

T. D. C. Part - I

ZOOLOGY (Hons)

PAPER - II

TOPIC: STANDARD DEVIATION

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## STANDARD DEVIATION

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SATURDAY

8

APPOINTMENTS

KARL PEARSON (1893) introduced the concept of Standard deviation (S.D).

It is the most important measure of dispersion (variation) and is widely used in many statistical formula.

It is also called Root mean square deviation or mean error or mean square error.

It is represented by symbol S.D or  $S$  or  $\sigma$  (sigma).

### Definition:-

It is defined as "square root of the mean of the squares of the deviation of the actual observation from their arithmetic mean".

WORK TO DO

### Formula

$$S.D. = \sqrt{\frac{\sum (x - \bar{x})^2}{N}}$$

(I)

The above formula may be used when  $N$  is more than 30.

But in sample (where  $N$  is less than 30) the S.D. is calculated by the following formula

$$S.D. = \sqrt{\frac{\sum (x - \bar{x})^2}{N - 1}}$$

(II)

PHONES

Where, S.D = standard deviation. / Sigm ( $\sigma$ )

$\bar{x}$  = Arithmetic mean of all observation.

$\sqrt{\quad}$  = root square

9 SUNDAY

$x$  = individual observation

$(x - \bar{x})^2$  = squared deviation.

$N$  = number of observation.

$\Sigma$  = Sum of

Calculation of S.D.1) Individual Method :-Direct Method :-Formula :-

$$S.D. = \sqrt{\frac{\sum (x - \bar{x})^2}{N}} \text{ or } \sqrt{\frac{\sum (x - \bar{x})^2}{N-1}}$$

2) Calculation of S.D. :- Discrete Series

WORK TO DO

Direct Method (Actual mean Method)Formula :-

$$S.D. = \sqrt{\frac{\sum f(x - \bar{x})^2}{N}} \quad \text{--- (iii)}$$

Where  $\bar{x}$  = Mean $x$  = individual observation. $x - \bar{x}$  = Deviation of the various values from the mean. $(x - \bar{x})^2$  = squared deviationsPHONES  $\sum f$  = total frequencies $\sqrt{\quad}$  = root square $N$  = no. of items or  $\sum f$ .~~unpaired~~Example :- Find out the S.D. of the following observations. 60, 60, 61, 62, 63, 63, 63, 64, 64, 76.Solution By Method of individual observations

No. of observation	Individual observation (X)	Deviation (X - $\bar{X}$ ), $\bar{X} = 63$	Squared deviation (X - $\bar{X}$ ) <sup>2</sup>
1	60	-3	9
2	60	-3	9
3	61	-2	4
4	62	-1	1
5	63	+0	0
6	63	+0	0
7	63	+0	1
8	64	+1	1
9	64	+1	49
10	70	+7	

WORK TO DO

$$\sum X = 630$$

$$\bar{X} = \frac{\sum X}{N} = \frac{630}{10}$$

$$= 63$$

$$\sum (X - \bar{X})^2 = 74$$

$$\therefore S.D = \sqrt{\frac{\sum (X - \bar{X})^2}{N}}$$

$$= \sqrt{\frac{74}{10}} = \sqrt{7.4} =$$

2.72