Unit 15 · Measure of Dispersion

WORKSHEET

Full marks 35

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 35

1 Key words [3]

Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

coefficient of variation	consistent	median	positively	quartile	range	skewness	variance

The square of the standard deviation is the _____. The standard deviation as a percentage of the mean is the _____; of two sets, the one with the smaller value is the more _____. Lack of symmetry in a distribution is called _____. A long tail of a few large values makes a distribution _____ skewed. When the mode is ill-defined, Karl Pearson's coefficient uses the _____ in its place.

2 True or false [3]

Write ✓ for a true statement and ✗ for a false one. Correct the false ones.

i. Adding the same number to every value does not change the standard deviation. ☐

ii. Multiplying every value by -2 multiplies the standard deviation by -2. ☐

iii. Of two sets, the one with the smaller standard deviation is always the more consistent. ☐

iv. In a symmetric distribution the mean, the median and the mode are equal. ☐

v. A distribution with mean 30 and mode 34 is positively skewed. ☐

vi. The coefficient of variation has no unit. ☐

3 Multiple choice [6]

Choose the correct option for each of the following questions.

i. The coefficient of variation is: [1]

a. $\frac{\sigma}{X} \times 100\%$ **b.** $\frac{\overline{X}}{\sigma} \times 100\%$

c. $\frac{\overline{X} - M_o}{\sigma}$ **d.** $\frac{\sigma^2}{X} \times 100\%$

ii. A set of values has $\sigma = 8$. Every value is halved and then 5 is subtracted. The new standard deviation is: [1]

a. 4 **b.** -1

c. 3 **d.** 16

iii. In a city, most families earn a modest income and a few earn very much more. The mean income is most likely: [1]

a. more than the median income
b. less than the median income
c. equal to the median income
d. equal to the modal income

iv. The standard deviation of a set is 0. Then: [1]

a. the mean is 0
b. all the values are equal
c. all the values are 0
d. the mean equals the median, but the values may differ

v. A set has mean 25 and coefficient of variation 20%. Its variance is: [1]

a. 25
b. 5
c. 125
d. 0.8

vi. Every student's marks in a test are increased by 10%. Which of these stays the same? [1]

a. the mean
b. the standard deviation
c. the variance
d. the coefficient of variation

4 Short answer [2]

Write a short answer to the following question.

The monthly rainfall at Pokhara has a standard deviation of about 334 mm, at Kathmandu about 130 mm; their coefficients of variation are 103.8% and 104.0%. Pragya says Pokhara's year is much more uneven. Is she right? Give a reason.

5 Short questions [10]

Answer the following questions. Show your working.

a. Pemba's and Rubina's tea shops sold these numbers of cups on six days (made-up data): [5]

Pemba	**48**	**52**	**50**	**54**	**46**	**50**
Rubina	30	52	24	60	36	38

Whose daily sales are more consistent? [5]

Answer:

b. The mean and standard deviation of 20 values were found to be 50 and 4. Later it was found that one value, 46, had been copied as 64. Find the correct mean and standard deviation. [5] **[5]**

Answer: _____

6 Long question **[8]**

Answer the following question. Show your working.

The marks of 60 students in an easy test (made-up data):

Marks	10–20	20–30	30–40	40–50	50–60	60–70
Students	2	6	8	12	20	12

a. Find the mean and the standard deviation. [3]
b. Find the coefficient of variation. [1]
c. Find the median and the mode. [2]
d. Find Karl Pearson's coefficient of skewness from the mode and from the median, and say what they show. [2]

Answer: _____

Science Playground, Katunje, Bhaktapur
https://science-playground.com/learn/grade-11-math/measure-of-dispersion

7 Think [3]

Diya measured the lowest temperature at Jumla each night in January (made-up figures): mean 0.5 °C, standard deviation 3 °C, so a coefficient of variation of 600%. She says Jumla's nights are far less steady than a town whose January nights have mean 8 °C and standard deviation 3 °C (C.V. 37.5%). Is the C.V. the right measure here? Explain, using the same Jumla figures in °F ($°F = 1.8 \times °C + 32$).

8 Activity: How long is a word? (not marked)

Choose a paragraph of about 30 words from any English book. Count the letters in each word and make a frequency table.

Letters in the word	1	2	3	4	5	6	7	8	9 or more
Number of words									

Find the mean, the median, the mode and σ, then Karl Pearson's coefficient of skewness. Which way is it skewed, and why?