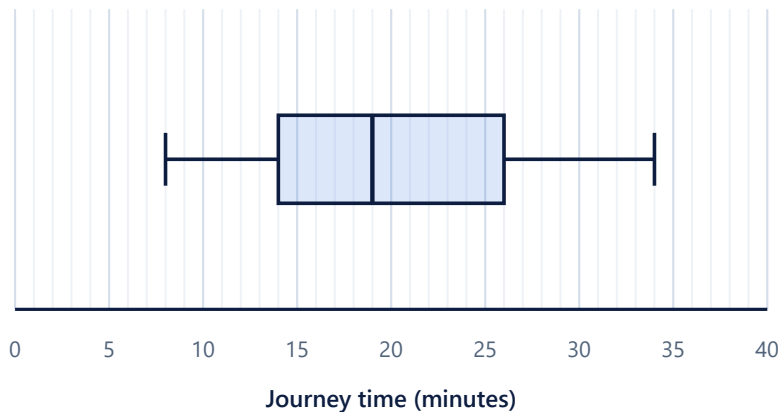




- 1 The box plot shows the journey times, in minutes, of 15 deliveries made by a courier.
- Write down the median journey time.
 - Work out the interquartile range of the journey times.
 - Work out the range of the journey times.



(3 marks)

The line inside the box is at 19, so the median is 19 minutes

Interquartile range = upper quartile - lower quartile = $26 - 14$
= 12 minutes

Range = longest - shortest = $34 - 8 = 26$ minutes

- 2 Here are the numbers of emails Priya received on each of 11 days, written in order.

3 5 6 8 9 11 13 14 16 18 21

- Find the median.
- Find the lower quartile and the upper quartile.
- Work out the interquartile range.

(3 marks)

There are 11 values, so the median is the 6th value: 11

Exclude the overall median, then find the median of each remaining half. The lower five values have middle value 6; the upper five have middle value 16. These are the lower and upper quartiles

The lower quartile is the 3rd value: 6. The upper quartile is the 9th value: 16

Interquartile range = $16 - 6 = 10$

- 3 Aisha records how many minutes late her train is on 12 days.

3 8 5 12 9 6 20 11 15 23 14 18

- Work out the median, the lower quartile and the upper quartile.
- Work out the interquartile range.
- Write down the five values you would need to draw a box plot of these data.

(4 marks)

Put in order

3 5 6 8 9 11 | 12 14 15 18 20 23

a)

$$\text{median} = \frac{11 + 12}{2} = 11.5$$

$$Q_1 = \frac{6 + 8}{2} = 7$$

$$Q_3 = \frac{15 + 18}{2} = 16.5$$

b)

$$\text{IQR} = 16.5 - 7$$

9.5

c)

3, 7, 11.5, 16.5, 23

- 4 The stem and leaf diagram shows the marks of 15 students in a spelling test.

Stem	Leaves
1	2 5 8
2	0 3 4 7 9
3	1 4 6 8
4	0 2 5

Key: 2 | 3 means 23 marks

Work out the five values needed to draw a box plot for this data: the lowest mark, the lower quartile, the median, the upper quartile and the highest mark.

(3 marks)

The ordered data is 12, 15, 18, 20, 23, 24, 27, 29, 31, 34, 36, 38, 40, 42, 45

With 15 values the median is the 8th value: 29

The lower quartile is the 4th value: 20. The upper quartile is the 12th value: 38

Lowest = 12, highest = 45

5

Two shops sell second-hand bikes. The tables summarise the prices, in pounds, of the bikes sold last month.

Shop A

Minimum	60
Lower quartile	95
Median	130
Upper quartile	180
Maximum	250

Shop B: median £150, interquartile range £45.

- Work out the interquartile range of the prices at Shop A.
- Compare the prices of bikes at the two shops. Give two comparisons.
- Which shop has the more consistent prices? Give a reason.

(4 marks)

$$\text{Interquartile range for Shop A} = 180 - 95 = £85$$

Comparing averages: Shop B's median of £150 is higher than Shop A's £130, so on average bikes at Shop B cost more

Comparing spread: Shop A's IQR of £85 is larger than Shop B's £45, so Shop A's prices are more spread out

Shop B is more consistent because its interquartile range is smaller

6

Two bus companies, Northline and Citygo, record how many minutes late their buses are.

	Minimum	Lower quartile	Median	Upper quartile	Maximum
Northline	2	4	6	9	15
Citygo	1	5	7	8	12

Work out the interquartile range for each company. Which company is more consistent? Which has the shorter typical delay? Give a reason for each answer.

