

**Section (2.5) :**  
**Descriptive Statistics**  
**Measures of Dispersion**  
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key words:

Descriptive Statistic, measure of dispersion , range ,variance, coefficient of variation.

## 2.5. Descriptive Statistics – Measures of Dispersion:

- A measure of dispersion conveys information regarding the amount of variability present in a set of data.
- Note:
  1. If all the values are the same
    - There is no dispersion .
  2. If all the values are different
    - There is a dispersion:
  3. If the values close to each other
    - The amount of Dispersion small.
  - b) If the values are widely scattered
    - The Dispersion is greater.

# Ex. Figure 2.5.1 –Page 43

- \*\* Measures of Dispersion are :
  1. Range (R).
  2. Variance.
  3. Standard deviation.
  4. Coefficient of variation (C.V).

# 1.The Range (R):

- Range = Largest value- Smallest value =

$$x_L - x_S$$

- Note:
- Range concern only onto two values
- Example 2.5.1 Page 40:
- Refer to Ex 2.4.2. Page 37
- Data:
- 43,66,61,64,65,38,59,57,57,50.
- Find Range?
- Range=66-38=28

## 2.The Variance:

- It measure dispersion relative to the scatter of the values a bout there mean.

### a) Sample Variance ( $S^2$ ) :

- $S^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}$  ,where  $\bar{x}$  is sample mean

- Example 2.5.2 Page 40:

- Refer to Ex 2.4.2.Page 37

- Find Sample Variance of ages ,  $\bar{x} = 56$

- Solution:

- $S^2 = [(43-56)^2 + (66-56)^2 + \dots + (50-56)^2] / 10$
- $= 900/10 = 90$

- **b)Population Variance ( $\sigma^2$ ) :**

- $\sigma^2 = \frac{\sum_{i=1}^N (x_i - \mu)^2}{N}$  where  $\mu$  is Population mean

### **3.The Standard Deviation:**

- is the square root of variance= $\sqrt{\text{Variance}}$

a) Sample Standard Deviation =  $S = \sqrt{S^2}$

b) Population Standard Deviation =  $\sigma = \sqrt{\sigma^2}$

## 4.The Coefficient of Variation (C.V):

- Is a measure use to compare the dispersion in two sets of data which is independent of the unit of the measurement .
- $C.V = \frac{S}{\bar{X}} (100)$  where S: Sample standard deviation.
- $\bar{X}$  : Sample mean.

## Example 2.5.3 Page 46:

- Suppose two samples of human males yield the following data:

	Sampe1	Sample2
Age	25-year-olds	11year-olds
Mean weight	145 pound	80 pound
Standard deviation	10 pound	10 pound

- We wish to know which is more variable.
- **Solution:**
- $c.v \text{ (Sample1)} = (10/145) * 100 = 6.9$
- $c.v \text{ (Sample2)} = (10/80) * 100 = 12.5$
- Then age of 11-years old(sample2) is more variation

# Exercises

- Pages : 52 – 53
- Questions: 2.5.1 , 2.5.2 ,2.5.3
- H.W.: 2.5.4 , 2.5.5, 2.5.6, 2.5.14
- \* Also you can solve in the review questions page 57:
- Q: 12,13,14,15,16, 19