Interquartile Range (IQR)

$IQR = Q3 - Q1$

Importance of IQR

- Removes outliers – It focuses only on the middle 50%, ignoring extreme values.
- Shows variability – A higher IQR means the data is more spread out, while a lower IQR means the data is closely packed.

Lesser Outlier Formula

- Outliers are extreme values that lie far from the rest of the data. To find lower outliers, we use the formula:
- $\text{Lower Bound} = Q1 - (1.5 \times IQR)$

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Greater Outlier Formula

- Outliers are extreme values that lie far from the rest of the data. To find greater outliers, we use the formula:
- $\text{Greater Bound} = Q3 + (1.5 \times IQR)$

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Why is 1.5 used in the outlier formula?

The 1.5 in the formula $Q1 - (1.5 \times IQR)$ is a multiplier that helps identify mild outliers. It is based on Tukey's Rule, a common statistical method for detecting outliers.

Reason for 1.5

1. Balances detecting outliers without being too strict – A smaller number (like 1.2) would flag too many values as outliers, while a larger number (like 2.0) might miss some.
2. Covers a reasonable range – In a normal distribution, about 99.3% of data falls within Q1 - 1.5 × IQR and Q3 + 1.5 × IQR, making anything beyond that unusual.
3. Widely accepted in statistics – It's a simple, effective way to detect outliers without making assumptions about the data distribution.

Summary

- 1.5 is a standard threshold for detecting outliers in most datasets.
- It helps spot unusually low or high values without being too aggressive.
- For stricter detection, 3 × IQR can be used for extreme outliers.

Example:

The five number summary for the Day and Night classes is

Day	32	56	74.5	82.5	99
Night	25.5	78	81	89	98

Day:

Q1=56

Q3=82.5

IQR=Q3-Q1=82.5-56=26.5

(1.5)(IQR) = 1.5*26.5=39.75

Lesser Outlier:

Q1-(1.5)*(IQR)=56-39.75=16.25

Greater Outlier:

Q3+(1.5)*(IQR)=82.5+39.75=122.25

Hence, No outliers present in Day Classes.

Night:

Q1=78

Q3=89

IQR=Q3-Q1=89-78=11

(1.5)(IQR) = 1.5*11=16.5

Lesser Outlier:

Q1-(1.5)*(IQR)=78-16.5=61.5

Greater Outlier:

Q3+(1.5)*(IQR)=89+16.5=105.5

Hence, **25.5 is the lesser outlier** present in Night class values.