Basic Mathematics_22103_CO5_UO5.3

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STATISTICS

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Variance, Coefficient of Variance

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Learning Objective/ Key learning

- Determine the variance and coefficient of variance of given grouped and ungrouped data and justify the consistency of given simple sets of data.

Contents

Key takeaways

Variance

Coefficient of variance

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Concept Explanation

- **Variance**

The square of a standard deviation is called the variance.

Variance = $(S.D.)^2 = \sigma^2$

Coefficient of variance = $\frac{\sigma}{\bar{x}} \times 100$

Example:

Find variance and coefficient of variance of the following data:

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	14	23	27	21	15

Solution:

C.I.	f_i	x_i	$f_i x_i$	$d_i = \lvert x_i - \bar{x} \rvert$	d_i^2	$f_i d_i^2$
0-10	14	5	70	20	400	5600
10-20	23	15	345	10	100	2300
20-30	27	25	675	0	0	0
30-40	21	35	735	10	100	2100
40-50	15	45	675	20	400	6000
	$\sum f_i = 100$		$\sum f_i x_i = 2500$			$\sum f_i d_i^2 = 16000$

$$\text{Mean} = \bar{x} = \frac{\sum f_i x_i}{N} = \frac{2500}{100} = 25$$

$$\text{S.D.} = \sigma = \sqrt{\frac{\sum f_i d_i^2}{N}} = \sqrt{\frac{16000}{100}}$$

$$= 12.649$$

$$\text{Variance} = \sigma^2 = (12.649)^2$$

$$= 159.997$$

$$\text{Coefficient of variance} = \frac{\sigma}{\bar{x}} \times 100$$

$$= \frac{12.649}{25} \times 100$$

$$= 50.596$$

Example:

- The mean and S.D. of runs scored by two batsman in 10 innings are

Batsman	Mean	S.D.
A	50	15
B	12	2

Which batsman is more consistent?

Let v_1 and v_2 be coefficient of variations for Batsman A and B

$$v_1 = \frac{\sigma}{\bar{x}} \times 100$$

$$= \frac{15}{50} \times 100$$

$$= 30$$

$$v_2 = \frac{2}{12} \times 100$$

$$= 16.67$$

$\therefore v_1 > v_2$

$\therefore$ Batsman B is more consistent.

Application of concept

- Coefficient of variance is used in engineering for quality control. It is also used in biochemistry, medical physics, biology, psychology, pathology, social sciences etc.

Quiz

- Q 1. If S.D.= 7.01 then variance =?
- a) 49.1401 b)50.5 c) 64.12 d) 36.04

- Q 2. v_1 and v_2 are coefficients of variations for Set I and Set II. $v_1 = 10.25$ and $v_2 = 12.5$ which set is more consistent?
- a) set I b) set II c) both I and II d) None

- Ans: 1) a 2) a