

Cumulative frequency and box plots

About 50 minutes Calculator allowed 39 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/gcse-cumulative-frequency-and-box-plots/

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** From chapter 17 [2 marks]
- A class has 10 boys and 20 girls. The boys' mean test mark is 79 and the girls' mean test mark is 49. Find the mean mark for the whole class.
- Answer

Answer

- A3** Last lesson [2 marks] **A4** From chapter 9 [2 marks]
- For the classes $0 < x \leq 10$, $10 < x \leq 20$ and $20 < x \leq 30$ the frequencies are 9, 4 and 12. Work out an estimate of the mean.
- Answer

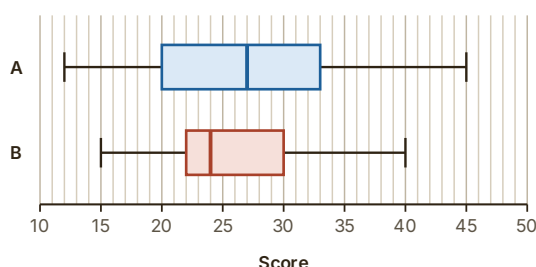
Answer

B Example, then your turn

Your teacher works through each example with you. Then try the one beside it.

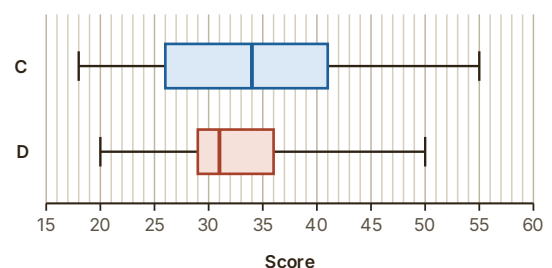
EXAMPLE 1

The box plots show the scores of two groups. Compare the two groups.



Hint Compare an average (the median) and a spread (the interquartile range).

- B1** The box plots show the scores of two more groups. Compare the two groups. [3 marks]



c Practice

- C1** Write down the cumulative frequencies for the frequencies 9, 17, 28, 19, 7. [2 marks]

Answer

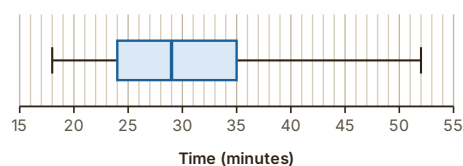
- C2** A box plot's five values are 18, 27, 33, 41, 60. Work out the interquartile range and the range. [2 marks]

Answer

- C3** Of 70 times, 44 are 30 or less and 59 are 40 or less. How many are in $30 < t \leq 40$, and how many are over 40? [2 marks]

Answer

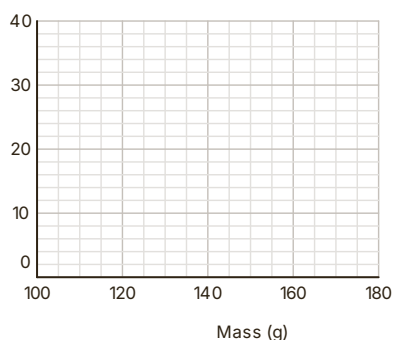
- C4** The box plot shows the times taken by 200 runners. Estimate how many of the runners took between 24 and 35 minutes. [2 marks]



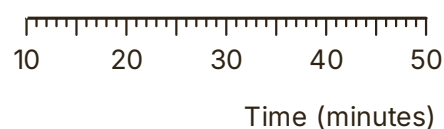
Answer

- C5** The masses, m g, of 40 apples are grouped as $100 < m \leq 120$: 6, $120 < m \leq 140$: 14, $140 < m \leq 160$: 12, $160 < m \leq 180$: 8. Draw a cumulative frequency graph on the grid. [3 marks]

Cumulative frequency



- C6** The times taken by some runners have a lowest value of 12 minutes, a lower quartile of 19, a median of 24, an upper quartile of 31 and a highest value of 45. Draw a box plot on the scale. [2 marks]



- C7** For 120 values, at what cumulative frequencies do you read the two quartiles? [2 marks]

Answer

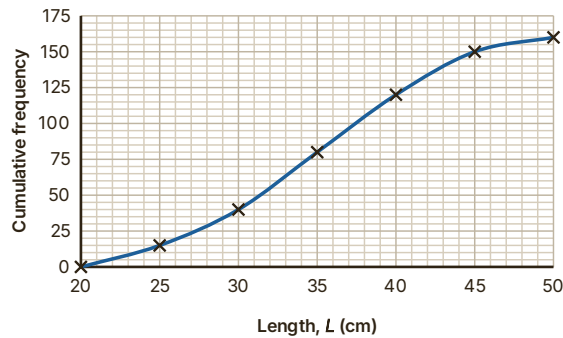
D Exam-style questions

- D1** Box plots of test marks: Class A 10, 22, 30, 36, 58 and Class B 14, 18, 28, 40, 50. Ali says, "Class B is more consistent, because its range is smaller."

[3 marks]

Is Ali right? Give a reason for your answer.

- D2** The cumulative frequency graph shows the lengths of 160 fish.



- (a) Use the graph to find the median length.

[1 mark]

Answer

- (b) Use the graph to find the interquartile range.

[2 marks]

Answer

- (c) How many of the fish are longer than 45 cm?

[2 marks]

Answer

- (d) The longest 40 fish are kept for a display. Use the graph to estimate the shortest length of a fish kept for the display.

[2 marks]

Answer

Total for D2: 7 marks

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** Times in the classes $0 < t \leq 10$, $10 < t \leq 20$, $20 < t \leq 30$, $30 < t \leq 40$ have frequencies 9, k , 20, 14. The median read from the cumulative frequency graph is exactly 20. Find k .

[3 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** The median is read at half the total frequency. At $t = 20$ the graph has a plotted point.
- Hint 2** The total is $43 + k$, and the cumulative frequency at $t = 20$ is $9 + k$.
- Hint 3** $\frac{43+k}{2} = 9 + k$, so $43 + k = 18 + 2k$ and $k = 25$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can draw a cumulative frequency graph and read the median and quartiles off it. ☐ ☐ ☐

I can draw a box plot and read the interquartile range from one. ☐ ☐ ☐

I can compare two groups by the median and the IQR. ☐ ☐ ☐