

Median and Quartiles from Cumulative Frequency Curves

Notes

When estimating the medians and quartiles from a cumulative frequency curve, we need to draw horizontal and vertical lines on the graphs.

The median for a set of data values is given by the $\frac{1}{2}(n + 1)$ th value.

Given that we are finding an estimate, we can dispense with the +1 part of the formula.

Therefore, horizontal lines are drawn at the following points:

$$\text{Median, } Q_2 = \frac{1}{2}n \text{ th value}$$

$$\text{Lower quartile, } Q_1 = \frac{1}{4}n \text{ th value}$$

$$\text{Upper quartile, } Q_3 = \frac{3}{4}n \text{ th value}$$

When the horizontal line hits the curve, it becomes a vertical line and goes down to the x -axis.

N.B. “Across and down”

It is a good idea to draw dotted lines, rather than solid lines, and label each dotted line.

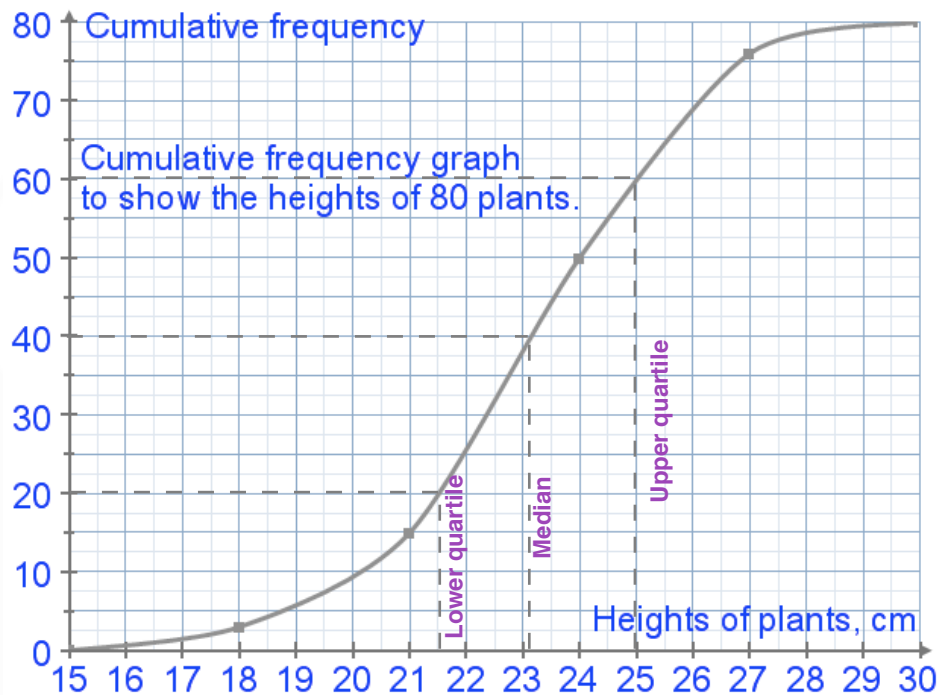
The values you obtain from your graph may be slightly different to the answers given in the book but as long as they are less than $\pm 5\%$ your answers will probably be considered correct,

*Autograph — allow user-defined, and adjust lines by dragging along the axes.
The example below refer to the graphs drawn in the previous lesson.*

E.g. 1 The table below shows the heights of a set of plants, measured to the nearest cm.

- (b) Estimate the median.
 - (c) Estimate the upper and lower quartiles.
 - (d) Hence write down the interquartile range for the data.
- N.B.** You will need your graph from the previous lesson.

Working:



- (c) There are 80 plants so $n = 80$
 Median, $Q_2 = \frac{1}{2}n$ th value = 40th value
 Draw a horizontal line at 40, then down to the horizontal axis
 Median, $Q_2 \approx 23.1$ cm (± 1 cm would be correct)
- (d) Lower quartile, $Q_1 = \frac{1}{4}n$ th value = 20th value
 Draw a horizontal line at 20, then down to the horizontal axis
 Lower quartile, $Q_1 \approx 21.5$ cm (± 1 cm would be correct)
- Upper quartile, $Q_3 = \frac{3}{4}n$ th value = 60th value
 Draw a horizontal line at 60, then down to the horizontal axis
 Upper quartile, $Q_3 \approx 25$ cm (± 1 cm would be correct)
- (e) IQR $\approx 25 - 21.5 = 3.5$ cm. (± 1 cm would be correct)

E.g. 2 The table shows Y11 marks in a Maths test.

- (c) Estimate the median mark.
- (d) Estimate the IQR.
- (e) Pupils who achieved less than 45 marks have to re-sit the test. Estimate how many pupils will re-sit.
- (f) Pupils who achieved more than 55 marks will sit the higher tier exam. Estimate how many will be entered for the higher tier.

Video: [Reading cumulative frequency graphs](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook: p480 E14.2 Qu 1, 2bc, 3cd, 4bc, 5cde, 6
A*-G class textbook: p480 E14.2 Qu 1, 2b, 3cd, 4cd, 5bc, 6
9-1 homework book: p165 E14.2 Qu 1cd, 2, 3cd
A*-G homework book: p122 M14.7 Qu 1cd, 2, 3cd

Summary

When estimating the medians and quartiles from a cumulative frequency curve, we need to draw horizontal and vertical lines on the graphs.

Horizontal lines are drawn at the following points:

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$$\text{Lower quartile, } Q_1 = \frac{1}{4}n \text{ th value}$$

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When the horizontal line hits the curve, it becomes a vertical line and goes down to the x -axis.

[Homework book answers \(only available during a lockdown\)](#)