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CORE CONCEPT OF

BUSINESS MATHMATICS & STATISTICS

1. What is the standard deviation?
2. Briefly illustrate the standard deviation for individual series?
3. What is the standard deviation for grouped data?
4. Illustrate the small sigma σ.

STANDARD DEVIATION

Standard Deviation [S.D.] $\bar{x}$

The standard deviation is the most widely used measure of dispersion, since it is directly related to the mean. If you chose the mean as the most appropriate measure of central location, then the standard deviation would be the natural choice for a measure of dispersion. The standard deviation measures the differences from the mean; a larger value indicates large variation. **Standard deviation is denoted by small sigma σ**. The standard deviation is in the same units as the actual observations.

To calculate the standard deviation **for ungrouped (individual series) data**, we follow the following steps.

1) Find Assume mean (A) ***[select A as a minimum value(data) from the given data]***
2) Taking Deviation(d_x) from X (x-A) Then totaled up as **Σ**dx
3) Squares the deviations (d_x^2) Then totaled up as **Σ**d_x^2
4) Formula is—

$$S.D = \sqrt{\frac{\Sigma dx2}{N} - \left(\frac{\Sigma dx}{N}\right)^2}$$

Example 11:

From the following sample of 9 observations, find the standard deviation: 68, 49, 32, 21, 55, 39, 60, 65 and 40.

Solution- 11:

X	dx(x-A)	$(dx)^2$
68	47	2209
49	28	784
32	11	121
21	0	0
55	34	1156
39	18	324
60	39	1521
65	44	1936
40	19	361
	240	8412

$$\sigma = \sqrt{\frac{\Sigma dx2}{N} - \left(\frac{\Sigma dx}{N}\right)^2}$$

$$\sigma = \sqrt{\frac{8412}{9} - \left(\frac{240}{9}\right)^2}$$

$$\sigma = \sqrt{934.67 - (26.67)^2}$$

$$\sigma = \sqrt{934.67 - 711.29}$$

$$\sigma = \sqrt{223.38}$$

$$\sigma = \mathbf{14.95}$$

Standard Deviation (For grouped data) - Steps are--

1) Find Assume mean (A) ***[select any value as A from the given data]***
2) Taking Deviation(d_x) from X (x-A) and Multiplied by respective frequency, then sum up as **Σ**fdx
3) Such multiplications (fd_x) are again multiplied by deviations (d_x) and (fd_x^2) is obtained. These products are totaled to get **Σ**fd_x^2
4) Formula is—

$$S.D=\sqrt{\frac{\Sigma f dx2}{N}-\left(\frac{\Sigma fdx}{N}\right)^2}$$

Example 12- Calculate S.D. from the following data.

x	32-40	40-48	48-56	56-64	64-72	72-80
f	12	9	16	8	10	15

Solution- 12: A=52

C.I.	f	x	dx(x-A)	fdx	(fdx)2
32-40	12	36	-16	-192	256
40-48	9	44	-8	-72	64
48-56	16	52	0	0	0
56-64	8	60	8	64	64
64-72	10	68	16	160	256
72-80	15	76	24	360	576
	70			320	1216

$$S.D=\sqrt{\frac{\Sigma f dx2}{N}-\left(\frac{\Sigma fdx}{N}\right)^2} \qquad \bar{x}=A+\left(\frac{\Sigma fdx}{N}\right)2$$

$$S.D=\sqrt{\frac{1216}{70}-\left(\frac{320}{70}\right)^2}$$

$$S.D=\sqrt{17.37-(4.57)^2}$$

$$S.D=\sqrt{17.37-20.88}$$

$$S.D=\sqrt{3.51}$$

S.D= 1.873 Ans