Teacher guidance

Key focus

Quartiles split an ordered dataset into four equal parts. This LO uses the exclusive (Tukey) method throughout: sort the data, find the median (Q_2), then Q_1 is the median of the lower half and Q_3 is the median of the upper half – when the count is odd, leave the overall median out of BOTH halves. The interquartile range IQR $= Q_3 - Q_1$ measures the spread of the middle 50% of the data and, unlike the range, is not pulled around by a single extreme value.

Suggested teaching sequence

1. Introduce the five-number summary (minimum, Q_1, median, Q_3, maximum) and connect it to the box-and-whisker graph students already recognise from displays.
2. Practise finding the median first, for both odd- and even-count datasets – this is the split point for everything that follows.
3. Model the exclusive method on an odd-count set: find the median, then find the median of the lower half (excluding the overall median) for Q_1, and the median of the upper half for Q_3.
4. Repeat for an even-count set, where the data splits into two equal halves with no value excluded.
5. Introduce the IQR as $Q_3 - Q_1$ and connect it to the width of the box on a box-and-whisker graph.
6. Practise reading a five-number summary directly off a box plot, including comparing two or more box plots by their medians and IQRs.
7. Discuss why the IQR is a more resistant measure of spread than the range, using a dataset with one extreme value to show the range balloon while the IQR stays stable.

Core examples to model

- Odd count (exclusive method): 10, 12, 14, 15, 18, 20, 25 $\Rightarrow$ median $= 15$; lower half $10, 12, 14 \Rightarrow Q_1 = 12$; upper half $18, 20, 25 \Rightarrow Q_3 = 20$; IQR $= 20 - 12 = 8$.
- Even count: 6, 9, 12, 15, 18, 21, 24, 27 $\Rightarrow$ median $= (15+18) \div 2 = 16.5$; lower half $6, 9, 12, 15 \Rightarrow Q_1 = (9+12) \div 2 = 10.5$; upper half $18, 21, 24, 27 \Rightarrow Q_3 = (21+24) \div 2 = 22.5$.
- Reading a box plot: min 5, $Q_1 = 10$, median 14, $Q_3 = 19$, max 26 $\Rightarrow$ IQR $= 19 - 10 = 9$.
- Outlier resistance: 4, 6, 8, 10, 12, 14, 30 $\Rightarrow$ $Q_1 = 6$, $Q_3 = 14$, IQR $= 8$, but the range is $30 - 4 = 26$ – the single outlier (30) inflates the range far more than the IQR.

Watch for

- Forgetting to sort the data before finding the median or quartiles.
- For an odd-count dataset, including the overall median in the lower or upper half when finding Q_1/Q_3 – it must be excluded from both halves.

- Adding Q_1 and Q_3 instead of subtracting to find the IQR (IQR $= Q_3 - Q_1$, not $Q_1 + Q_3$).
- Confusing the IQR (a single value describing spread) with a count or percentage of data points.
- Reading the wrong value off a box plot – remind students the box edges are Q_1 and Q_3, not the minimum and maximum.
- Assuming the range and IQR always tell the same story – they can differ a lot when a dataset has an outlier.

Checks for understanding

- Can students find the median of an ordered dataset for both odd and even counts?
- Can they correctly apply the exclusive method to find Q_1 and Q_3?
- Can they calculate the IQR and explain that it measures the spread of the middle 50% of the data?
- Can they read the five-number summary off a box-and-whisker graph?
- Can they compare two datasets or box plots using their medians and IQRs?
- Can they explain why the IQR is more resistant to outliers than the range?