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For B.Sc part I & II, paper III(A).

Q :- Write Notes on STANDARD ERROR  
OF STANDARD DEVIATION ?

Q :- Difference Between standard  
Deviation And standard Error :-

Introduction :-

Standard Deviation (SD) and standard Error (SE) are seemingly similar terminologies; however they are conceptually so varied that they are used almost interchangeably in statistics literature. Both terms are usually preceded by a plus-minus symbol (+/-) which is indicative of the fact that they define a symmetric value or represent a range of values. Invariably, both terms appear with an average (mean) of a set of measured values.

Interestingly, an SE has nothing to do with standards, within errors, or with the communication of scientific data.

A detailed look at the origin and the explanation of SD and SE will reveal, why professional statisticians and those who use it cursorily, both tend to over-

### Standard Deviation (SD)

A SD is a Descriptive statistic describing the spread of a distribution. As a metric, it is useful when the data are normally distributed. However, it is less useful when data are highly skewed or bimodal because it doesn't describe very well the shape of the distribution. Typically, we use SD we intend to describe how much the data varies around the mean. Other useful statistics for describing the spread of the data are inter-quartile range, the 25th and 75th percentiles, and the range of the data.

Variance is a descriptive statistic also, and it is defined as the square of the standard deviation. It is not usually reported when describing results.



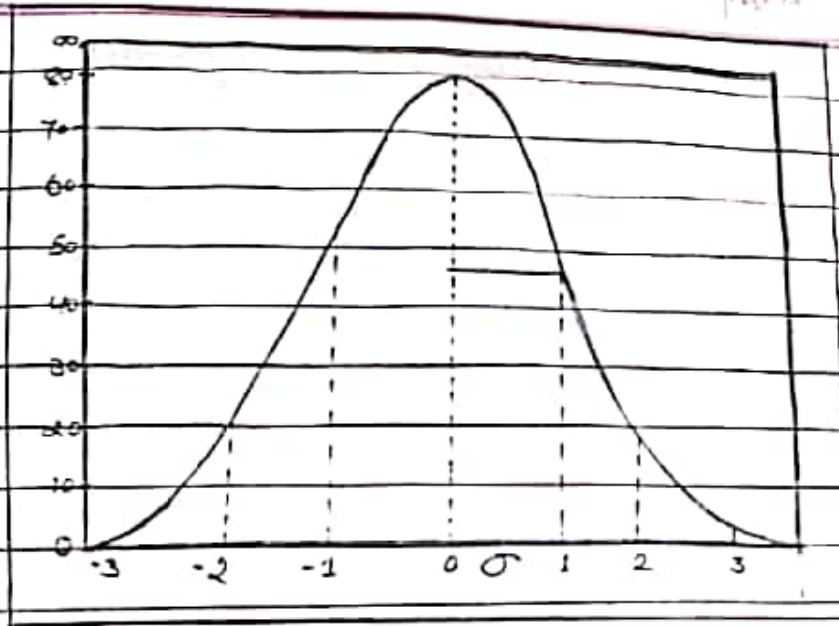


Figure 1. SD is a measure of the spread of the data. When data are a sample from a normally distributed distribution, then one expects two-thirds of the data to lie within 1 standard deviation of the mean.

- but it is a more mathematically tractable formula (i.e. the sum of squared deviations) and plays a role in the computation of statistics.

For example, if we have two statistics  $P$  &  $Q$  with known variances  $\text{var}(P)$  &  $\text{var}(Q)$ , then the variance of the sum  $P+Q$  is equal to the sum of the variances:  $\text{var}(P) + \text{var}(Q)$ .

## Standard Error

A standard error is an inferential statistic that is used when comparing sample means (averages) across populations. It is a measure of precision of the sample mean. Statistical theory tells us that the sample mean (for a large "enough" sample and under a few regularity conditions) is approximately normally distributed.

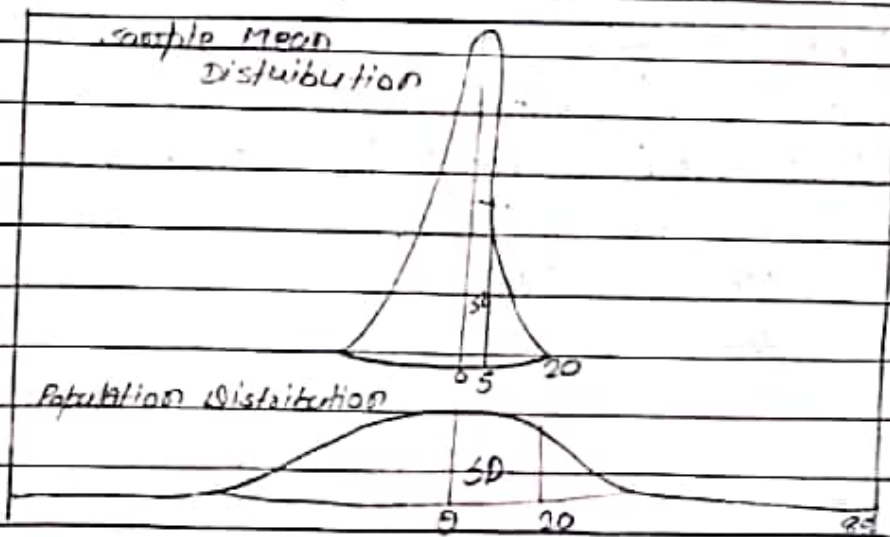


Figure 2. The distribution at the bottom represents the distribution of the data, whereas the distribution at the top is the theoretical distribution of the sample mean. The SD of 20 is a measure of the spread of the data, whereas the mean: