(Variance)

Variance:-

The sum of square of deviations of the observation from mean divided by no of observation is called variance.

FORMULA:-

$$S^2 = \frac{\Sigma(x - \bar{x})^2}{n}$$

$$S^2 = \frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2 \quad \text{formula استعمال کریں گے}$$

ہم اکثر یہ

STANDARD DEVIATION:-

The positive square root of variance is called standard deviation $S = \sqrt{S^2}$

$$S = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}}$$

$$S = \sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2}$$

COFFICIENT OF Variation:- (C.V)

The standard deviation as a percentage of mean is called cofficient of variation.

$$C.V = \frac{S}{\bar{X}} \times 100\%$$

NOTE :-

1 :- A data which smaller cofficient of variation has more consitency or less variablity.

2 :- A data with greter coV has less consistency or more variability.

QUESTION NO1

$$X = 45, 32, 37, 46, 39, 36, 41, 48, 36$$

Variance = ?

$$S^2 = \frac{\Sigma X^2}{n} - \left(\frac{\Sigma X}{n}\right)^2$$

X	X^2
45	2025
32	1024
37	1369
46	2116
39	1521
36	1296
41	1681
48	2304
36	1296
$\Sigma X = 360$	$\Sigma X^2 = 14632$

$$S^2 = \frac{14632}{9} - \left(\frac{360}{9}\right)^2$$

$$S^2 = 1625.7 - \{1600\}$$

$$\boxed{S^2 = 25.7}$$

Standard deviation ?

$$S = \sqrt{S^2}$$

$$S = \sqrt{25.78}$$

$$\boxed{S = 5.08}$$

③ ✦ (Coffecient of variation) ✦

$$C.V = \frac{S}{\overline{X}} \times 100 \%$$

$$C.V = \frac{5.08}{40} \times 100$$

$$\boxed{C.V = 12.7}$$

$$\overline{X} = \frac{\Sigma x}{n}$$

$$\overline{X} = \frac{360}{9} = 40$$

QUESTION - 02

$$X = 58, 49, 76, 80, 47, 72, 61, 59$$
$$77, 48$$

$$S^2 = \frac{\Sigma X^2}{n} - \left(\frac{\Sigma X}{n}\right)^2$$

$$= \frac{40769}{10} - \left(\frac{627}{10}\right)^2$$

$$= 4076.9 - (62.7)^2$$

$$= 4076.9 - 3931.29$$

Find Variance :-

X	X^2
58	3364
49	2401
76	5776
80	6400
47	2209
72	5184
61	3721
59	3481
77	5929
48	2304

$= 4076.9 - 3931.29$

$= 145.61$

$$\boxed{S^2 = 145.61}$$

$\Sigma X = 687$ $\Sigma X^2 = 40769$

2- SANDARD DEVIATI N

$S_x = \sqrt{S^2}$

$S_x = \sqrt{(145.61)}$

$$\boxed{S_x = 12.07}$$

③ COFFICIENT OF VERIATION :-

$C.V \; SD = \dfrac{S}{\bar{X}} \times 100\%$

$C.V = \dfrac{12.07 \times 100}{62.7}$

$= \dfrac{1207}{62.7}$

$C.V = 19.25$

$$\boxed{C.V = 19.25}$$

$\bar{X} = \dfrac{\Sigma X_i}{n}$

$= \dfrac{687}{70}$

$\bar{X} = \dfrac{687}{10}$

$$\boxed{\bar{X} = 62.7}$$

Find out value of Y

$$Y = 39, 38, 86, 72, 75, 69, 57, 49$$
$$83, 66$$

Find Variance :-

Y	Y^2
39	1521
38	1444
86	7396
72	5184
75	5625
69	4761
57	3249
49	2401
83	6889
66	4356
$\Sigma Y = 634$	$\Sigma Y^2 = 42826$

$$S^2 = \frac{\Sigma Y^2}{n} - \left(\frac{\Sigma Y}{n}\right)^2$$

$$S^2 = \frac{42826}{10} - \left(\frac{634}{10}\right)^2$$

$$= 4282.6 - (63.4)^2$$

$$= 4282.6 - 4019.56$$

$$= 263.04$$

$$\boxed{S_Y^2 = 263.04}$$

2- STANDARD DEVIATION :-

$$S = \sqrt{S^2}$$

$$S = \sqrt{263.04}$$

$$S = 16.22$$

$$\boxed{S = 16.22}$$

3- COFFICIENT OF VARIATION :-

$$C.V = \frac{S}{\bar{x}} \times 100\%$$

$$C.V = \frac{16.22}{63.4} \times 100$$

$$\boxed{C.V = 25.58}$$

$$\bar{Y} = \frac{\Sigma Y}{n}$$

$$\bar{x} = \frac{634}{10} = 63.4$$

$$\boxed{Y = 63.4}$$

(QUESTION #04)

$$X = 81, 94, 64, 80, 75, 79$$

Variance:-

X	X^2
81	6561
94	8836
64	4096
80	6400
75	5625
79	6241
$\Sigma X = 473$	$\Sigma X^2 = 37759$
	37759

$$S^2 = \frac{\Sigma X^2}{n} - \left(\frac{\Sigma X}{n}\right)^2$$

$$S^2 = \frac{37759}{6} - \left(\frac{473}{6}\right)^2$$

$$= \frac{37759}{6} - \frac{223729}{36}$$

$$= \frac{226554 - 223729}{36}$$

$$\Rightarrow \frac{2825}{36} \Rightarrow \boxed{78.47}$$

STANDARD DEVIATION:-

$$\sqrt{S^2} = \sqrt{\frac{\Sigma X^2}{n} - \left(\frac{\Sigma X}{n}\right)^2} \qquad \Rightarrow \qquad S = \sqrt{S^2}$$

$$S = \sqrt{78.47}$$

$$\boxed{S = 8.858}$$

COFFICIENT OF Variation :-

$$C.V = \frac{S}{\bar{X}} \times 100\%$$

$$C.V = \frac{8.858}{78.83} \times 100\%$$

$$\boxed{C.V = 11.2.37}$$

$$\bar{X} = \frac{\Sigma X}{n}$$

$$\bar{X} = \frac{473}{6}$$

$$\bar{X} = 78.83$$