogram was drawn from this information.



Use the histogram to complete the table.

Time (t minutes)	Frequency
$10 \leq t < 15$	10
$15 \leq t < 30$	
$30 \leq t < 40$	
$40 \leq t < 50$	
$50 \leq t < 70$	

(Total 2 marks)

Moving Averages

Things to remember:

- For an x-point moving average, calculate the mean of the first x values.
- Then move the group along by one value, and find the mean of those x values.
- Repeat until the end.

Questions:

1. The table shows the number of computer games sold in a supermarket each month from January to June.

Jan	Feb	Mar	Apr	May	Jun
147	161	238	135	167	250

Work out the three month moving averages for this information.

.....
(Total 2 marks)

2. The table shows the number of digital cameras Bytes sold each month in the first six months of 2005.

Month	January	February	March	April	May	June
Number of digital cameras sold	30	19	20	15	27	39

The first 3-month moving average for this data is 23

Work out the **second** 3-month moving average for this data.

.....
(Total 2 marks)

3. The table shows the number of orders received each month by a small company.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Number of orders received	23	31	15	11	19	16	20	13

Work out the first two 4-month moving averages for this data.

..... and
(Total 3 marks)

4. A shop sells DVD players.

The table shows the number of DVD players sold in every three-month period from January 2003 to June 2004.

Year	Months	Number of DVD players sold
2003	Jan – Mar	58
	Apr – Jun	64
	Jul – Sep	86
	Oct – Dec	104
2004	Jan – Mar	65
	Apr – Jun	70

- (a) Calculate the set of four-point moving averages for this data.

.....
(2)

- (b) What do your moving averages in part (a) tell you about the trend in the sale of DVD players?

.....
(1)
(Total 3 marks)

5. Paul and Carol open a new shop in the High Street.
The table shows the monthly takings in each of the first four months.

Month	Jan	Feb	March	April
Monthly takings (£)	9375	8907	9255	9420

Work out the 3-point moving averages for this information.

.....
(Total 2 marks)

6. The owner of a music shop recorded the number of CDs sold every 3 months.

The table shows his records from January 2004 to June 2005.

Year	Months	Number of CDs
2004	Jan – Mar	270
	Apr – Jun	324
	Jul – Sept	300
	Oct – Dec	258
2005	Jan – Mar	309
	Apr – Jun	335

- (a) Calculate the complete set of four-point moving averages for this information.

.....
(2)

- (b) What trend do these moving averages suggest?

.....
(1)
(Total 3 marks)

7. The table shows some information about student absences.

Term	Autumn 2003	Spring 2004	Summer 2004	Autumn 2004	Spring 2005	Summer 2005
Number of absences	408	543	351	435	582	372

Work out the three-point moving averages for this information. The first two have been done for you.

434, 443,,

(Total 2 marks)

Sampling

Things to remember:

- Random sampling is where every member of the population has an equal chance of being chosen, which makes it fair.
- With systematic sampling you are unlikely to get a biased sample.
- Stratified sampling is the best way to reflect the population accurately.
- Stratified sample = $\frac{\text{total in group}}{\text{total in population}} \times \text{sample size}$

Questions:

1. In Holborn School there are
460 students in Key Stage 3
320 students in Key Stage 4
165 students in Key Stage 5

Nimer is carrying out a survey.

He needs a sample of 100 students stratified by Key Stage.

Work out the number of students from Key Stage 3 there should be in the sample.

.....
(Total for Question is 2 marks)

2. Henri is carrying out a survey of the people aged 65 and over in his village.
The table shows information about these people.

Age	Male	Female
65 – 69	20	22
70 – 74	18	21
75 – 79	15	18
80 – 84	8	16
85 – 89	5	10
90+	2	5
Total	68	92

Henri is going to take a sample of 30 people stratified by age.

How many people aged 75 – 79 should be in the sample?

.....
(Total for Question is 3 marks)

3. 156 students went to London.
Each student visited one of the British Museum or the National Gallery or the Stock Exchange.
The table gives information about these students.

	Place visited		
	British Museum	National Gallery	Stock Exchange
Male	25	18	35
Female	27	32	19

Kate takes a sample of 30 of these students.
The sample is stratified by place visited and by gender.

Work out the number of male students who visited the Stock Exchange in the sample.

.....
(Total for Question is 2 marks)

4. There are 1200 students at a school. Kate is helping to organise a party. She is going to order pizza. Kate takes a sample of 60 of the students at the school. She asks each student to tell her **one** type of pizza they want. The table shows information about her results.

Pizza	Number of students
ham	20
salami	15
vegetarian	8
margherita	17

Work out how much ham pizza Kate should order.
Write down any assumption you make **and** explain how this could affect your answer.

.....
.....

(Total for question = 3 marks)

5. (a) Max wants to take a random sample of students from his year group.
(i) Explain what is meant by a random sample.

.....
.....
.....

- (ii) Describe a method Max could use to take his random sample.

.....
.....
.....

(2)

- (b) The table below shows the numbers of students in 5 year groups at a school.

Year	Number of students
9	239
10	257
11	248
12	190
13	206

Lisa takes a stratified sample of 100 students by year group.
Work out the number of students from Year 9 she has in her sample.

.....
(2)
(Total for Question is 4 marks)

Petersen Capture-Recapture

Things to remember:

- $\frac{M}{N} = \frac{m}{n}$ so $N = \frac{Mn}{m}$
- N is the population size to be estimated
- M is the number of members of the population that are captured initially and marked
- n is the number of members of the population that are captured subsequently
- m is the number of members of this subsequent captured sample that are marked
- Some assumptions we must make, however, are:
 - There is no death, immigration or emigration (ie. the population is closed)
 - The sampling methods used are identical
 - The marking has not affected the survival rate of the animals

Questions:

1. Toga wants to estimate the number of termites in a nest.
On Monday Toga catches 80 termites.
He puts a mark on each termite.
He then puts all 80 termites back in the nest.
On Tuesday Toga catches 60 termites.
12 of these termites have a mark on them.
Work out an estimate for the total number of termites in the nest.
You must write down any assumptions you have made.

(Total for question = 4 marks)

2. A farmer wants to estimate the number of rabbits on his farm.
One day he catches 193 rabbits. He puts a tag on each rabbits then releases them.
Then next day the farmer catches 137 rabbits.
51 of these rabbits have a tag on them.
Work out an estimate for the total number of rabbits on his farm.
Write down any assumptions you have made.

(Total for question = 4 marks)

3. A scientist wants to estimate the number of fish in a disused canal. He catches a sample of 30 fish from the canal. He marks each fish with a dye and then puts them back in the canal. The next day the scientist catches 20 fish from the canal. He finds that 4 of them are marked with the dye.
- (a) Estimate the total number of fish in the canal.

.....
(2)

- (b) Write down any assumptions you made.

.....
.....
.....

(2)
(Total for question = 4 marks)

4. A gardener wants to estimate the number of snails in his garden. One day he catches 82 snails. He puts a tag on each snails then releases them. Then next day the gardener catches 125 snails. 59 of these snails have a tag on them. Work out an estimate for the total number of snails in his garden. Write down any assumptions you have made.

(Total for question = 4 marks)

5. A fisherman wants to estimate the number of fish in his pond.
One day he catches 164 fish. He puts a tag on each fish then releases them.
Then next day the fisherman catches 73 fish.
33 of these fish have a tag on them.
Work out an estimate for the total number of fish in his pond.
Write down any assumptions you have made.

(Total for question = 4 marks)