



ANSWER BOOK

Measures of location and spread

Statistics · Year 12–13

7 questions · 20 marks

NAVY EDITION

SECTION A · Warm-up

- A1** Mean $40/5 = 8$; median 7, the middle of the ordered list; mode 7, the most frequent value. Three different answers from one small set: the measures genuinely measure different things. [2]
- A2** The mean is $450/25 = 18$. The variance is $8500/25 - 18^2 = 340 - 324 = 16$, so $\sigma = 4$. Mean of the squares minus square of the mean, in that order: reversing it gives a negative variance, which is the instant sign of the slip. [3]

SECTION B · Standard

- B1** The median position is $n/2 = 20$. The first class carries 8, so the 20th value sits 12 into the second class, which holds 14 across a width of 10: median $\approx 10 + (12/14) \times 10 = 18.6$. The check: 18.6 sits inside 10 to 20, as it must. [2]
- B2** Uncode in reverse: $x = 100 + 5y$, so the mean is $100 + 5 \times 4 = 120$ and the standard deviation is $5 \times 2 = 10$. The subtraction of 100 shifted the data but never stretched it, so only the factor of 5 reaches the spread. [3]
- B3** Adding 7 raises the mean by 7 and leaves the standard deviation alone: the whole set slides without changing shape. Multiplying by 3 triples both: stretching moves the centre and widens the spread in the same proportion. [3]

SECTION C · Stretch

- C1** The centres agree: both average 500 g. But machine A's bags cluster within a few grams of the target while machine B's stray far more, so A is much more consistent. Equal means say nothing about reliability; the spread carries that story. [3]
- C2** Deviations above and below the mean would cancel if simply added: their raw sum is always zero. Squaring makes every deviation count positively, and also weights large strays more heavily than small ones, which is why one wild value moves σ so much. [2]