Exercise walk-through

6.1.4
Grouped Summaries

AQA · GCSE · Mathematics

Averages and spread

- The **mean** is the total divided by the number of values.
- The **median** is the middle value when the data is in order.
- The **mode** is the most common value; for grouped data, the **modal class** is the group with the highest frequency.

$$\text{mean} = \frac{\sum fx}{\sum f}$$

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 $20 \div 20 = 1$.

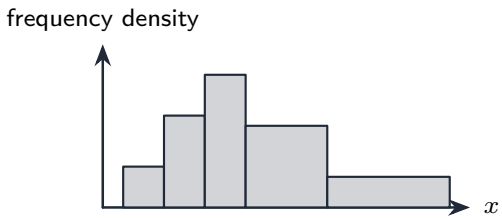
$$\text{frequency density} = \frac{\text{frequency}}{\text{class width}}$$

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.

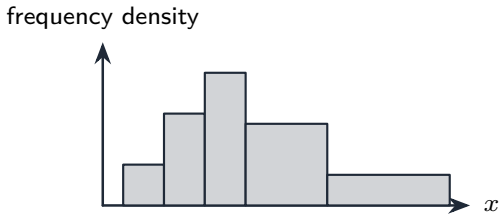
Exercise 2.1

2.1 Use the worked example. How many values are there altogether? [1]



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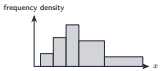
2.1

- $2 + 5 + 3 = \mathbf{10}$

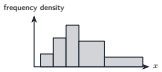
Exercise 2.2

2.2 The table shows the number of pets owned by 20 students. Write down the mode. [1]

Pets	**0**	**1**	**2**	**3**
Frequency	5	8	4	3



2.3 Use the table in **2.2**. Work out the mean number of pets. [2]

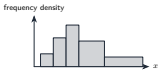


2.4 The heights of 30 plants are grouped below. Write down the modal class. [1]

Height h **(cm)**	$10 < h \leq 20$	$20 < h \leq 30$	$30 < h \leq 40$	$40 < h \leq 50$
Frequency	6	11	8	5



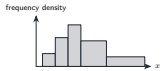
2.5 Use the table in **2.4**. Which class contains the median? [2]



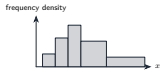
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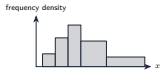


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2.2

- the highest frequency is 8: mode = **1** pet

2.3

- $\sum fx = 0 + 8 + 8 + 9 = 25$
- mean $= \frac{25}{20} =$ **1.25** pets

Full solution on next slide

Full solution 2.2

2.2

- the highest frequency is 8: mode = **1** pet

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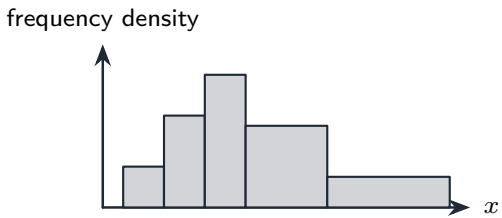
- $\mathbf{20 < h \leq 30}$

2.5

- the median is between the 15th and 16th values; running totals are 6, then 17
- $\mathbf{20 < h \leq 30}$

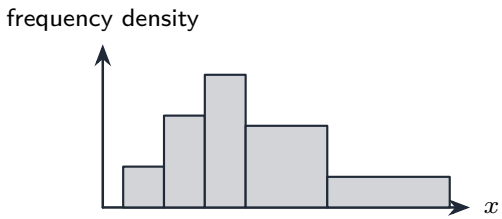
Exercise 3.1

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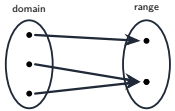


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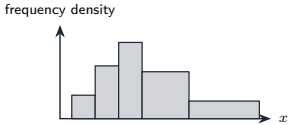
- the exact values are not known, so each is assumed to be at its class **midpoint**

Setup for exercise 3.2

3.2 Explain why you cannot find the range of the heights in **2.4** exactly, and write down the largest possible range. [2]

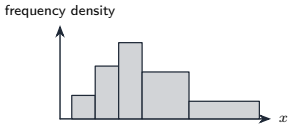


3.3 Use the table in **2.4**. Work out an estimate of the mean height. [3]



3.4 The times taken by 30 pupils are shown. Work out an estimate of the mean time, and estimate how many pupils took more than 25 minutes. [4]

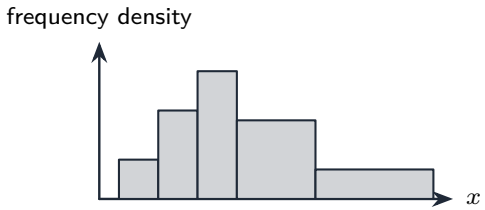
Time t (min)	$0 < t \leq 10$	$10 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 40$
Frequency	5	12	8	5



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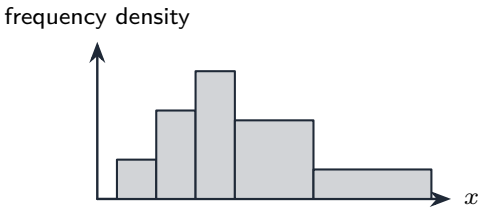
Exercise 3.2

3.5 The values 1, 2, 3 and 4 have frequencies 3, x, 5 and 2. The mean is 2.4. Work out x. [4]



Exercise 3.2

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3.2

- the smallest and largest values are not known, only their classes
- largest possible range $= 50 - 10 =$ **40** cm

3.3

- midpoints 15, 25, 35, 45: $\sum fx = 15\times6+25\times11+35\times8+45\times5 = 90+275+280+225 =$

Full solution on next slide

Full solution 3.2 (1/2)

3.2

- the smallest and largest values are not known, only their classes
- largest possible range $= 50 - 10 =$ **40** cm

3.3

- midpoints 15, 25, 35, 45: $\sum fx = 15{\times}6{+}25{\times}11{+}35{\times}8{+}45{\times}5 = 90{+}275{+}280{+}225 = 870$
- estimated mean $= \dfrac{870}{30} =$ **29** cm

3.4

Full solution 3.2 (2/2)

- midpoints 5, 15, 25, 35: $\sum fx = 25 + 180 + 200 + 175 = 580$
- estimated mean $= \dfrac{580}{30} =$ **19.3** minutes
- more than 25: about half of the 8 in $20 < t \leq 30$, plus all 5 in $30 < t \leq 40$
- $4 + 5 =$ **9** pupils

3.5

- $\sum f = 10 + x$ and $\sum fx = 3 + 2x + 15 + 8 = 26 + 2x$
- $\dfrac{26 + 2x}{10 + x} = 2.4$, so $26 + 2x = 24 + 2.4x$
- $2 = 0.4x$
- $\boldsymbol{x = 5}$