Working with data (2)

- Calculating estimates for the mean and range of grouped data
- Identifying the modal class interval and the class interval that includes the median
- Drawing cumulative frequency graphs
- Finding the median, lower and upper quartiles and the interquartile range
- Drawing box plots

Keywords

You should know

explanation 1a | explanation 1b | explanation 1c | online

1 The grouped frequency table shows the number of lengths 30 pupils swam in 10 minutes.

Lengths swum in 10 minutes	Frequency
5–9	7
10–14	9
15–19	10
20–24	3
25–29	1

a Calculate an estimate for the mean number of lengths swum.

b Write the class interval in which the median lies.

c Find the modal class interval.

d Pupils who swam less than 10 lengths in 10 minutes have extra swimming lessons. What percentage of the class have extra swimming lessons?

2 At the school summer fête, people were asked to estimate how many sweets there were in a jar. The table shows the results. The person whose estimate was closest to the actual number would win.

Estimated number of sweets	Frequency
76–100	12
101–125	23
126–150	20
151–175	15
176–200	8
201–225	2

a Calculate an estimate for the mean estimated number of sweets in the jar.

b Find an estimate of the range of the guesses.

c There were 151 sweets in the jar.
How many people definitely guessed too many?

3 This table shows the weight of 12 athletes in kilograms.

Weight, w (kg)	Frequency
$60 < w \leq 70$	1
$70 < w \leq 80$	3
$80 < w \leq 90$	5
$90 < w \leq 100$	2
$100 < w \leq 110$	1

a Calculate an estimate for the mean weight of an athlete to one decimal place.

b Find the class interval that includes the median.

c Find the modal class interval.

4 This table shows the heights, in centimetres, of 100 pupils aged between 12 and 14.

Height, h (cm)	Frequency
$130 < h \leq 140$	2
$140 < h \leq 150$	12
$150 < h \leq 160$	35
$160 < h \leq 170$	42
$170 < h \leq 180$	5
$180 < h \leq 190$	4

a Calculate an estimate for the mean height to 1 d.p.

b Find the class interval that includes the median.

c Find the modal class interval.

d What fraction of pupils are more than 170 cm tall?

5 This table shows the time taken in seconds for the 15 finalists at a sports day to sprint 100 m.

Time, t (seconds)	Frequency
$11 < t \leq 12$	1
$12 < t \leq 13$	2
$13 < t \leq 14$	5
$14 < t \leq 15$	4
$15 < t \leq 16$	2
$16 < t \leq 17$	1

a Calculate an estimate for the mean time to 1 d.p.

b Find the class interval that includes the median.

c Find the modal class interval.

d What percentage of pupils ran the race in 14 seconds or less?

6 The table shows the numbers of low birth weight babies (less than 2500 g) born in March at a hospital.

a Find the class interval that includes the median.

b Find the modal class interval.

c 5% of the babies born at the hospital have a low birth weight.
What was the total number of babies born at the hospital during March?

Weight, w (g)	Frequency
$500 \leq w < 750$	1
$750 \leq w < 1000$	3
$1000 \leq w < 1250$	1
$1250 \leq w < 1500$	1
$1500 \leq w < 1750$	2
$1750 \leq w < 2000$	2
$2000 \leq w < 2250$	4
$2250 \leq w < 2500$	6

explanation 2a explanation 2b explanation 2c

7 The grouped frequency table shows information about the times taken by some athletes to run 200 m.

Draw a frequency polygon to show this information.

