

1.8 Graphical Representations of Summary Statistics

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS boxplot 箱线图 • five-number summary 五数概括 • percentiles 百分位数
• median 中位数 • outliers 离群值

Objective

Build the skills to answer exam questions on **graphical representations of summary statistics**.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ 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.

■ The 1.5 IQR rule

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

■ Percentiles

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

2 Practice

2.1 Name the five values in a five-number summary. [2]

2.2 State the rule for identifying an outlier. [1]

2.3 For a data set with $Q_1 = 10$ and $Q_3 = 20$, find the IQR. [1]

3 Exam-style questions

3.1 A boxplot is built from the [1]

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

3.2 A value is an outlier if it is more than _____ $\times$ IQR beyond a quartile. [1]

- **A** 1
- **B** 1.5
- **C** 2
- **D** 3

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

(a) Find the IQR. [1]

(b) Find the upper outlier boundary, $Q_3 + 1.5 \times \text{IQR}$. [2]

Solutions

2.1 minimum, Q_1 , median, Q_3 , maximum.

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

2.3 $20 - 10 = 10$.

3.1 B.

3.2 B.

3.3 (a) $27 - 15 = 12$. (b) $27 + 1.5 \times 12 = 27 + 18 = 45$.