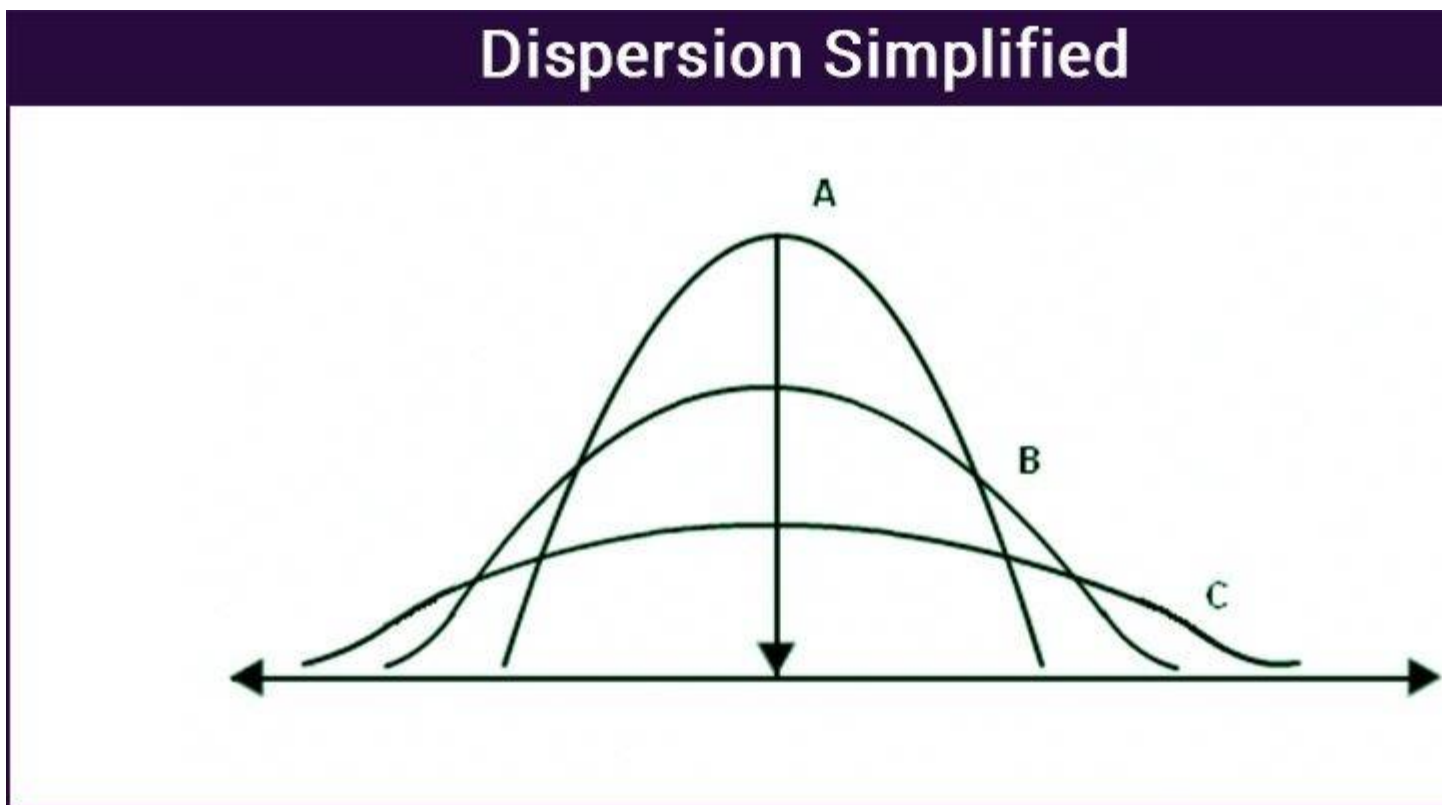## TOPIC NAME:

What is Dispersion in Statistics?

Dispersion is the state of getting dispersed or spread. Statistical dispersion means the extent to which a numerical data is likely to vary about an average value. In other words, dispersion helps to understand the distribution of the data.