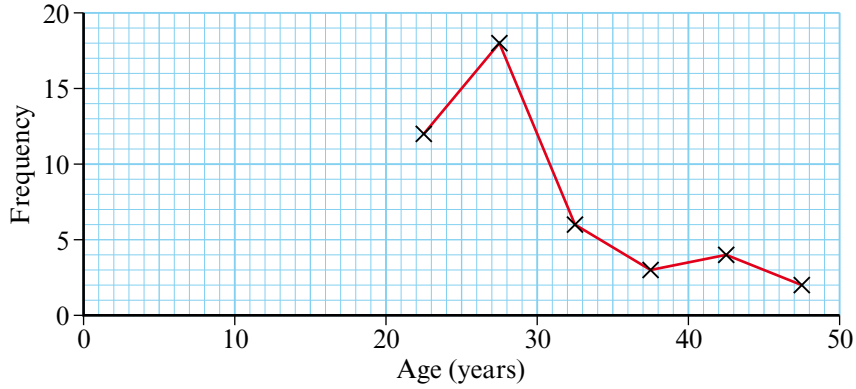
Time, t (seconds)	Frequency
$20 \leq t < 22$	2
$22 \leq t < 24$	4
$24 \leq t < 26$	9
$26 \leq t < 28$	6
$28 \leq t < 30$	3

8 The grouped frequency table gives information about the number of seconds that 80 people spent waiting at a supermarket checkout.

Draw a frequency polygon to show this information.

Time, t (seconds)	Frequency
$0 \leq t < 60$	10
$60 \leq t < 120$	19
$120 \leq t < 180$	24
$180 \leq t < 240$	20
$240 \leq t < 300$	5
$300 \leq t < 360$	2

9 The frequency polygon shows some information about the ages of employees in a company.



a Write the modal class interval.

b Work out the total number of employees in the company.

10 The grouped frequency table gives information about the number of seconds that 80 people spent waiting at a supermarket checkout.

Time, t (seconds)	Frequency
$0 \leq t < 60$	10
$60 \leq t < 120$	19
$120 \leq t < 180$	24
$180 \leq t < 240$	20
$240 \leq t < 300$	5
$300 \leq t < 360$	2

Time, t (seconds)	Cumulative frequency
$0 \leq t < 60$	
$0 \leq t < 120$	
$0 \leq t < 180$	
$0 \leq t < 240$	
$0 \leq t < 300$	
$0 \leq t < 360$	

a Copy and complete the cumulative frequency table.

b Draw a cumulative frequency diagram for your table.

c Use your graph to find an estimate for the number of people who waited for these times.

i less than 200 seconds **ii** more than 200 seconds

11 The grouped frequency table gives information about the weights, in grams, of 60 potatoes.

Weight, w (grams)	Frequency
$0 \leq w < 50$	7
$50 \leq w < 100$	12
$100 \leq w < 150$	20
$150 \leq w < 200$	11
$200 \leq w < 250$	7
$250 \leq w < 300$	3

Weight, w (grams)	Cumulative frequency
$0 \leq w < 50$	
$0 \leq w < 100$	
$0 \leq w < 150$	
$0 \leq w < 200$	
$0 \leq w < 250$	
$0 \leq w < 300$	

a Copy and complete the cumulative frequency table.

b Draw a cumulative frequency diagram for your table.

c Use your graph to find an estimate for the number of potatoes with these weights.

