

Cumulative frequency diagrams

Year 8 About 70 minutes No calculator 45 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/ks3-year-8-cumulative-frequency-diagrams/

Date _____

A Do Now

Quick questions to start.

- A1

Last lesson

[1 mark]

4 values are in a class with mid-value 10 and 6 values are in a class with mid-value 20. Estimate the mean.

Answer _____
- A2

Needed today

[1 mark]

Write down the running totals of 5, 8, 12 and 9.

Answer _____

- A3

Needed today

[1 mark]

Work out $\frac{3}{4}$ of 120.

Answer _____
- A4

From chapter 2

[1 mark]

Factorise $6x + 15$.

Answer _____

B Example, then your turn

Year 8

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

EXAMPLE 1

The table shows the times of 60 swimmers. Work out the cumulative frequencies, and list the points you would plot.

Time t (s)	Frequency
$20 < t \leq 30$	4
$30 < t \leq 40$	12
$40 < t \leq 50$	22
$50 < t \leq 60$	16
$60 < t \leq 70$	6

Hint Keep a running total. Each total goes with the TOP of its class.

- B1

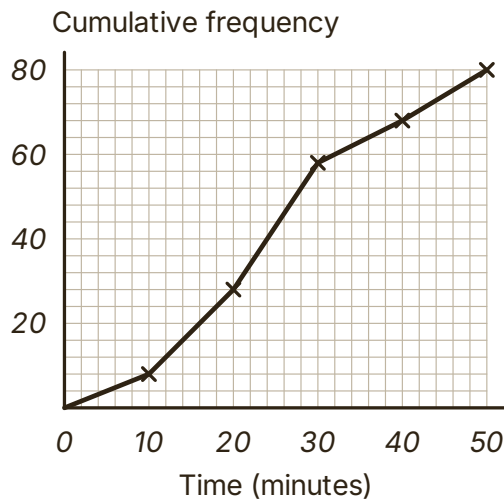
[3 marks]

The table shows the heights of 50 sunflowers. Work out the cumulative frequency for each class, and list the points you would plot.

Height h (cm)	Frequency
$100 < h \leq 120$	3
$120 < h \leq 140$	9
$140 < h \leq 160$	17
$160 < h \leq 180$	14
$180 < h \leq 200$	7

EXAMPLE 2

The graph shows the times 80 people took to finish a puzzle. Estimate the median and the interquartile range.



Hint The median is read across from $\frac{1}{2}$ of 80; the quartiles from $\frac{1}{4}$ and $\frac{3}{4}$ of 80.

EXAMPLE 3

Use the graph in Example 2. Estimate how many people took more than 36 minutes.

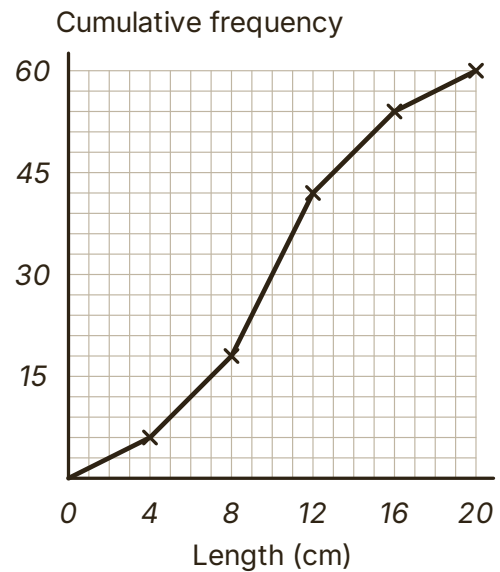
Hint Read UP from 36 to find how many took 36 minutes or less. Take that from 80.

EXAMPLE 4

Two classes did the same test. Class P: median 24, interquartile range 16. Class Q: median 28, interquartile range 9. Compare the marks of the two classes.

Hint Make one comparison of the medians (the average) and one of the IQRs (the spread). Say what each means.

B2 The graph shows the lengths of 60 leaves. Estimate the median and the interquartile range. [3 marks]



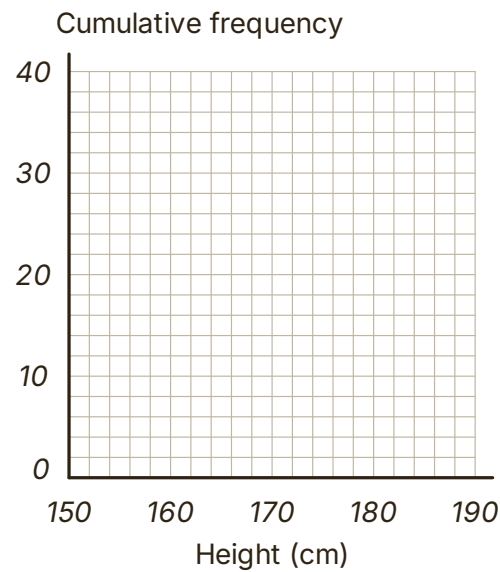
Answer median ... cm IQR ... cm

B3 Use the graph in B2. Estimate the percentage of the leaves that are longer than 15 cm. [2 marks]

Answer

B4 Two shops record how long customers wait. Shop X: median 6 minutes, IQR 5 minutes. Shop Y: median 9 minutes, IQR 2 minutes. Make two comparisons of the waiting times. [2 marks]

C1 40 students were measured. [4 marks]
Nobody was shorter than 150 cm. The cumulative frequencies were: 5 up to 160 cm, 16 up to 170 cm, 36 up to 180 cm and 40 up to 190 cm. Draw the cumulative frequency graph on the grid, joining the points with straight lines. Use it to estimate the median height.



