Your notes

GCSE Maths: revision notes

Averages and range

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Mean, median, mode and range

- **Mean** = total of the values ÷ number of values. **Median** = the middle value when the data is in order. **Mode** = the most common value. Range = largest – smallest.
- For 3, 5, 5, 8, 9: **mean** = 30 ÷ 5 = 6, **median** = 5, **mode** = 5 and range = 9 – 3 = 6.
- With an even number of values, the **median** is halfway between the two middle values: for 4, 7, 9, 12 it is 8.

Averages from frequency tables

- **Mean** = total of (value × **frequency**) ÷ total **frequency**.
- Goals 0, 1, 2 and 3 with frequencies 4, 7, 6 and 3: total goals = 0 + 7 + 12 + 9 = 28, so the **mean** is 28 ÷ 20 = 1.4.
- The **median** is the ((n + 1) ÷ 2)th value. For 20 values, it is halfway between the 10th and 11th values, which are both 1 here.

Grouped data

- Use the **midpoint** of each group to estimate the **mean**. The **modal class** is the group with the highest frequency.
- Times 0–10 (**frequency** 5), 10–20 (**frequency** 8) and 20–30 (**frequency** 7) minutes: estimated mean = (5 × 5 + 15 × 8 + 25 × 7) ÷ 20 = 320 ÷ 20 = 16 minutes.
- It is only an estimate, because you don't know the exact values in each group.

Choosing an average

- The **median** is better than the **mean** when there are extreme values (**outliers**). The mode is the only average for non-numerical data, such as favourite colours.

- The **range** measures spread: a smaller **range means** the data is more consistent.

Worked examples

A team's goals in 20 matches: 0 goals 4 times, 1 goal 6 times, 2 goals 7 times, 3 goals 3 times. Find the mean.

Multiply each number of goals by how often it happened. **0×4 = 0, 1×6 = 6, 2×7 = 14, 3×3 = 9**

Add them to get the total goals. **0 + 6 + 14 + 9 = 29**

Add the frequencies to get the number of matches. **4 + 6 + 7 + 3 = 20**

Divide the total by the number of matches. **29 ÷ 20 = 1.45**

Answer: Mean = 1.45 goals

Key terms

Mean	The total of the values divided by the number of values.
Median	The middle value when the data is in order.
Mode	The most common value.
Range	The largest value minus the smallest value.
Outlier	A value that is much bigger or smaller than the rest.
Frequency	How many times something happens.
Modal class	The group with the highest frequency.
Midpoint	The value halfway through a group, used to estimate the mean.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What is the mean of 3, 5, 5, 8, 9?
2. What is the median of 3, 5, 5, 8, 9?
3. What is the range of 3, 5, 5, 8, 9?
4. What is the median of 4, 7, 9, 12?
5. What is the mode of 2, 3, 3, 4, 4, 4, 5?
6. Which average is best when there is an extreme value?
7. Which average can be used for favourite colours?
8. Goals scored were 0, 1, 2 and 3, with frequencies 4, 7, 6 and 3. What is the mean number of goals?

Answers

1. 6
2. 5
3. 6

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4. 8
5. 4
6. The median
7. The mode
8. 1.4

What to do next

Practise 12 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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