



MEASURES OF DISPERSION

STANDARD DEVIATION

- Most important & widely used measure of dispersion
- First used by Karl Pearson in 1893
- Also called root mean square deviations
- It is defined as the square root of the arithmetic mean of the squares of the deviation of the values taken from the mean
- Denoted by σ (sigma)
- $\sigma = \sqrt{\frac{\Sigma(X - \bar{X})^2}{N}}$ or $\sqrt{\frac{\Sigma x^2}{N}}$ where $x = X - \bar{X}$
- Coefficient of S.D. = $\frac{\sigma}{\bar{X}}$



CALCULATION OF STANDARD DEVIATION

Individual Series

- Actual Mean Method
- Assumed Mean Method
- Method based on Actual Data

Discrete Series

- Actual Mean Method
- Assumed Mean Method
- Step Deviation Method

Continuous Series

- Actual Mean Method
- Assumed Mean Method
- Step Deviation Method

STANDARD DEVIATION – INDIVIDUAL SERIES ACTUAL MEAN METHOD

○ $\sigma = \sqrt{\frac{\Sigma(X - \bar{X})^2}{N}}$ or $\sqrt{\frac{\Sigma x^2}{N}}$ where $x = X - \bar{X}$

Q1: Calculate the SD of the following data:

16, 20, 18, 19, 20, 20, 28, 17, 22, 20

Ans: 3.13



STANDARD DEVIATION – INDIVIDUAL SERIES ASSUMED MEAN / SHORTCUT METHOD

○ $\sigma = \sqrt{\frac{\Sigma d^2}{N} - \left(\frac{\Sigma d}{N}\right)^2}$ where $d = X - A$

Q2: Calculate the SD of the following data:

7, 10, 12, 13, 15, 20, 21, 28, 29, 35

Ans: 8.76



STANDARD DEVIATION – INDIVIDUAL SERIES METHOD BASED ON USE OF ACTUAL DATA

$$\sigma = \sqrt{\frac{\Sigma X^2}{N} - \left(\frac{\Sigma X}{N}\right)^2}$$

Q3: Calculate the SD of the following data:

16, 20, 18, 19, 20, 20, 28, 17, 22, 20

Ans: 3.13



STANDARD DEVIATION – DISCRETE SERIES ACTUAL MEAN METHOD

○ $\sigma = \sqrt{\frac{\Sigma f(X - \bar{X})^2}{N}}$ or $\sqrt{\frac{\Sigma fx^2}{N}}$ where $x = X - \bar{X}$

Q4: Calculate the SD of the following data:

X:	3	4	5	6	7	8	9
F:	7	8	10	12	4	3	2

Ans: 1.602



STANDARD DEVIATION – DISCRETE SERIES ASSUMED MEAN / SHORTCUT METHOD

○ $\sigma = \sqrt{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2}$ where $d = X - A$

Q5: Calculate the SD of the following data:

X:	3	4	5	6	7	8	9
F:	7	8	10	12	4	3	2

Ans: 1.602



STANDARD DEVIATION – DISCRETE SERIES STEP DEVIATION METHOD

○ $\sigma = \sqrt{\frac{\sum fd'^2}{N} - \left(\frac{\sum fd'}{N}\right)^2} \times i$ where $d' = \frac{X-A}{i}$

Q6: Calculate the SD of the following data:

X	10	20	30	40	50	60	70
F:	3	5	7	9	8	5	3

Ans: 16.5



STANDARD DEVIATION – CONTINUOUS SERIES STEP DEVIATION METHOD

○ $\sigma = \sqrt{\frac{\sum fd'^2}{N} - \left(\frac{\sum fd'}{N}\right)^2} \times i$ where $d' = \frac{X-A}{i}$

Q7: Calculate the Mean & SD of the following data:

X	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
F:	5	10	20	40	30	20	10	4

Ans: 39.38, 15.69

