# ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

**STUDY MATERIAL-10**

**SUBJECT – STATISTICS**

**1st term**

**Chapter: DISPERSION** **Class: XI**

**Topic: Range** **Date: 10.08.2020**

# DISPERSION

# PART 1

## Definition:

The degree of discrepancy or scatterness of a set of observations from its central value is known as dispersion.

So less be the dispersion better is the central value.

**Measures of Dispersion**:

- **Absolute measures**:

1. Range

2. Mean deviation

3. Mean square deviation

- **Relative measures:**

1. Coefficient of mean deviation

2. Coefficient of quartile deviation

3. Coefficient of variation

## RANGE

It is the diference of the minimum observation from the maximum observation. It is denoted by R.

For ungrouped grouped data

Observations: $x_1 , x_2 , \ldots \ldots \ldots \ldots . , x_n$

$R_x = x_{(n)} - x_{(1)}$

For grouped data

Observations: $x_1$ , $x_2$ , … … … … . , $x_n$

Frequency: $f_1$ , $f_2$ , … … . … … . , $f_n$

$R_x = x_{(n)} - x_{(1)}$

**Properties:**

- Change of base or origin and scale

If $y_i = a + b\ x_i\ \forall\ i = 1(1)n$

Then, $R_y = |b|\ R_x$

Proof:

Case1: b is positive, ie, b> 0

$y_{(n)} = a + b.x_{(n)}$……………(*)

$y_{(1)} = a + b.x_{(1)}$……………(**)

Subtracting (**) from (*), we get

$R_y = b.R_x$

Case2: b is negative, ie, b< 0

$y_{(n)} = a + b.x_{(1)}$……………(*)

$y_{(1)} = a + b.x_{(n)}$……………(**)

Subtracting (**) from (*), we get

$R_y = -b.R_x$

Combining case 1 and case 2, we get

$R_y = |b|\, R_x.$

- If all the observations are equal to a constant, the range becomes equal to zero.

If $x_i = k(constant)\ \forall\ i = 1(1)n,$

Then $R_x = 0$

Proof:

$R_x = x_{(n)} - x_{(1)}$

$= k - k = 0$

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