(3 marks)

$$\text{Northline: IQR} = 9 - 4 = 5$$

$$\text{Citygo: IQR} = 8 - 5 = 3$$

Smaller IQR = less spread = more consistent

Citygo is more consistent ($3 < 5$)

Lower median = shorter typical delay

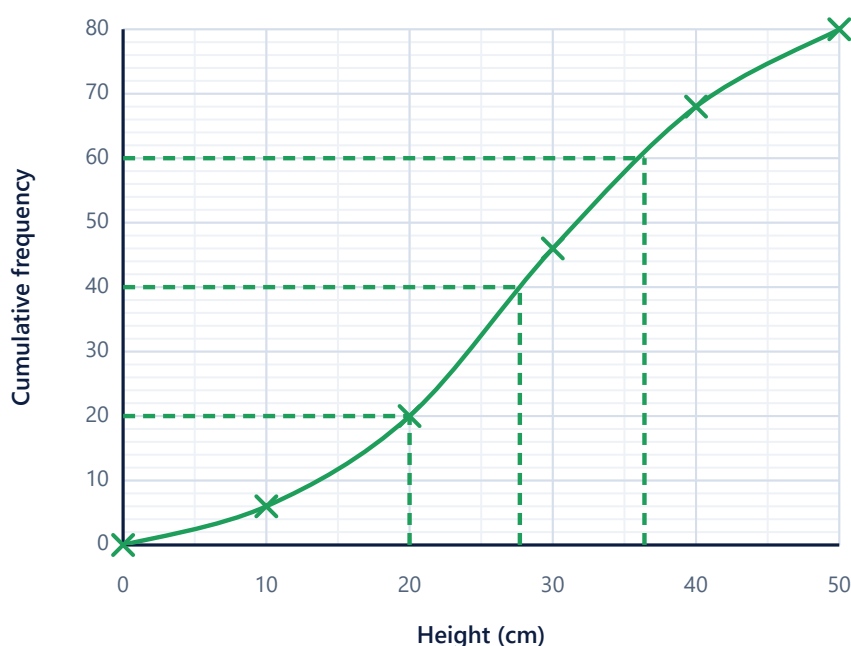
$$\text{Northline: median } 6 < 7$$

7

The table shows the heights, h cm, of 80 sunflower seedlings.

Height (h cm)	Frequency
$0 < h \leq 10$	6
$10 < h \leq 20$	14
$20 < h \leq 30$	26
$30 < h \leq 40$	22
$40 < h \leq 50$	12

- Complete the cumulative frequency table.
- On the grid, draw a cumulative frequency graph for this information.
- Use your graph to find an estimate for the median height.
- Use your graph to find an estimate for the interquartile range of the heights.



(6 marks)

Cumulative frequencies: 6, 20, 46, 68, 80

Plot each cumulative frequency at the upper class boundary and join with a smooth curve

Median: read across from 40 on the cumulative frequency axis; this gives roughly 28 cm

Lower quartile: read across from 20, giving about 20 cm. Upper quartile: read across from 60, giving about 36 cm

Interquartile range is approximately $36 - 20 = 16$ cm

8

The table shows the times, in minutes, taken by 50 students to complete a puzzle.

Time t (minutes)	$0 < t \leq 10$	$10 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 50$
Frequency	4	11	19	12	4

- a. Complete a cumulative frequency table for these data.
- b. Use the cumulative frequency to estimate the interquartile range. Use the 12.5th and 37.5th values and assume the values are spread evenly within each class. Give your answer to 1 decimal place.

(4 marks)

a)

4, 15, 34, 46, 50

b)