i less than 120 g **ii** more than 120 g

12 The grouped frequency table gives information about the ages of 140 people employed at a school.

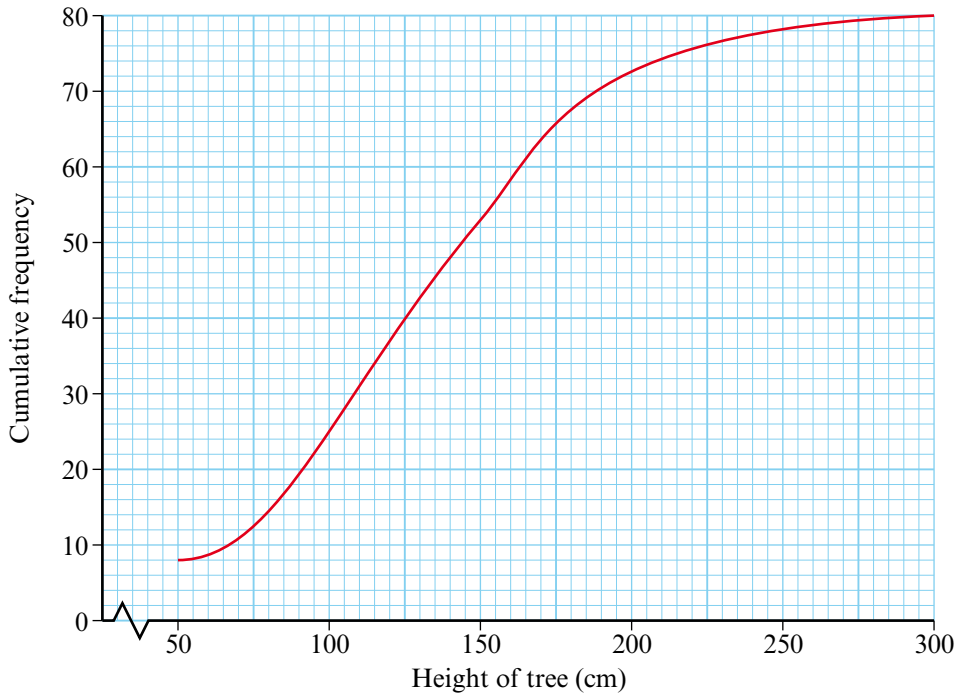
Age, a (years)	Frequency
$20 \leq a < 25$	7
$25 \leq a < 30$	8
$30 \leq a < 35$	12
$35 \leq a < 40$	16
$40 \leq a < 45$	37
$45 \leq a < 50$	23
$50 \leq a < 55$	15
$55 \leq a < 60$	12
$60 \leq a < 65$	10

Age, a (years)	Cumulative frequency
$0 \leq a < 25$	
$0 \leq a < 30$	
$0 \leq a < 35$	
$0 \leq a < 40$	
$0 \leq a < 45$	
$0 \leq a < 50$	
$0 \leq a < 55$	
$0 \leq a < 60$	
$0 \leq a < 65$	

a Copy and complete the cumulative frequency table.

b Draw a cumulative frequency diagram for your table.

13 The cumulative frequency graph gives information about the heights of some small trees.



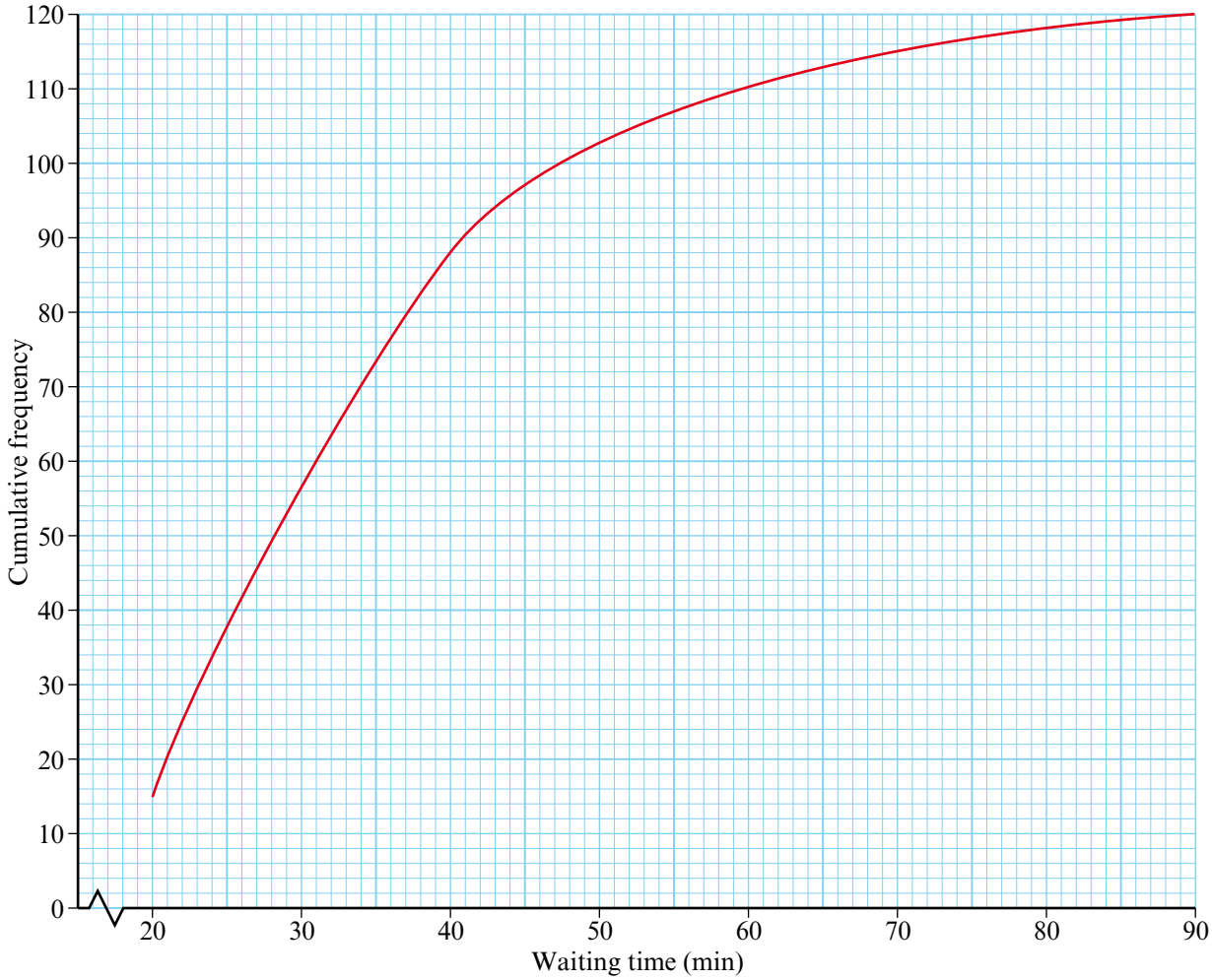
Use the graph to find these data.

