Exercise walk-through

6.1.1 Data

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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.

Exercise 2.1

2.1 Work out the mean of 3, 7, 8, 10, 12. [1]



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2.1

- $\dfrac{3+7+8+10+12}{5} = \dfrac{40}{5} = \mathbf{8}$

Setup for exercise 2.2

2.2 Work out the median of 12, 5, 9, 3, 8, 10. [1]



2.3 Write down the mode and work out the range of 4, 7, 7, 2, 9, 7, 5. [2]



Exercise 2.2

2.4 Five numbers have a mean of 12. Four of them are 10, 11, 14 and 9. Work out the fifth. [2]



2.5 Which average best represents 12, 13, 13, 14, 95? Give a reason. [1]



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2.2

- in order 3, 5, 8, 9, 10, 12; middle two are 8 and 9: median = **8.5**

2.3

Full solution on next slide

Full solution 2.2

2.2

- in order 3, 5, 8, 9, 10, 12; middle two are 8 and 9: median = **8.5**

2.3

- mode = **7**
- range = $9 - 2 = \mathbf{7}$

2.4

- total = $12 \times 5 = 60$
- fifth = $60 - (10 + 11 + 14 + 9) = 60 - 44 = \mathbf{16}$

2.5

- the **median** (13): the outlier 95 would pull the mean up to 29.4, above every other value

Exercise 3.1

3.1 Explain why the range is not a good measure of spread for the data in **2.5**. [1]



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3.1

- the range $95 - 12 = 83$ depends only on the extreme values, so the one outlier makes the data look far more spread than it is

Setup for exercise 3.2

3.2 Class A's test marks have mean 64 and range 30. Class B's have mean 58 and range 12. Compare the marks of the two classes. [2]



3.3 The table shows the goals scored in 20 matches. Work out the mean number of goals per match. [3]

Goals	**0**	**1**	**2**	**3**
Frequency	4	7	6	3



3.4 Class A has 20 students with a mean height of 164 cm. Class B has 10 students with a mean height of 170 cm. Work out the mean height of all 30 students. [3]



Exercise 3.2

3.5 The numbers x, $x + 3$, $2x$, 7 and 9 have a mean of 7. Work out x, then find the median and the mode of the five numbers. [4]



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3.2

- on average class A did better: its mean, 64, is higher than 58
- class B's marks were more consistent: its range, 12, is smaller than 30

3.3

- $\sum fx = 0 \times 4 + 1 \times 7 + 2 \times 6 + 3 \times 3 = 0 + 7 + 12 + 9 = 28$
- mean $= \dfrac{\sum fx}{\sum f} = \dfrac{28}{20} = \mathbf{1.4}$ goals

3.4

Full solution on next slide

Full solution 3.2

3.2

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3.4

- total for A $= 20 \times 164 = 3280$; total for B $= 10 \times 170 = 1700$
- combined mean $= \dfrac{3280 + 1700}{30} = \dfrac{4980}{30} = \mathbf{166}$ cm

3.5

- total $= 7 \times 5 = 35$, so $x + (x + 3) + 2x + 7 + 9 = 35$
- $4x + 19 = 35$, so $\boldsymbol{x = 4}$
- the numbers are 4, 7, 8, 7, 9; in order 4, 7, 7, 8, 9: median $= \mathbf{7}$
- mode $= \mathbf{7}$