LQ = 12.5th value, in 10 to 20

$$Q1 = 10 + \frac{12.5 - 4}{11} \times 10$$

$$= 17.73$$

UQ = 37.5th value, in 30 to 40

$$Q3 = 30 + \frac{37.5 - 34}{12} \times 10$$

$$= 32.92$$

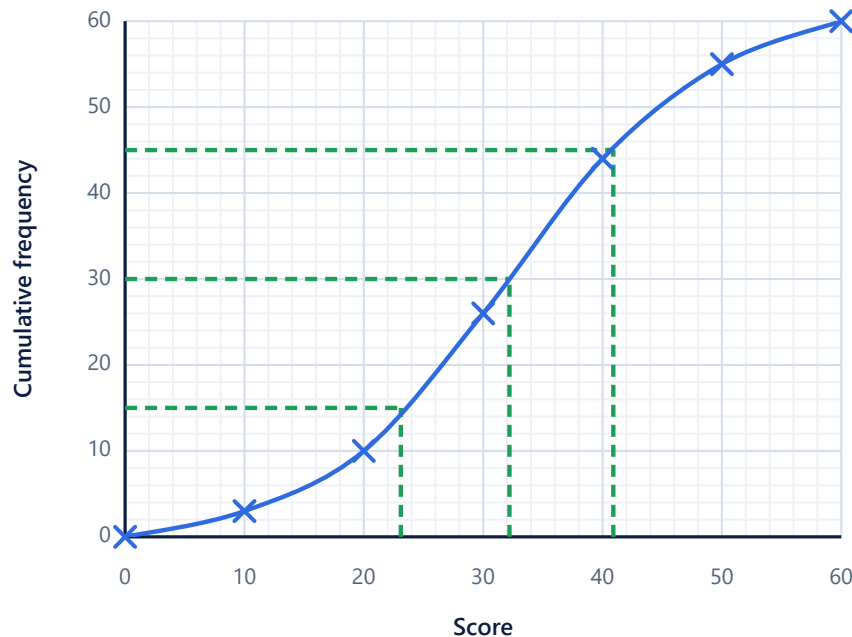
$$IQR = 32.92 - 17.73$$

15.2 minutes

9

The cumulative frequency graph shows the test scores of the 60 students in Class A.

- Use the graph to find an estimate for the median score.
- Use the graph to find an estimate for the interquartile range of the scores.
- The 60 students in Class B had a median score of 45 and an interquartile range of 12. Compare the scores of the two classes.



(6 marks)

Median: read across from 30 (half of 60) to the curve and down, giving roughly 32 marks

Lower quartile: read across from 15, giving about 23. Upper quartile: read across from 45, giving about 41

Interquartile range is approximately $41 - 23 = 18$

Class B's median of 45 is higher than Class A's, so on average Class B scored better

Class B's interquartile range of 12 is smaller than Class A's, so Class B's scores are more consistent

10

Here are the times, in seconds, taken by the 15 swimmers in Team A to swim 50 metres.

41 38 45 36 50 39 43 47 35 44 40 52 37 46 42

- Find the median, the lower quartile and the upper quartile of the times for Team A.
- Team B's times had a median of 44 seconds and an interquartile range of 13 seconds. Compare the times of the two teams. Give two comparisons.

(5 marks)

Ordered times: 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 50, 52

With 15 values the median is the 8th value: 42 seconds

The lower quartile is the 4th value: 38. The upper quartile is the 12th value: 46

Team A's interquartile range = $46 - 38 = 8$ seconds

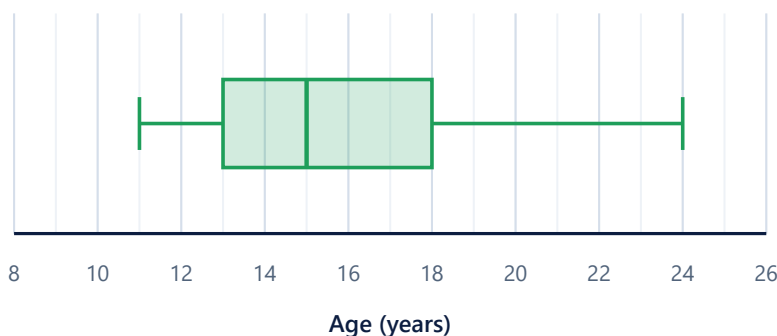
Team A's median of 42 is lower than Team B's 44, so on average Team A swam faster; Team A's IQR of 8 is smaller than Team B's 13, so Team A's times were more consistent

11

The ages of the members of a youth orchestra are summarised below.

Youngest	Lower quartile	Median	Upper quartile	Oldest
11	13	15	18	24

- On the grid, draw a box plot for these ages.
- Work out the interquartile range.



