

# L · Data presentation and interpretation · supported focus

AQA · A-Level · Mathematics

## Scope and prerequisites

---

AQA A-level Mathematics 7357, section L (Data presentation and interpretation), version 1.3 (first assessment 2018). Original teaching notes; objective-level mapping lives in content/teaching/aqa\_a\_level\_mathematics/objective-review.yaml.

Prerequisites: GCSE averages, frequency tables and box plots. Each lesson develops its own method before independent transfer.

These are original teaching examples, not official AQA material.

## Data presentation and interpretation

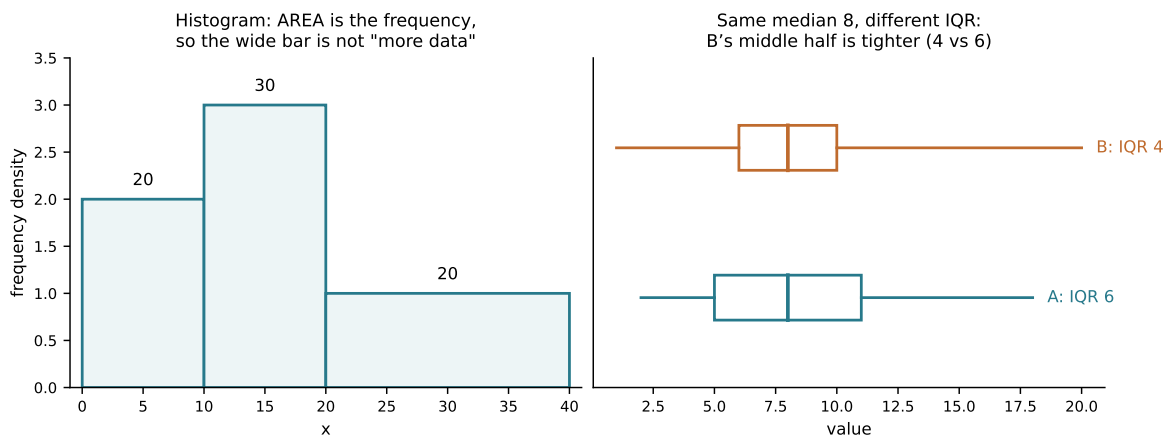
---

### ■ What would explain this observation?

- The tallest bar of a histogram contains FEWER observations than a shorter, wider one next to it. How can the picture be honest and the reading still be wrong?
  - Start with a prediction. State what the AREA of a histogram bar means, and what height alone tells you.
- 

### ■ Build the model

- A histogram uses AREA for frequency, so with unequal class widths the height is the **frequency density** :  $\text{frequency} \div \text{class width}$ . Grouped means and medians are estimates – values inside a class are represented by its midpoint or interpolated position.
- A **box plot** shows minimum, quartiles, median and maximum. Compare the median for the typical value and the **interquartile range** ( $\text{IQR} = Q_3 - Q_1$ ) for consistency. An outlier rule such as  $1.5 \times \text{IQR}$  beyond the quartiles is a stated convention, not a law.
- frequency density: Frequency divided by class width, used as histogram height; box plot: A display of the five-number summary for comparing distributions; interquartile range: The upper quartile minus the lower quartile, the spread of the middle half.



## ■ Choose evidence that can test it

- Before comparing displays, read the axis quantities, units and scale: a truncated axis exaggerates, and a grouped mean is an estimate because the true values inside each class are unknown.
- Compare both a centre and a spread in context: equal medians do not mean equal distributions, and the IQR describes only the middle half – a larger full range can still accompany a tighter box.

## ■ Work from known quantities

- State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution.
- Known: classes 0–10, 10–20, 20–40 with frequencies 20, 30, 20. Widths are 10, 10, 20, so densities are 2, 3, 1. The last bar is shortest despite 20 observations because its width is double; the areas 20, 30, 20 recover the frequencies exactly.

### Example:

For those grouped data, estimate the mean using midpoints, using the same sequence: midpoints → weighted sum → divide. (Answer: midpoints 5, 15, 30 give estimated sum  $5 \times 20 + 15 \times 30 + 30 \times 20 = 1,150$ ; estimated mean =  $1,150/70 \approx 16.4$ . This is an estimate, since each class is represented by its midpoint.)

## ■ Check the conclusion and its limits

- The tallest bar is not automatically the most frequent: check widths first. A cumulative-frequency graph plots running totals at UPPER class boundaries, and quartiles read from it are interpolation estimates, not exact measurements.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

**Warn:**

A histogram bar's height always equals its frequency, even with unequal class widths. This claim is false: height is frequency DENSITY; only the area equals the frequency. The wide 20-frequency bar with density 1 holds exactly as much data as the narrow one with density 2.

**Key:**

Data presentation and interpretation: histogram area carries frequency, grouped statistics are midpoint estimates, box plots compare median and IQR in context, and every comparison starts from the axis units and scale.