Box Plots — Compare and IQR

Core Worksheet

Worked Examples & Guided Practice

I Do (Teacher Model) The table below shows summary statistics for test scores of Class A and Class B.

Group	Min	Q1	Median	Q3	Max
Class A	20	35	55	70	90
Class B	30	45	60	70	85

(a) Calculate the Interquartile Range (IQR) for both Class A and Class B.
(b) Compare the distributions of test scores for Class A and Class B.

We Do (Guided Practice) A box plot for Boys has median 160 cm and IQR = 15 cm. A box plot for Girls has median 152 cm and IQR = 8 cm. Compare the heights of Boys and Girls in two sentences.

You Do (Independent Practice) Given the dataset for heights: $12, 15, 18, 22, 25, 28, 30, 35, 40$. Calculate the lower quartile Q_1, median Q_2, upper quartile Q_3, and interquartile range (IQR).

Challenge (Extension) An outlier is defined as any data value greater than $Q_3 + 1.5 \times \text{IQR}$ or less than $Q_1 - 1.5 \times \text{IQR}$. Given $Q_1 = 40$ and $Q_3 = 60$, test whether 95 is an outlier.

Practice Perfect Questions

Q1. Find the IQR of a dataset with lower quartile $Q_1 = 18$ and upper quartile $Q_3 = 42$.

Q2. Class 1 has median score 68% and IQR 12%. Class 2 has median score 74% and IQR 20%. Which class scored higher on average? Which class was more consistent?

Q3. The median run time for Runner A is 45 mins (IQR = 4 mins). Runner B has median 42 mins (IQR = 9 mins). Compare their performances.

Q4. State the 5 key values needed to draw a box plot.

Q5. Given data $5, 8, 12, 14, 15, 18, 22$, find the median and IQR.

Q6. Test if a score of 10 is a low outlier when $Q_1 = 25$ and $Q_3 = 35$.

Answers & Worked Solutions

Model Solutions

- **I Do:** (a) $\text{IQR}_A = 70 - 35 = 35$, $\text{IQR}_B = 70 - 45 = 25$
  (b) Class B scored higher on average because its median (60) is higher than Class A's median (55). Class B's scores were more consistent because its IQR (25) is smaller than Class A's IQR (35).
- **We Do:** Boys are taller on average than Girls because their median (160 cm) is higher than Girls' median (152 cm). Girls' heights are more consistent because their IQR (8 cm) is smaller than Boys' IQR (15 cm).
- **You Do:** $Q_2(\text{median}) = 25$. $Q_1 = \frac{15+18}{2} = 16.5$. $Q_3 = \frac{30+35}{2} = 32.5$. $\text{IQR} = 32.5 - 16.5 = 16$
- **Challenge:** $\text{IQR} = 60 - 40 = 20$. Upper fence $= 60 + 1.5(20) = 60 + 30 = 90$. Since $95 > 90$, 95 IS an outlier.

Practice Perfect Questions Solutions

Q1. $\text{IQR} = 42 - 18 = 24$

Q2. Class 2 scored higher on average (median $74\% > 68\%$). Class 1 was more consistent (IQR $12\% < 20\%$).

Q3. Runner B is faster on average (median 42 mins $<$ 45 mins). Runner A is more consistent (IQR 4 mins $<$ 9 mins).

Q4. Minimum value, Lower Quartile (Q_1), Median (Q_2), Upper Quartile (Q_3), Maximum value

Q5. Median $= 14$. $Q_1 = 8$, $Q_3 = 18 \implies \text{IQR} = 18 - 8 = 10$

Q6. $\text{IQR} = 10$. Lower fence $= 25 - 1.5(10) = 25 - 15 = 10$. Score of 10 is on the boundary (not strictly less than 10), so not an extreme outlier.