Measures of Variability of Ungrouped Data

Measures of Dispersion or Variability refer to the spread of the values about the mean.

Ways of Measuring Variability

1. **Range:** the difference between the largest and smallest values in that dataset. It is the simplest measure of variability.

$$R = HV - LV$$

where R = the range, HV = the highest value, LV = the lowest value

2. **Mean Absolute Deviation (MAD):** the dispersion of a set of data about the average of these data

$$MAD = \frac{\sum |x - \overline{x}|}{N}$$

where MAD = the mean absolute deviation, x = the individual score, $\overline{x}$ = the mean, N = the number of scores

3. **Variance:** the average squared difference of the values from the mean.

$$\sigma^2 = \frac{\sum (x-\mu)^2}{N} \text{ or } s^2 = \frac{\sum (x-\overline{x})^2}{n}$$

where σ^2 = the population variance, s^2 = the sample variance, μ = the population mean, $\overline{x}$ = the sample mean, N = the number of scores in the population, n = the number of scores in the sample

4. **Standard Deviation:** the standard or typical difference between each data point and the mean. It is just the square root of the variance.

$$\sigma = \sqrt{\frac{\sum (x-\mu)^2}{N}} \text{ or } s = \sqrt{\frac{\sum (x-\overline{x})^2}{n}}$$

where σ = the population standard deviation, s = the sample standard deviation

Practice Exercises

Compute the four measures of variability for each set of numbers.

1. {12, 13, 14, 15, 16, 17, 18}
2. {7, 7, 8, 12, 14, 14, 14, 14, 15, 15}
3. {12, 12, 13, 13, 13, 13, 13, 15, 19, 20, 20}
4. {12, 13, 17, 22, 22, 23, 25, 26}
5. {23, 25, 27, 27, 32, 32, 36, 38}

Problem Set

Compute the four measures of variability of the following sets of data:

1. Science achievement test scores: 60, 75, 80, 85, 90, 95
2. The weights in kilogram of 10 students: 52, 55, 50, 55, 43, 45, 40, 48, 45, 47
3. The diameter (in cm) of balls: 12, 13, 15, 15, 15, 16, 18
4. Prices of books (in pesos): 85, 99, 99, 99, 105, 105, 120, 150, 200, 200
5. Cholesterol level of middle-aged persons: 147, 154, 172, 195, 195, 209, 218, 241, 283, 336

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