Exercise walk-through

6.2
Charts, tables, time series and scatter (S2, S5–S6)

AQA · GCSE · Mathematics

Samples and data

- **Primary data** is collected by you; **secondary data** was collected by someone else.
- **Categorical data** is in words, such as favourite colour.
- **Discrete** data can take only certain values, such as the number of brothers and sisters.
- **Continuous data** can take any value in a **range**, such as a time or a height, even if it is rounded when it is recorded.

Histograms, cumulative frequency and box plots (H)

- **Histograms.** In a **histogram** the area of each bar, not its height, shows the frequency.
- When the **class intervals** have different widths, the height is the **frequency density**:
- **Worked example 6 (H).** Classes $0 \leq x < 10$, $10 \leq x < 20$ and $20 \leq x < 40$ have frequencies 20, 30 and 20.
- The **class width** of the last class is 20, so the frequency densities are $20 \div 10 = 2$, $30 \div 10 = 3$ and $20 \div 20 = 1$.

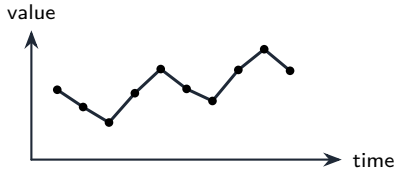
$$\text{frequency density} = \frac{\text{frequency}}{\text{class width}}$$

Sources for this lesson

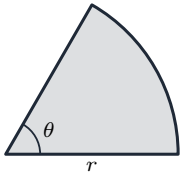
- AQA, *GCSE Mathematics (8300) specification*, subject content section 3.6 (Statistics).
- "Landon, 1,293,669; Roosevelt, 972,897", *The Literary Digest* (31 October 1936).
- P. Squire, "Why the 1936 Literary Digest poll failed", *Public Opinion Quarterly* 52 (1988), pages 125 to 133.
- AQA, *GCSE Mathematics* Higher Papers 1, 2 and 3 (June 2024), the **pie chart**, frequency table and **box plot** questions, adapted.

Exercises 2.1·2.2

2.1 Of 40 students, 10 walk, 15 take the bus and 15 cycle. Work out the three pie-chart angles. [2]

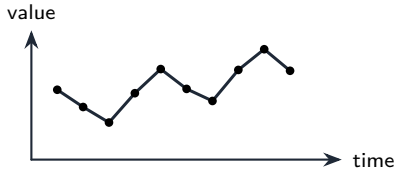


2.2 A pie-chart sector has angle 162°. What percentage of the total does it represent? [2]



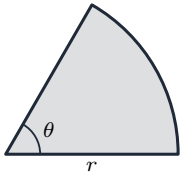
Exercises 2.1·2.2

2.1 Of 40 students, 10 walk, 15 take the bus and 15 cycle. Work out the three pie-chart angles. [2]



2.1 $\frac{10}{40} \times 360 = 90°$; $\frac{15}{40} \times 360 = 135°$ each.

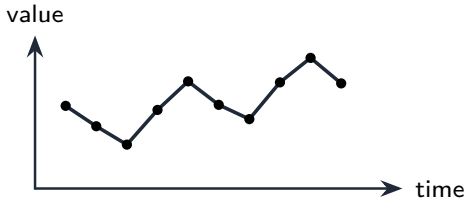
2.2 A pie-chart sector has angle 162°. What percentage of the total does it represent? [2]



2.2 $\frac{162}{360} \times 100 = 45\%$.

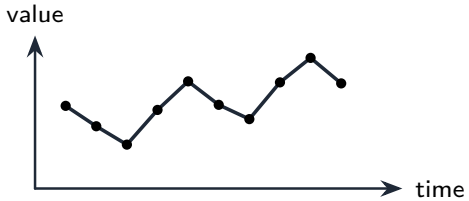
Exercise 2.3

2.3 Daily attendance over a week reads 32, 35, 33, 36, 34. Write down the range and the largest value. [2]



Exercise 2.3

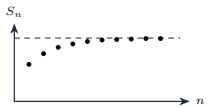
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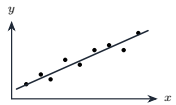
2.3 Range $= 36 - 32 = 4$; largest value 36.

