Extension & Challenge — Averages & Data Investigations

Part A — Mean, Median, Mode & Range

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These four measures summarise a data set. The **mean** shares the total equally; the **median** is the middle value in order; the **mode** is the most common; the **range** is the highest minus the lowest.

> **Worked example.** Data: $2, 4, 4, 6$. Mean $= (2+4+4+6) \div 4 = 4$. Median (middle of $2, 4, 4, 6$) $= (4+4) \div 2 = 4$. Mode $= 4$. Range $= 6 - 2 = 4$.

1 For the data set $3, 7, 7, 8, 10$, find the mean, median, mode and range.

Mean: _____ Median: _____ Mode: _____ Range:

2 Five test scores are $12, 15, 15, 18, 20$. Find the mean, median, mode and range.

3 The mean of four numbers is 10. What is their total? A fifth number, 20, is added. What is the new mean?

4 **Find the missing value.** Four numbers have a mean of 9. Three of them are 7, 8 and 12. What is the fourth number?

5 **Reasoning.** A shoe shop wants to know which size to stock most of. Which average — mean, median or mode — is most useful here? Why?

6 **Open challenge.** Create a set of five whole numbers that has a mean of 6 and a mode of 4.

Part B — Investigating & Critiquing Data

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A statistical investigation follows a cycle: ask a question, collect data, display it, then interpret it. Good data detectives also spot when a graph has been drawn to **mislead**.

> Common tricks: a vertical axis that does not start at zero, uneven spacing, or a survey too small to be trusted. Always check the scale before believing a graph.

1 Write a **statistical question** you could investigate in your class (one with answers that will vary). What data would you collect to answer it?

2 Sort each into *categorical* (groups) or *numerical* (numbers) data: favourite colour, height in cm, type of pet, number of siblings.

3 **Spot the trick.** A column graph's vertical axis starts at 90 instead of 0, so a change from 92 to 96 looks enormous. Why is this misleading?

4 A survey asks only 5 people whether they like a new drink, and 4 say yes. Why might it be unwise to claim "80% of people like it"?

5 **Choose the display.** For each, name a sensible graph: (a) how a plant's height changes over 6 weeks; (b) favourite lunch of the class.

6 **Plan an investigation.** Choose a question from question 1 (or a new one) and outline: the data you would collect, how you would display it, and what conclusion you expect to draw.