Mean, median, mode and range

Each measure answers a different question about the same data.

Find the mean, median, mode and range of 4, 5, 5, 7, 9.

$\text{Mean} = \frac{4+5+5+7+9}{5} = 6$	Add the values, then divide by how many there are.
$\text{Median} = 5$	The ordered list has 5 values, so take the third.
$\text{Mode} = 5$	5 occurs most often.
$\text{Range} = 9 - 4 = 5$	Subtract the smallest value from the largest.

$6, \quad 5, \quad 5, \quad 5$

Find the median of 2, 4, 7, 9.

$\frac{4+7}{2} = \frac{11}{2}$	With an even number of values, average the two middle values.

5.5

Mean from a frequency table

Multiply each value by its frequency before adding.

Value x	1	2	3	Total
Frequency f	2	5	3	10
Product fx	2	10	9	21

Find the mean of the values in the table.

$\sum f = 10$	There are 10 observations, not 3.
$\sum fx = 21$	Add the products in the last row.
$\bar{x} = \frac{\sum fx}{\sum f} = \frac{21}{10}$	Divide the sum of products by the total frequency.

$\bar{x} = 2.1$

Grouped data

For an estimated mean from intervals, use each interval midpoint in place of x. The exact values inside the intervals are unknown.

Estimated mean from grouped data

Use the midpoint of each interval to represent its values.

Time (min)	Frequency	Midpoint	Product
0 to under 10	2	5	10
10 to under 20	3	15	45
20 to under 30	1	25	25

Estimate the mean time.

$\sum f = 2 + 3 + 1 = 6$	Count the observations.
$\sum fx = 10 + 45 + 25 = 80$	Add the midpoint × frequency products.
$\bar{x} \approx \frac{80}{6}$	Divide by the total frequency. It is an estimate because the actual times are unknown.

$\bar{x} \approx 13.3 \text{ min}$

Comparing centre and spread

Use the mean, median or mode for a typical value. Use the range for spread.

Compare A: 4, 5, 6 and B: 1, 5, 9.

$\text{Median of A} = \text{Median of B} = 5$	Both groups have the same middle value.
$\text{Range of A} = 6 - 4 = 2$	Subtract the smallest value from the largest.
$\text{Range of B} = 9 - 1 = 8$	The larger range means the values in B span a wider interval.

A is less spread out by range.

Watch out for extremes

A single unusually large value can raise the mean and the range. The median is usually less affected.

Averages and Spread

Try the questions before opening the separate answer key. Show one step per line.

25.1 · Fluency

Find the median, mode and range of 2, 6, 6, 9, 12.

25.2 · Variation

Values 2, 4 and 7 occur 3, 5 and 2 times respectively. Find the mean.

25.3 · Choose a method

Two classes both have median score 65. Their ranges are 20 and 44. What can you conclude and what can you not conclude?

Check your work: are the sign, units and level of accuracy appropriate?