Tables, charts and stem-and-leaf plots

Leaving Certificate · Ordinary Level

Understand the idea

How to start

Frequency means how often a value or category occurs. A chart turns these counts into a display.

1. Read the title, key, units and axis scales first.
2. Translate the marks or bars into actual values or counts.
3. Use the display that matches the kind of data and label it clearly.

Key terms & definitions

Frequency
The number of observations in a category or interval.

Histogram
A display of grouped numerical data with touching bars.

Key
An explanation of how to read the stem and leaf units.

Key ideas

• A frequency table records how often each category or value occurs. Check the frequencies add to the sample size.

• Bar charts suit categories; bars are separated. A histogram groups numerical data; equal-width intervals use adjoining bars with frequency as height.

• For a pie chart, sector angle is $\frac{\text{frequency}}{\text{total}} \times 360^\circ$.

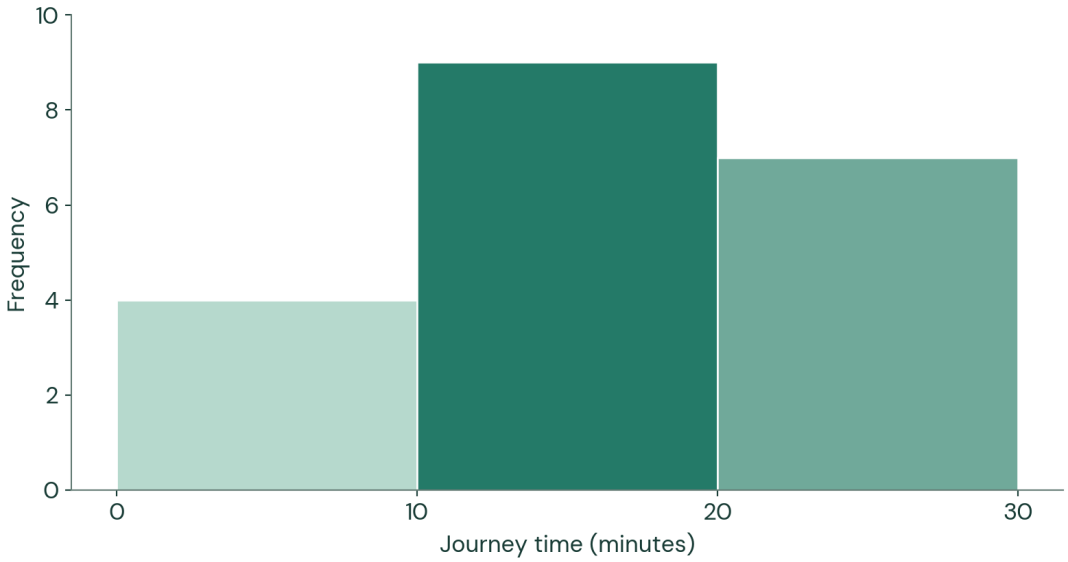
• A line graph can show change over time. Label both axes, units and scales.

• In a stem-and-leaf plot, order the leaves and provide a key. A back-to-back plot compares two groups using shared stems.

• Check whether an axis is truncated, intervals are inconsistent or area pictures exaggerate a difference.

• A scatter plot shows paired numerical data. An upward pattern suggests positive correlation; a downward pattern suggests negative correlation. Correlation does not establish cause.

• Ordinary Level: interpret scatterplots and match them to a supplied correlation coefficient. Drawing a line of best fit or calculating correlation is Higher Level; the fitted-line example is optional enrichment.



Equal-width histogram: frequencies are 4, 9 and 7 for adjoining 10 −minute intervals.

Quick reminder

• Read the key and scale first.

• Order stem-and-leaf entries and give a key.

• Compare both a typical value and spread when comparing groups.

Worked examples

Example 01 · Pie chart sector

In a survey of 40 students , 12 walk to school. Find the walking sector angle.

Why this method?

Read the key, units and scales before using a display. Translate the displayed information back into data values.

$$\text{walkingfraction} = \frac{12}{40}$$

Step 1

Twelve of the 40 students walk. Put the part over the total.

$\text{angle} = \frac{12}{40} \times 360^\circ$	**Step 2** The whole pie chart is 360°, so take the same fraction of a full turn.
$\text{angle} = 0.3 \times 360^\circ = 108^\circ$	**Step 3** Calculate the fraction first, then multiply.
$108^\circ < 180^\circ$	**Step 4** A check: fewer than half the students walk, so the sector must be less than half a circle.