(3 marks)

a)

Box from 13 to 18

Line inside the box at 15

Whiskers to 11 and 24

b)

$$\text{IQR} = 18 - 13$$

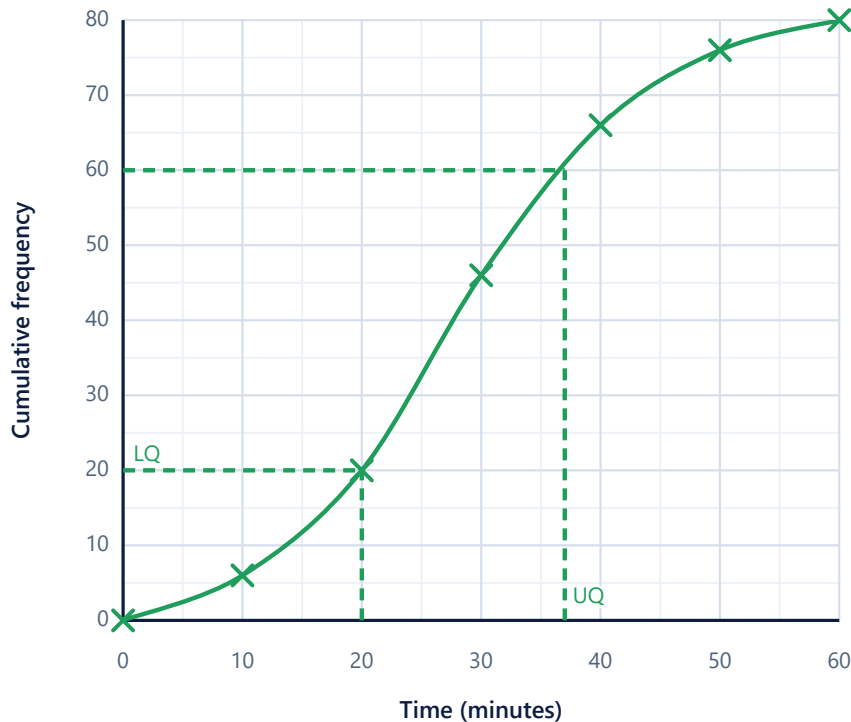
Box plot as drawn; IQR = 5 years

12

80 people took part in a fun run. The table shows the cumulative frequency of their finishing times.

Time, t (minutes)	≤ 10	≤ 20	≤ 30	≤ 40	≤ 50	≤ 60
Cumulative frequency	6	20	46	66	76	80

- On the grid, draw a cumulative frequency graph for these data.
- Use your graph to estimate the interquartile range of the times.



(5 marks)

a)

Plot (10, 6), (20, 20), (30, 46)...

Join with a smooth curve

b)

$$\text{LQ at } \frac{1}{4} \times 80 = 20 \rightarrow t \approx 20$$

$$\text{UQ at } \frac{3}{4} \times 80 = 60 \rightarrow t \approx 37$$

$$= \text{IQR} \approx 37 - 20$$

about 17 minutes

13

The times, in minutes, taken by 9 runners to finish a race are

21 23 24 25 26 27 28 30 31

- Work out the range and the interquartile range of these times.
- A tenth runner finishes in 58 minutes. Work out the new range and the new interquartile range.
- Which of the range and the interquartile range is affected less by the 58 minute time? Explain why.

(5 marks)

a)

21 23 24 25 | 26 | 27 28 30 31

$$Q_1 = \frac{23 + 24}{2} = 23.5$$

$$Q_3 = \frac{28 + 30}{2} = 29$$

$$IQR = 29 - 23.5 = 5.5$$

$$\text{range} = 31 - 21 = 10$$

b)

21 23 24 25 26 | 27 28 30 31 58

$$Q_1 = 24, Q_3 = 30$$

$$IQR = 30 - 24 = 6$$

$$\text{range} = 58 - 21 = 37$$

c)

The IQR (5.5 to 6) - it ignores extreme values

80 students sat an exam marked out of 100. The table shows their scores, s marks.

Score (s marks)	Frequency
$0 < s \leq 20$	6
$20 < s \leq 40$	18
$40 < s \leq 60$	28
$60 < s \leq 80$	20
$80 < s \leq 100$	8

- Complete the cumulative frequency table.
- Write down the class interval that contains the median score.
- A cumulative frequency graph of the data gives these estimates: median 51, lower quartile 37, upper quartile 66. Work out an estimate for the interquartile range.
- The pass mark was 60. Work out the percentage of students who scored more than 60.
- Last year the same exam had a median of 46 and an interquartile range of 24. Compare this year's scores with last year's.

(7 marks)

Cumulative frequencies: 6, 24, 52, 72, 80

The median is between the 40th and 41st values; 24 students scored 40 or less and 52 scored 60 or less, so the median is in $40 < s \leq 60$

$$\text{Interquartile range} = 66 - 37 = 29$$

$$\text{Students scoring more than 60} = 20 + 8 = 28, \text{ and } \frac{28}{80} = 35\%$$

This year's median of 51 is higher than last year's 46, so on average students did better this year; this year's IQR of 29 is bigger than 24, so this year's scores were more varied