

Fix it 1 Running totals

Cumulative frequency · ANSWERS

Cumulative frequency is a running total. Add each frequency on to the total so far. The last running total is the total frequency.

EXAMPLE

Masses of 40 parcels. Work out the cumulative frequency.

Mass (kg)	Frequency	Cumulative frequency
$0 < m \leq 2$	6	6
$2 < m \leq 4$	11	17
$4 < m \leq 6$	15	32
$6 < m \leq 8$	8	40

- The first is 6.
- $6 + 11 = 17$
- $17 + 15 = 32$
- $32 + 8 = 40$, the total: 40 parcels.

YOUR TURN

- Work out the cumulative frequency for each class.

Time (s)	$0 < t \leq 10$	$10 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 40$
Frequency	3	8	12	7

3, 11, 23, 30

- Work out the cumulative frequency for each class.

Distance (km)	$0 < d \leq 5$	$5 < d \leq 10$	$10 < d \leq 15$	$15 < d \leq 20$	$20 < d \leq 25$
Frequency	9	14	21	10	6

9, 23, 44, 54, 60

- The cumulative frequencies of five classes are 11, 26, 48, 63, 70. Find the frequency of the third class.

22

Check: Add up all the frequencies. You get your last running total.

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Fix it 2 Plot at the top of the class

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Plot each running total at the top of its class: for $20 < t \leq 30$ the point is (30, running total). Not the middle of the class, and not the frequency.

EXAMPLE

Which point do you plot for the class $20 < m \leq 25$?

Mass (kg)	Frequency	Cumulative frequency
$15 < m \leq 20$	13	13
$20 < m \leq 25$	8	21

- Across: the top of the class, 25.
- Up: the running total, 21.
Not the frequency, 8.
- Plot (25, 21).

YOUR TURN

- The class $40 < t \leq 50$ has frequency 9 and cumulative frequency 31. Which point do you plot?

(50, 31)

- Write the three points you plot.

Length (cm)	$0 < l \leq 20$	$20 < l \leq 40$	$40 < l \leq 60$
Frequency	4	11	12
Cumulative frequency	4	15	27

(20, 4), (40, 15), (60, 27)

- The class $20 < t \leq 30$ has cumulative frequency 18. Mia plots (25, 18). What should she plot?

(30, 18)

Check: Each point's first number is the top of a class. The last point is as high as the total frequency.

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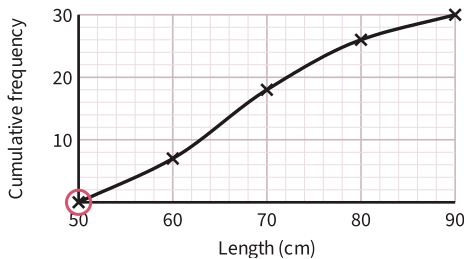
Fix it 3 Start and join

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Start the curve on the x axis at the bottom of the first class: nothing is below it. Join every point in order with a smooth curve that never goes down.

EXAMPLE

The lengths of 30 fish, from $50 < l \leq 60$ to $80 < l \leq 90$. Draw the curve.



1. No fish are 50 cm or less: start at (50, 0).
2. Then (60, 7), (70, 18), (80, 26), (90, 30).
3. Join them with a smooth curve that never goes down.

YOUR TURN

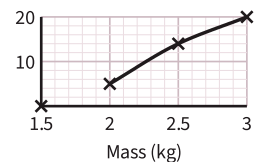
- 1 The first class is $0 < t \leq 5$. At which point does the curve start?

(0, 0)

- 2 The first class is $30 < w \leq 40$. The points plotted are (40, 6), (50, 19) and (60, 30). At which point does the curve start?

(30, 0)

- 3 The first class is $1.5 < m \leq 2$. Leo draws this curve. What has he missed?



start at (1.5, 0)

Check: Your curve starts on the x axis, goes through every point and never goes down.

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Fix it 4 How far up

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The total frequency is the last running total. Go $\frac{1}{2}$ of it up for the median, $\frac{1}{4}$ of it for the lower quartile and $\frac{3}{4}$ of it for the upper quartile.

EXAMPLE

There are 80 values. How far up do you go for the median and the quartiles?

1. Median: $\frac{1}{2}$ of 80 = 40
2. Lower quartile: $\frac{1}{4}$ of 80 = 20
3. Upper quartile: $\frac{3}{4}$ of 80 = 60

YOUR TURN

- 1 There are 120 values. How far up do you go for the lower quartile, the median and the upper quartile?

30, 60 and 90

- 2 The running totals are 8, 27, 51, 72, 100. How far up do you go for the upper quartile?

75

- 3 The frequencies of four classes are 12, 20, 18, 10. How far up do you go for the lower quartile?

15

Check: The median's height is halfway between the two quartiles' heights.

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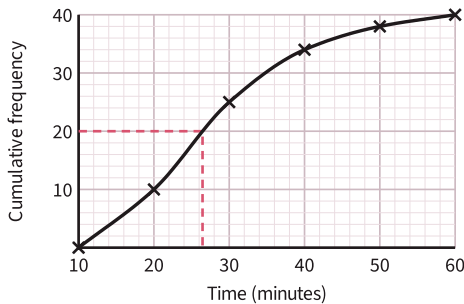
Fix it 5 Read across and down

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Find the height on the cumulative frequency axis. Go across to the curve, then straight down to the x axis and read the value there.

EXAMPLE

The times 40 people took to finish a quiz. Find the median.



1. $\frac{1}{2}$ of 40 = 20: across from 20 to the curve.
2. Then straight down to the x axis.
3. Median: about 26 minutes (24 to 28)

YOUR TURN

- 1 Use the graph in the example. Read across from 10 and down to find the lower quartile.

20 minutes

- 2 Use the graph in the example. Read across from 30 and down to find the upper quartile.

about 35 minutes (33 to 37)

- 3 Use the graph in the example. Read across from 36 and down. What time do you read?

about 44 minutes (42 to 46)

Check: Go back up from your answer to the curve, then across. You land on the height you started at.

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Fix it 6 The interquartile range

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Interquartile range = upper quartile – lower quartile. Use the two values you read off the x axis, not the heights you read across from.

EXAMPLE

40 values. Across from 10 gives 22 minutes. Across from 30 gives 41 minutes.

Find the interquartile range.

1. Use the values read off the x axis, not the heights 10 and 30.
2. Upper quartile – lower quartile
3. $41 - 22 = 19$ minutes

YOUR TURN

- 1 The lower quartile is 15 minutes and the upper quartile is 27 minutes. Find the interquartile range.

12 minutes

- 2 The lower quartile is 1.8 km and the upper quartile is 4.3 km. Find the interquartile range.

2.5 km

- 3 There are 60 values. Across from 15 gives 152 cm and across from 45 gives 171 cm. Ana says the interquartile range is $45 - 15 = 30$. What is it?

19 cm

Check: Add the interquartile range to the lower quartile. You get the upper quartile back.

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