Example 02 · Equal-width histogram

Journey times are grouped as $0 - < 10, 10 - < 20$ and $20 - < 30$ minutes, with frequencies $4, 9$ and 7. Describe the histogram.

Why this method?

Read the key, units and scales before using a display. Translate the displayed information back into data values.

Horizontal axis: time in minutes. Vertical axis: frequency.	**Step 1** Set the axes
Use intervals of width 10 and bar heights $4, 9$ and 7.	**Step 2** Draw equal-width adjoining bars
The modal class is $10 - < 20$ minutes. There are 20 students in total; the exact individual times are unknown.	**Step 3** Read the bar heights as frequencies, then interpret the most frequent interval in the context of the question.

Example 03 · Median from a back-to-back stem and leaf plot

Plot 1 : The back-to-back stem and leaf plot shows two groups of seven values. What is the median of Group B?

```
Group A | Stem | Group B
       7 5 1 | 1 | 1 4 7
             | 2 | 3
           8 | 3 | 0
         7 5 | 4 | 2
           5 | 5 | 9
Key: stems = tens; leaves = units.
```

Group A | Stem | Group B
751 | 1 | 147
| 2 | 3
8 | 3 | 0
75 | 4 | 2
5 | 5 | 9
Key: stems = tens; leaves = units.

Why this method?

Read the key, units and scales before using a display. Translate the displayed information back into data values.

11, 14, 17, 23, 30, 42, 59	**Step 1** Order the values of Group B from smallest to largest
23	**Step 2** The median is the 4th of the 7 values

Think about it: Before moving on: why do the leaves of Group A run to the left of the stems, and those of Group B to the right?

Example 04 · Interpret correlation without claiming causation

A scatterplot of hours of practice and score has correlation 0.82.

0.82 is positive and fairly close to 1.	**Step 1** The plot shows a strong positive linear association.

Association is not proof of cause.	**Final step** Prior knowledge, teaching or other variables could also affect scores.

Optional extension · not required for Ordinary Level

Example 05 · Use a supplied fitted line

A fitted model is $y = 2x + 5$. Estimate y when $x = 3$, within the observed data range.

Why this method?

Read the requested quantity, choose the matching rule and follow the reason beside each line.

$y = 2(3) + 5$	**Step 1** Replace x with 3. This is a prediction from a model.
$y = 11$	**Step 2** Multiply first, then add 5. A fitted line does not predict every observed value exactly.

Common mistake

Reading left-hand leaves in a back-to-back stem-and-leaf plot as though it were a right-hand plot. With key $2|3 = 23$, the row $8\ 5\ 1\ |\ 2$ on the left represents 28, 25 and 21; read outwards from the stem to list them in increasing order.

Exam technique

Compare two groups using both a typical value and spread, with the units.

Try it yourself

Work on paper before checking the answers at the end. These questions are for self-checking, not submitted homework.

Question 1

The back-to-back stem and leaf plot shows two groups of seven values. What is the median of Group B?

```
Group A | Stem | Group B
         5 2 | 1 | 3 8
         7 2 | 2 | 4 6
         8 1 | 3 | 3 6
           4 | 4 | 9
             | 5 |
Key: stems = tens; leaves = units.
```

Group A | Stem | Group B
52 | 1 | 38
72 | 2 | 46
81 | 3 | 36
4 | 4 | 9
| 5 |
Key: stems = tens; leaves = units.

A. 27

B. 28

C. 26

D. 2

Question 2

Data A : 7.1, 7.1, 7.5, 6.1, 8.2. Data B : 7.3, 7.7, 6.8, 8.7, 8.8, 8.3. Key : 6 | 1 means 6.1. Compare the centre and spread of the two groups using the plot. Which statement about median and range is supported?

A	Stem	B
1	6	8
5 1 1	7	3 7
2	8	3 7 8

Key: 2 | 7 means 2.7. Repeated leaves are retained.

Ordered back-to-back plot for the two data lists in the question. Left A, shared stems, right B. Key : 2 | 7 means 2.7.

A. Higher median: B. Larger range: A.

B. Higher median: A. Larger range: A.

C. Higher median: B. Larger range: B.

D. Higher median: A. Larger range: B.

Watch an explanation

Cognito — Pie Charts

Corbettmaths — Graphs: stem and leaf (draw)

Open the website chapter to load the embedded players. Use the rates and rules in your question for financial examples.

Self-check answers

Question 1

26

Correct: ordered, Group B is $13, 18, 24, 26, 33, 36, 49$, and the 4th value is 26.

Question 2

Higher median: B. Larger range: A.

Correct.

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