

Exercise walk-through

Graphical Representations of Summary Statistics ■ 1.8

eXercise

You must be able to

- construct a **boxplot** 箱线图 from the **five-number summary** 五数概括
- mark **outliers** with the $1.5 \times \text{IQR}$ rule (a modified boxplot)
- estimate **percentiles** 百分位数 and describe position

Method — The five-number summary and boxplot

The **five-number summary** is minimum, Q_1 , median, Q_3 , maximum. A **boxplot** draws a box from Q_1 to Q_3 (with the median inside) and whiskers to the extremes.

Method — The 1.5 IQR rule

A value is an **outlier** if it is below $Q_1 - 1.5 \times \text{IQR}$ or above $Q_3 + 1.5 \times \text{IQR}$.

Method — Percentiles

Read position (percentiles) from a boxplot or ogive — e.g. Q_3 is the 75th percentile.

Practice 2.1 ■ 2 marks

Name the five values in a five-number summary.

Solution 2.1

Method: The five-number summary and boxplot

Worked steps

minimum, Q_1 , median, Q_3 , maximum **B1** **B1** *for any three; for all five.*

Practice 2.2 ■ 1 mark

State the rule for identifying an outlier.

Solution 2.2

Method: The 1.5 IQR rule

Worked steps

a value below $Q_1 - 1.5 \times \text{IQR}$ or above $Q_3 + 1.5 \times \text{IQR}$ **B1**.

Practice 2.3 ■ 1 mark

For a data set with $Q_1 = 10$ and $Q_3 = 20$, find the IQR.

Solution 2.3

Worked steps

$$20 - 10 = 10 \text{ (B1).}$$

Exam-style 3.1 ■ 1 mark

A boxplot is built from the

- A** mean and standard deviation
- B** five-number summary
- C** histogram
- D** z-scores

Solution 3.1

A mean and standard deviation

B five-number summary 

C histogram

D z-scores

Worked steps

B.

Exam-style 3.2 ■ 1 mark

A value is an outlier if it is more than _____ $\times$ IQR beyond a quartile.

A 1

B 1.5

C 2

D 3

Solution 3.2

Method: The 1.5 IQR rule

A 1

B 1.5



C 2

D 3

Worked steps

B.

Exam-style 3.3 ■ 1 mark

A data set has $Q_1 = 15$ and $Q_3 = 27$.

(a) Find the IQR.

(b) Find the upper outlier boundary, $Q_3 + 1.5 \times \text{IQR}$.

Solution 3.3

Method: The 1.5 IQR rule

Worked steps

(a) $27 - 15 = 12$ **B1**. (b) $27 + 1.5 \times 12 = 27 + 18 = 45$ **M1** **A1**.