Dispersion and Measures of Dispersion in Statistics

Measures of Dispersion

In statistics, the measures of dispersion help to interpret the variability of data i.e. to know how much homogenous or heterogenous the data is. In simple terms, it shows how squeezed or scattered the variable is.

Types of Measures of Dispersion

There are two main types of dispersion methods in statistics which are:

- Absolute Measure of Dispersion
- Relative Measure of Dispersion

Absolute Measure of Dispersion

An absolute measure of dispersion contains the same unit as the original data set. Absolute dispersion method expresses the variations in terms of the average of deviations of observations like standard or means deviations. It includes range, standard deviation, quartile deviation, etc.

The types of absolute measures of dispersion are:

1. **Range:** It is simply the difference between the maximum value and the minimum value given in a data set. Example: 1, 3,5, 6, 7 => Range = 7 -1= 6
2. **Variance:** Deduct the mean from each data in the set then squaring each of them and adding each square and finally dividing them by the total no of values in the data set is the variance. Variance $(\sigma^2)=\sum(X-\mu)^2/N$
3. **Standard Deviation:** The square root of the variance is known as the standard deviation i.e. S.D. = $\sqrt{\sigma}$.
4. **Quartiles and Quartile Deviation:** The quartiles are values that divide a list of numbers into quarters. The quartile deviation is half of the distance between the third and the first quartile.
5. **Mean and Mean Deviation:** The average of numbers is known as the mean and the arithmetic mean of the absolute deviations of the observations from a measure of central tendency is known as the mean deviation.

Also, read:

- Variance
- Quartiles
- Mean

Relative Measure of Dispersion:

The relative measures of depression are used to compare the distribution of two or more data sets. This measure compares values without units. Common relative dispersion methods include:

1. Coefficient of Range
2. Coefficient of Variation
3. Coefficient of Standard Deviation
4. Coefficient of Quartile Deviation
5. Coefficient of Mean Deviation

Coefficient of Dispersion

The coefficients of dispersion are calculated along with the measure of dispersion when two series are compared which differ widely in their averages. The dispersion coefficient is also used when two series with different measurement unit are compared. It is denoted as C.D.

The common coefficients of dispersion are:

C.D. In Terms of	Coefficient of dispersion
Range	C.D. $= (X_{max} - X_{min})/(X_{max} + X_{min})$
Quartile Deviation	C.D. $= (Q3 - Q1)/(Q3 + Q1)$
Standard Deviation (S.D.)	C.D. $=$ S.D./Mean
Mean Deviation	C.D. $=$ Mean deviation/Average

Measures of Dispersion Formulas

The most important formulas for the different dispersion methods are:

Arithmetic Mean Formula	Quartile Formula
Standard Deviation Formula	Variance Formula
Interquartile Range Formula	All Statistics Formulas

Example Question From Dispersion and Its Measures

A few example questions from statistical dispersion and its measures are given below which can will help to have a deeper understanding of the concepts.

Practice Questions From Dispersion

Find the Variance and Standard Deviation of the Following Numbers: 1, 3, 5, 5, 6, 7, 9, 10.

The mean = 46/ 8 = 5.75

Step 1: (1 − 5.75), (3 − 5.75), (5 − 5.75), (5 − 5.75), (6 − 5.75), (7 − 5.75), (9 − 5.75), (10 − 5.75)

= -4.75, -2.75, -0.75, -0.75, 0.25, 1.25, 3.25, 4.25

Step 2: Squaring the above values we get, 22.563, 7.563, 0.563, 0.563, 0.063, 1.563, 10.563, 18.063

Step 3: 22.563 + 7.563 + 0.563 + 0.563 + 0.063 + 1.563 + 10.563 + 18.063
= 61.504

Step 4: n = 8, therefore variance (σ^2) = 61.504/ 8 = 7.69 (3sf)

Now, Standard deviation (σ) = 2.77 (3sf)

Calculate the Variance of the Numbers 3, 8, 6, 10, 12, 9, 11, 10, 12, 7.

The variance of the following numbers will be 7.36.

Why Is Dispersion Important in Statistics?

The measures of dispersion are important as it helps in understanding how much a data is spread (i.e. its variation) around a central value.

How To Calculate Dispersion?

Dispersion can be calculated using various measures like mean, standard deviation, variance, etc.