Unit 15 · Measure of Dispersion

HARDER PRACTICE QUESTIONS

Full marks 28

Write your answers on separate paper. Show your working. Use σ, dividing by n, as NEB does.

1 One more value [6]

20 values have mean 50 and standard deviation 4.

a. A 21st value, 50, is added. Find the new standard deviation. [2]

b. The new value is exactly the mean, the most typical value there is. Explain why σ still changed. [1]

c. Find every value that could be added instead, as the 21st, so that the standard deviation stays exactly 4. [3]

2 A fixed charge and a rate [6]

In a ward, the monthly electricity use of households has mean 80 units, median 70 units and standard deviation 30 units. Each bill is Rs 150 (a fixed charge) plus Rs 10 a unit. (The figures are made up.)

a. Find the mean, the median and the standard deviation of the bills. [3]

b. Find the coefficient of variation of the units and of the bills. Why are they different? [2]

c. Compare Karl Pearson's coefficient of skewness (median form) for the units and for the bills. [1]

3 A table that counts up [6]

The daily earnings of 50 porters at a trekking town (in hundreds of rupees; made-up figures) were reported like this:

Earnings less than	10	20	30	40	50	60
Number of porters	4	12	27	40	46	50

The lowest class starts at 0.

a. Copy and complete a frequency table for the classes 0–10, 10–20, …, 50–60. [1]

b. Find the mean, the standard deviation and the mode. [3]

c. Find Karl Pearson's coefficient of skewness from the mode, and say what it shows. [2]

4 When the two coefficients disagree [6]

Ngima noted how many minutes seven buses left late from a bus park one morning (made-up figures): 2, 3, 3, 4, 10, 10, 10.

a. Find the mean, the median, the mode and the standard deviation. [2]

b. Find Karl Pearson's coefficient of skewness from the mode and from the median. [2]

c. One says the data are negatively skewed, the other positively. Explain why, and say which describes these data better. [2]

5 Make your own [4]

Use Karl Pearson's coefficient of skewness in its median form throughout.

a. Write five whole numbers, none of them negative, with mean 10 and median 8. Show that every such set, not only yours, is positively skewed. [1]

b. Show that the largest of the five must be at least 13, and find the greatest it can be. [2]

c. Write five whole numbers, none negative, with mean 10, that are negatively skewed. Explain why three of them must be more than 10. [1]