

Statistics

IGCSE Mathematics • Topic 9

IGCSE Mathematics



Statistics

What we will cover

- 1 Averages & range
- 2 Frequency tables
- 3 Quartiles & box plots
- 4 Pie charts
- 5 Cumulative frequency & histograms
- 6 Scatter & correlation

1 Averages

Statistics
└ Averages

Averages and range



$$\begin{aligned} \text{median} &= 3 \\ \text{mean} &= \frac{2+3+3+5+7}{5} = 4 \\ \text{mode} &= 3 \text{ (most common)} \\ \text{range} &= 7 - 2 = 5 \end{aligned}$$

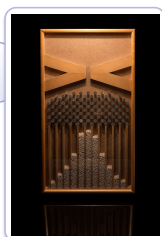
- **mean** 平均数 = $\frac{\text{sum of all values}}{\text{how many values}}$
- **median** 中位数 = the middle value when the data is put in order.
- **mode** 众数 = the value that appears most often.
- **range** 极差 = largest value – smallest value (it shows how spread out the data is).

Statistics
└ Averages

Mean from a frequency table

$$\text{mean} = \frac{\sum(\text{value} \times \text{frequency})}{\sum \text{frequency}}$$

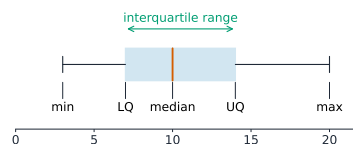
Values 1, 2, 3 with frequencies 4, 5, 1:
 $\frac{1(4) + 2(5) + 3(1)}{10} = 1.7$. For **grouped data** 分组数据 use each group's **midpoint** 中点; the **modal class** 众数组 has the highest frequency.



galton
Distribution

Statistics
└ Averages

Quartiles and box plots



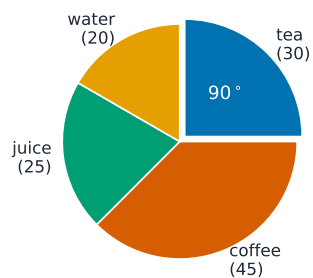
Quartiles 四分位数 cut ordered data into four.

Interquartile range 四分位距 = $UQ - LQ$ – the spread of the middle half, ignoring extremes.

2 Charts

Statistics
Charts

Pie charts



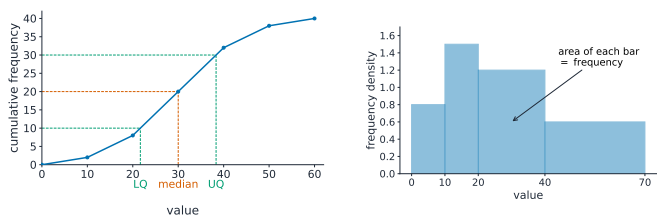
Each slice is its fraction of 360°:

$$\text{angle} = \frac{\text{frequency}}{\text{total}} \times 360^\circ$$

A **bar chart** 条形图 or **pictogram** 象形图 shows each group's frequency.

Statistics
Charts

Cumulative frequency and histograms



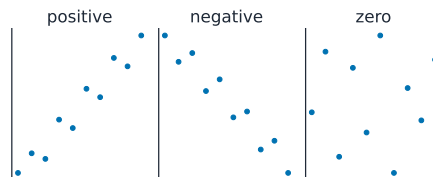
Read the **median** 中位数 at half the total on a **cumulative frequency** 累积频数 curve. On a **histogram** 直方图 with unequal widths, the **area** (frequency density) shows frequency.

Statistics
Charts

Scatter and correlation

A **scatter diagram** 散点图 shows **correlation** 相关性:

- positive – both rise; negative – one falls
- draw a **line of best fit** 最佳拟合线 to predict



3 Recap

Statistics
Recap

Worked example – the four averages

Find the mean, median, mode and range of 4, 7, 7, 2, 5.

- Mean = $\frac{4 + 7 + 7 + 2 + 5}{5} = \frac{25}{5} = 5$
- Order first: 2, 4, 5, 7, 7.
- Median = the middle value = 5
- Mode = most common = 7; range = $7 - 2 = 5$

Always order the list before taking the median – that is the single most common lost mark. With an even count, take the mean of the middle two.

Topic 9 – key takeaways

1 Averages

mean, median, mode; range is the spread

3 Pie

slice angle = fraction of 360°

2 Spread

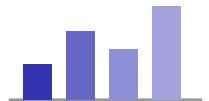
$IQR = UQ - LQ$ ignores extremes

4 Scatter

correlation; a line of best fit predicts

Check yourself

- 1 Which average is the middle value?
- 2 What is the range of 2, 4, 5, 7, 7?
- 3 What is the interquartile range?
- 4 What does a line of best fit help you do?



Answers 1. the median 2. 5 3. $UQ - LQ$ 4. predict / estimate values