a The total number of trees.

b An estimate for the number of trees that had a height of more than 200 cm.

c An estimate for the number of trees that had a height of more than 100 cm but less than 150 cm.

14 The cumulative frequency graph gives information about the number of minutes 120 passengers had to wait at an airport check-in desk.



Use the graph to find an estimate for the number of passengers that waited for these times.

a less than 40 minutes

b more than 40 minutes

c more than 30 minutes but less than 60 minutes

explanation 3a explanation 3b

15 Use the graph in question **13** to find estimates for these statistics.

a the median **b** the lower quartile

c the upper quartile **d** the interquartile range

16 Use the graph in question **14** to find estimates for these statistics.

a the median **b** the lower quartile

c the upper quartile **d** the interquartile range

17 The cumulative frequency table shows information about the prices of 80 houses.

a Use the information in the table to draw a cumulative frequency diagram.

b Use your diagram to find estimates for

i the median

ii the interquartile range

House price, p (£)	Cumulative frequency
$0 \leq p < 120\,000$	5
$0 \leq p < 140\,000$	12
$0 \leq p < 160\,000$	21
$0 \leq p < 180\,000$	32
$0 \leq p < 200\,000$	51
$0 \leq p < 220\,000$	72
$0 \leq p < 240\,000$	80

18 The cumulative frequency table gives information about the time that some pupils took to travel to school.

a Use the information in the table to draw a cumulative frequency diagram.

b Use your diagram to find an estimate for the number of pupils that took more than 45 minutes to travel to school.

c Use your diagram to find estimates for these statistics.

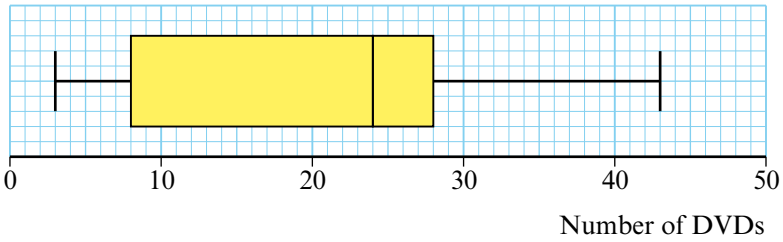
i the median

ii the interquartile range

Time to get to school, t (minutes)	Cumulative frequency
$0 \leq t < 10$	14
$0 \leq t < 20$	34
$0 \leq t < 30$	44
$0 \leq t < 40$	52
$0 \leq t < 50$	58
$0 \leq t < 60$	58