C2 The table shows the cumulative frequencies (Cum. freq.) of the times of 50 people. Work out how many people are in the class $20 < t \leq 30$, and how many took more than 10 minutes but no more than 30 minutes. [2 marks]

Time t (min)	Cum. freq.
$t \leq 10$	7
$t \leq 20$	19
$t \leq 30$	42
$t \leq 40$	50

Answer and

Answer median cm

C4 Most of Ben's times to walk to school are between 15 and 25 minutes, but one day he took 70 minutes. Explain why the interquartile range is a better measure of the spread of his times than the range. [2 marks]

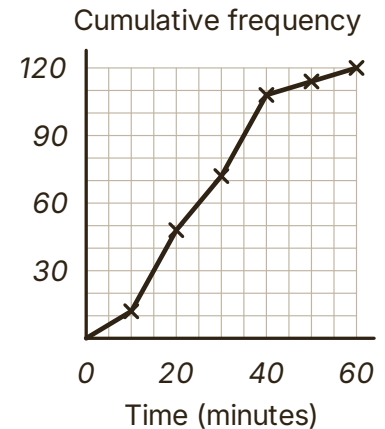
D1

The graph shows the times 120 people spent in a museum. Leo says, "The interquartile range is $90 - 30 = 60$ minutes."

[5 marks]

Write down the median. Then show that Leo is wrong by working out the interquartile range, and say what Leo did wrong.

Answer median ... min IQR ... min

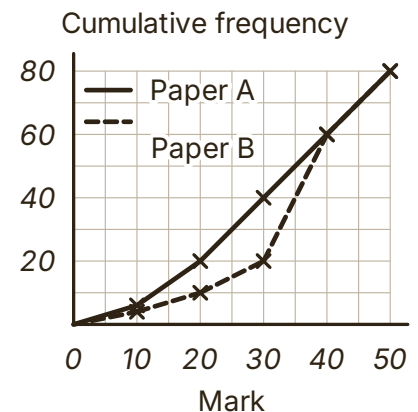


D2 80 students sat Paper A and Paper B. The graph shows the cumulative frequencies of their marks.

(a) Write down the median mark for each paper. [2 marks]

Answer A ... B ...

(b) Work out the interquartile range for each paper. [3 marks]



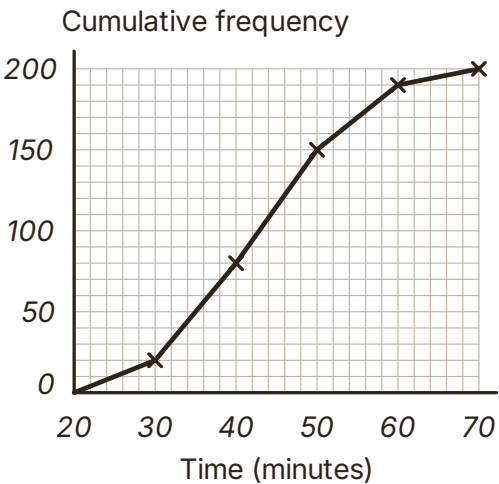
Answer A ... B ...

(c) Sophia says, "Paper A was easier than Paper B." Is she right? Give a reason for your answer. [2 marks]

Total for D2: 7 marks

D3 The graph shows the times of 200 runners in a race.

- (a) Estimate how many runners took more than 50 minutes. [2 marks]



Answer

- (b) Ali says, "Half the runners took less than 40 minutes." Is Ali right? Give a reason for your answer. [2 marks]

Total for D3: 4 marks

D4 The table shows the ages of 120 people. Which class contains the median? Show your working. [2 marks]

Age a (years)	Frequency
$0 < a \leq 20$	18
$20 < a \leq 40$	37
$40 < a \leq 60$	41
$60 < a \leq 80$	24

Answer

E Extension

Stretch

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

- E1 For 100 bags, the cumulative frequencies up to 10, 20, 30, 40 and 50 kg are 12, 30, x , 90 and 100. With the points joined by straight lines, the median is 25 kg. Find x , the number of bags in $20 < m \leq 30$, and the upper quartile. [5 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1 **Hint 1** The median is read across from 50.
Hint 2 25 kg is halfway from 20 to 30 kg, so 50 is halfway from 30 to x .
Hint 3 Read across from 75, between (30, 70) and (40, 90).

How did it go?

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

- I can draw a cumulative frequency graph. ☐ ☐ ☐
- I can read the median, quartiles and IQR from a graph. ☐ ☐ ☐
- I can compare two groups with the median and IQR. ☐ ☐ ☐