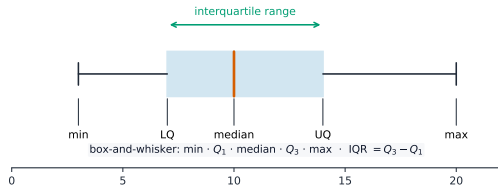


Statistics IGCSE Mathematics • Topic 9 IGCSE Mathematics	Statistics What we will cover - Averages & range - Frequency tables - Quartiles & box plots - Pie charts - Cumulative frequency & histograms - Scatter & correlation
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1 Averages	Statistics Averages Averages and range 2 3 3 5 7 ↑ median = 3 mean = $\frac{2+3+3+5+7}{5} = 4$ mode = 3 (most common) range = $7 - 2 = 5$ ■ 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).
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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. Distribution galton	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.
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Quartiles and box plots, in detail



A box-and-whisker plot shows the five-number summary; the box length is the interquartile range.

2 Charts

Statistics

Charts

Pie charts

Each slice is its fraction of 360° :

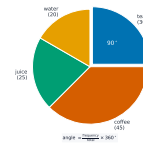
$$\text{angle} = \frac{\text{frequency}}{\text{total}} \times 360^\circ$$

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

Statistics

Charts

Pie charts, in detail



Each slice is its fraction of 360° :

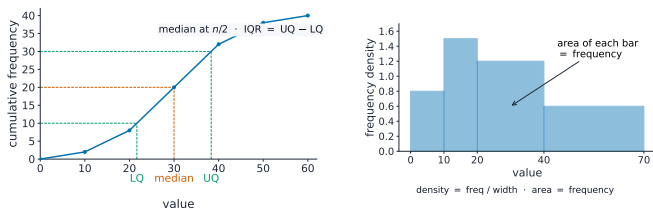
$$\text{angle} = \frac{\text{frequency}}{\text{total}} \times 360^\circ$$

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.

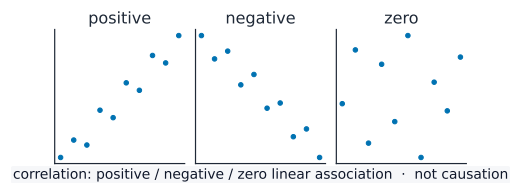
Statistics

Charts

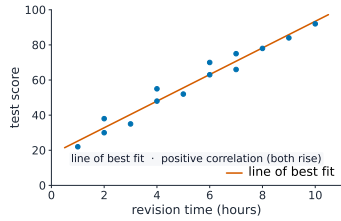
Scatter and correlation

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



Scatter diagrams and correlation



A line of best fit is one straight ruled line through the middle of the points; use it to predict.

Reading a scatter diagram

- Positive correlation** As one goes up, so does the other – the points rise from left to right.
- Negative correlation** Negative correlation 负相关: as one goes up, the other falls.
- Zero correlation** Zero correlation 零相关: no pattern, and no line of best fit worth drawing.
- Collecting the data** A tally table 计数表 records the raw counts before any statistical 统计的 summary is made.

Correlation is not cause. Say what the connection might be – or say that a third factor could explain both.

Collecting and showing data



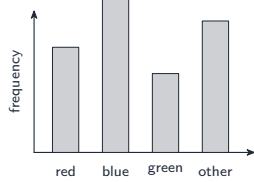
Data is collected from people – a sample drawn from a population.

Measures of spread (Extended)

When data is in order, the **quartiles** 四分位数 cut it into four equal parts.

The lower quartile (LQ) is one quarter of the way up; the upper quartile (UQ) is three quarters of the way up.

Charts and diagrams



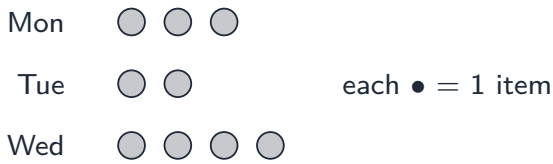
A bar chart shows the frequency of each group

Choosing how to show data, and the correlation words

- a frequency distribution** 频数分布 a table of values against how often each occurs
- a two-way table** 双向表 sorts data by two features at once – boys/girls against a choice
- a bar chart or pictogram** for categories; a histogram for grouped continuous data
- a stem-and-leaf diagram** 茎叶图 shows the shape and keeps every original value
- positive correlation** 正相关 as one rises so does the other; **negative** 负相关 means one rises as the other falls
- a percentile** 百分位数 read from a cumulative frequency curve – the median is the 50th

Correlation is not causation, and the exam says so. A strong line of best fit shows association only.

Charts and diagrams, continued



A pictogram uses a symbol to stand for a number of items

Exam tips

- Know the three averages: **mean** (add up ÷ how many), **median** (the middle value when in order), **mode** (the most common). The **range** is highest – lowest.
- From a frequency table the mean is $\frac{\sum fx}{\sum f}$ – divide by the *total frequency*, not the number of rows.
- On a **scatter diagram**, describe the correlation as positive, negative or none, and draw the line of best fit through the mean point.
- For a **histogram** with unequal class widths, the height is the *frequency density* (frequency ÷ class width), not the frequency.

3

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

2 Spread

IQR = UQ – LQ ignores extremes

3 Pie

slice angle = fraction of 360°

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