explanation 4 online

19 Kylie recorded the number of DVDs owned by some of her friends.
She drew this box plot from the data.



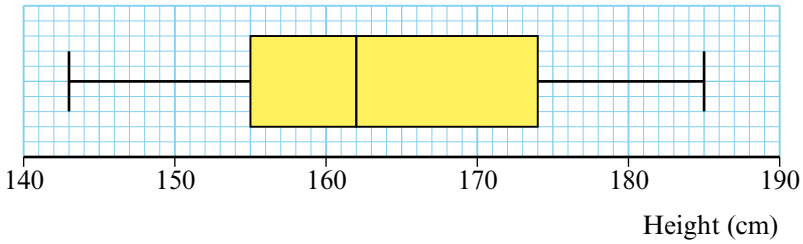
a Copy and complete this table.

Minimum number of DVDs	
Lower quartile	
Median	
Upper quartile	
Maximum number of DVDs	

b Use the information in your table to find these.

i the range **ii** the interquartile range

20 Lizzy recorded the heights of some of her friends.
She drew this box plot from the data.



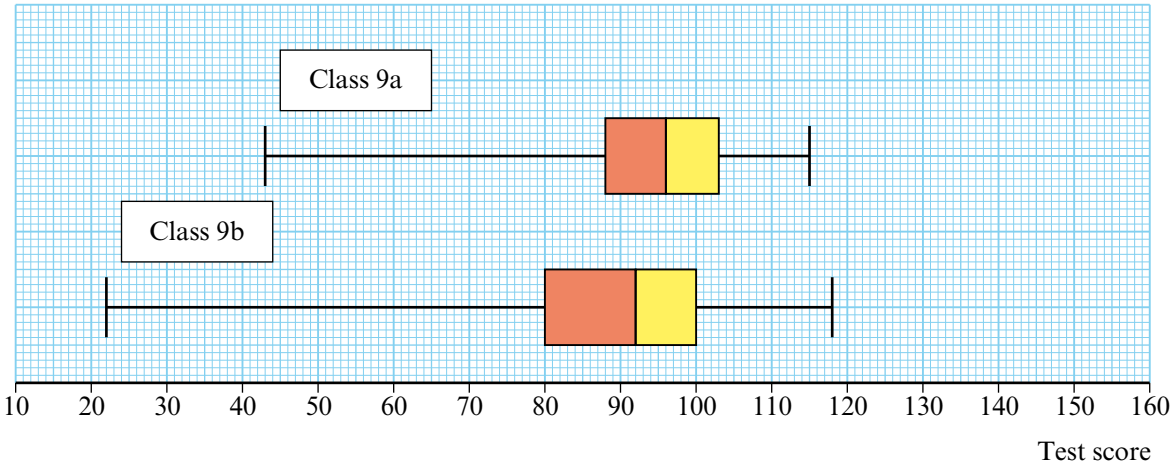
a What is the height of Lizzy's tallest friend?

b Write the median height.

c Work out the range of the heights.

d Work out the interquartile range for these heights.

21 Pupils in two classes took a test.
Their results were used to draw these box plots.



a In which class was the pupil who scored the highest mark?

b Work out the range for class 9a and the range for class 9b.

c Write the median score for each class.

d Which class had the better results? Give an explanation for your answer.

22 Angie measured the length of leaves.
The table shows some information about her results.

Minimum length	3.4 cm
Lower quartile	4.2 cm
Median	5.2 cm
Upper quartile	6.5 cm
Maximum length	8 cm

Use the information to draw a box plot.

23 Some pupils took a test. The table gives information about their results.

Minimum test score	23
Lower quartile	45
Median	53
Interquartile range	14
Range	52

a Work out the highest score.

b Work out the upper quartile.

c Draw a box plot for the data.