Exercise 2.4

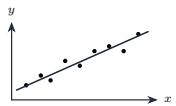
2.4 Which display suits categorical data with named categories: a bar chart or a time-series line graph? [2]



2.5 Name the correlation type when points rise together tightly, and when points fall loosely. [2]



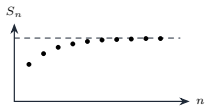
2.6 A line of best fit is $\hat{y} = 40 + 4.5x$ for inputs observed from 1 to 5. Predict y at $x = 3.6$ and at $x = 10$, stating which prediction is safer. [3]



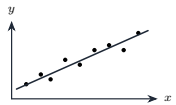
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Exercise 2.4

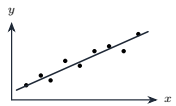
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2.4 A bar chart – separate bars for named categories; a time-series line graph needs ordered points in time.

2.5 Strong positive correlation; weak negative correlation.

2.6 $x = 3.6$: $\hat{y} = 40 + 4.5 \times 3.6 = 56.2$ – inside the observed range 1 to 5, so it interpolates

Full solution on next slide

Full solution 2.4

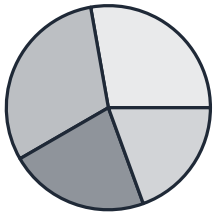
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2.5 Strong positive correlation; weak negative correlation.

2.6 $x = 3.6$: $\hat{y} = 40 + 4.5 \times 3.6 = 56.2$ – inside the observed range 1 to 5, so it interpolates and is safer. $x = 10$: $\hat{y} = 85$ – outside the range, an extrapolation whose trend may not continue.

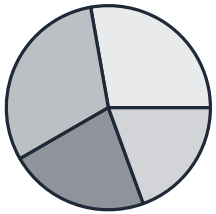
Exercise 3.1

3.1 *(June 2024 3H Q8, adapted.)* Six table values are 8, 9, 9, 6, 9, 10. (a) Work out their mean. (b) A pie chart of the same data has a 162° sector. Work out $4 \times \text{mean} + \text{percentage}$, where the percentage is the sector's share. [4]



Exercise 3.1

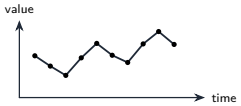
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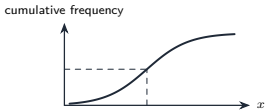
3.1 (a) $(8+9+9+6+9+10) \div 6 = 51 \div 6 = 8.5$. (b) Percentage $= \frac{162}{360} \times 100 = 45$; so $4 \times 8.5 + 45 = 34 + 45 = 79$.

Exercise 3.2

3.2 *(Original, Higher.)* Classes $0 \le x < 10$, $10 \le x < 20$, $20 \le x < 40$ have frequencies 20, 30, 20. Work out the frequency densities and check that the areas recover the frequencies. [3]



3.3 *(Original, Higher.)* For the same data, write down the cumulative frequency points and estimate the median, which reads at cumulative frequency 35. [2]

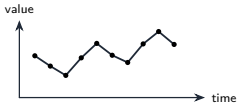


3.4 *(Original.)* A pictogram key says one symbol represents five students. How many symbols represent 12 students, and why must fractional symbols be allowed? [2]

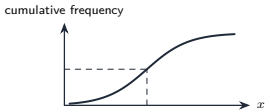


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3.2 Widths 10, 10, 20 give densities $20 \div 10 = 2$, $30 \div 10 = 3$, $20 \div 20 = 1$; areas $2 \times 10 = 20$, $3 \times 10 = 30$, $1 \times 20 = 20$ – the frequencies return.

3.3 Points $(0, 0)$, $(10, 20)$, $(20, 50)$, $(40, 70)$. The median at 35 lies in the second class: $10 + \frac{35-20}{30} \times 10 = 15$.

Full solution on next slide

Full solution 3.2

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3.3 Points $(0, 0)$, $(10, 20)$, $(20, 50)$, $(40, 70)$. The median at 35 lies in the second class: $10 + \frac{35-20}{30} \times 10 = 15$.

3.4 $12 \div 5 = 2.4$ symbols; data is not always a multiple of the key, so fractional (part-drawn) symbols must be allowed and the key stated.

Local review guidance: the $\frac{f}{n} \times 360°$ or $\frac{162}{360}$ fraction seen before multiplying; densities with unequal widths, height is not frequency; boundaries, not midpoints, with interpolation shown; interpolation vs extrapolation named with the observed range. This is authored classroom guidance.