

# 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  
• median 中位数

## Objective

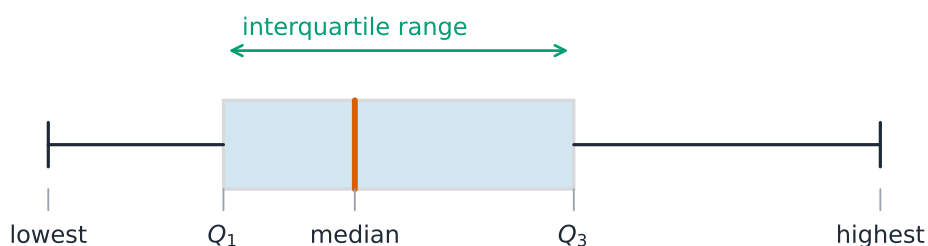
Build the skills to answer exam questions on **representation of data** 数据表示 — diagrams, averages, and **measures of spread** 离散程度 (range, IQR, standard deviation).

**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  $\sum x^2$

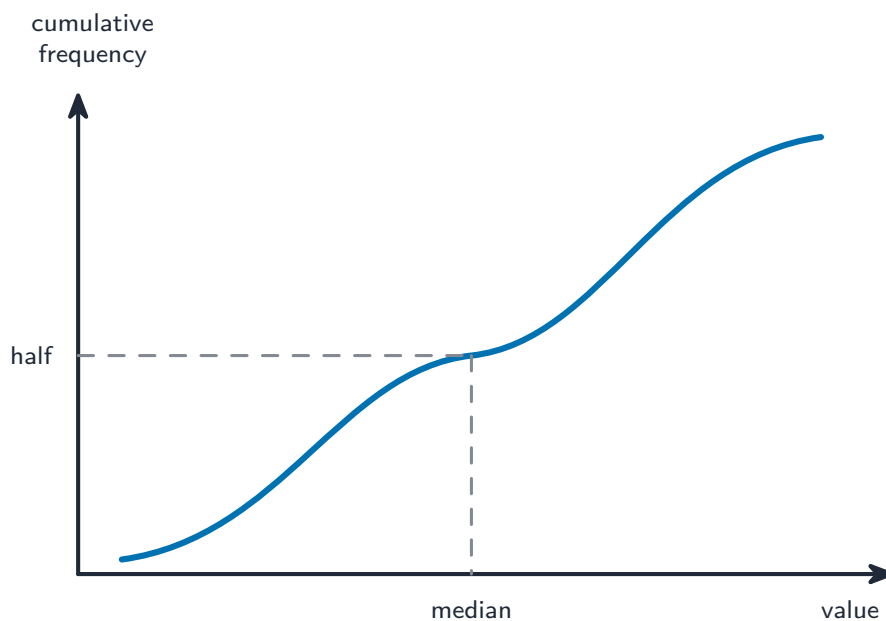
## 1 Worked examples

### ■ 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

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**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
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**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]

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

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**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]

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## Solutions

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**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.