

5.1 Representation of data

Name: _____ Class: _____ Date: _____ **Total: 12 marks**

KEY WORDS mean 平均数 • standard deviation 标准差 • cumulative frequency 累积频数
• box-and-whisker plot 箱线图 • median 中位数

Objective

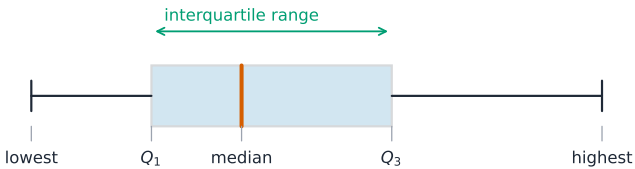
Build the skills to answer exam questions on **representation of data** 数据表示 — diagrams, averages, and **measures of spread** 离散程度 (range, IQR, standard deviation).

You must be able to:

- read a box-and-whisker plot and a cumulative frequency graph
- find the mean, median and mode
- find the standard deviation from $\sum x$ and $\sum x^2$

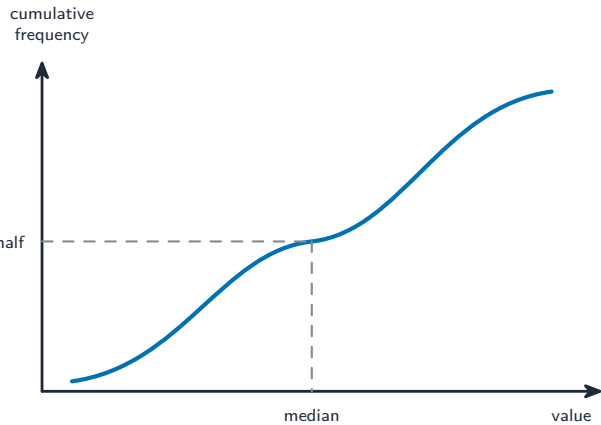
1 Worked examples

■ Spread from totals



box: Q_1 – Q_3 • median line • whiskers: min/max

The box spans Q_1 to Q_3 ($IQR = Q_3 - Q_1$); the whiskers reach the extremes



Read the median across from half the total frequency; the quartiles from $\frac{1}{4}$ and $\frac{3}{4}$

$n = 10, \sum x = 50, \sum x^2 = 300: \bar{x} = 5; \sigma = \sqrt{\frac{300}{10} - 5^2} = \sqrt{5} = 2.24.$

2 Practice

2.1 Find the interquartile range when $Q_1 = 14$ and $Q_3 = 23$. [1]

2.2 For 8 values, $\sum x = 96$. Find the mean. [1]

3 Exam-style questions

3.1 For data with $\sum x = 200, \sum x^2 = 4500$ and $n = 10$, the variance is: [1]

- A 25
- B 50
- C 450
- D 5

3.2 The masses (kg) of 7 parcels are 3, 5, 5, 8, 9, 12, 16.

(a) Find the median and the interquartile range. [3]

(b) Find the mean and the standard deviation. [4]

3.3 A cumulative frequency graph for 200 students rises smoothly. The median is read as 52, $Q_1 = 40$ and $Q_3 = 63$. Estimate how many students scored more than 63. [2]

Solutions

2.1 $\text{IQR} = 23 - 14 = 9$.

2.2 $\bar{x} = \frac{96}{8} = 12$.

3.1 B. $\text{Variance} = \frac{4500}{10} - \left(\frac{200}{10}\right)^2 = 450 - 400 = 50$.

3.2 (a) ordered already; median (4th) = 8; $Q_1 = 5$, $Q_3 = 12$, $\text{IQR} = 7$.

(b) $\sum x = 58$, $\bar{x} = \frac{58}{7} = 8.29$; $\sum x^2 = 9 + 25 + 25 + 64 + 81 + 144 + 256 = 604$;

$\sigma = \sqrt{\frac{604}{7} - 8.29^2} = \sqrt{86.29 - 68.7} = \sqrt{17.6} = 4.20$.

3.3 above Q_3 is the top quarter $= \frac{1}{4} \times 200 = 50$ students.