- Measures of dispersion or variation

The dispersion or a variation is that divergence or convergence between the observations values of the variable. The dispersion is that clearly gives idea the difference us and homogeneity or variance for these observations about the centers .Whenever the dispersion is a large indicates that the heterogeneity between observations and whenever the dispersion is small so that indicates a few differences between observations values .**There are several most important of measures of dispersion are :**

First : Absolute dispersion measures : which are the units has the same units of the original values and it is the most important measures :

1. The range.

2 .The mean deviation.

3. The variance and the standard deviation.

Second: The relative dispersion measures: which are not have units of measurement, the most important is coefficient of variation (C.V) .

First. The absolute dispersion measures :

1.The range: is the difference between the highest value and the lowest value in the group and is symbolized by (R) . R = y_{max} - y_{min} .

It is noted that sometimes the range was be misleading because it is depend on the terminals values after it put these values on ascending or descending that are often abnormal values. It is difficult to calculate the true range of the distribution histogram because not known the two terminals values .

Example 1: Find the Range for each of the following groups:

(A). y_i = 12, 6, 7, 3, 15, 10, 18, 5.

(B). y_i = 9, 3, 8, 8, 9, 8, 9, 10 .

Solution:

(A). $R = y_{max} - y_{min}$.

$R = 18 - 3 = 15$.

(B). $R = 10 - 3 = 7$.

2.The mean deviation: is the average of the absolute deviations (neglecting the signal) from the arithmetic mean and has the symbol is M.D.

$$M.D = \sum | y_i - \bar{y} | /n .$$

(A): The data is unclassified:

Example (1): find the mean deviation of the following : y_i =9 , 8 , 6 , 5 , 7.

Solution :

y_i	$y_i - \bar{y}$	$\lvert y_i - \bar{y} \rvert$
9	**2**	**2**
8	**1**	**1**
6	**-1**	**1**
5	**-2**	**2**
7	**0**	**0**
$\sum yi = 35$ $\bar{y} = 7$.	**0**	**6**

$\bar{Y} = \sum y_i / n$.

$\bar{Y} = (9 + 8 + 6 + 5 + 7) / 5 =$

$\bar{Y} = 35/5 = 7$.

$\bar{Y} = 7$.

M.D = $\sum \lvert y_i - \bar{y} \rvert / n =$

M.D = $\lvert 6 \rvert / 7 =$

M.D = 1.2 .

B: classified data: the observations values are y_1, y_2, y_3 ...... y_n are representing categories centers in the frequency distribution table with replicates are f_1, f_2, f_3, ... f_n, the mean deviation of these observations is

M.D = $\sum f_i \lvert y_i - \bar{y} \rvert / f_i$.

Example (2):find the mean deviation of the data in table faction .

Solution :

Factions	f_i	y_i	$y_i - \bar{y}$	$\mid y_i - \bar{y} \mid$	$f_i \mid y_i - \bar{y} \mid$
60 – 62	5	61	- 6.45	6.45	32.25
63 - 65	18	64	- 3.45	3.45	62.10
66 - 68	42	67	- 0.45	0.45	18.90
69 - 71	27	70	2.55	2.55	68.85
72 - 74	8	73	5.55	5.55	44.40
Total	100	335	0		226.50

$\bar{y} = \sum f_i y_i / \sum f_i$.

$\bar{y} = (5 \times 61 + 18 \times 64 + 42 \times 67 + 27 \times 70 + 8 \times 73) / 100$

$\bar{y} = 6745 / 100 =$

$\bar{y} = 67.45$.

M.D = $\sum f_i \mid y_i - \bar{y} \mid / f_i$

M.D = 226.50/100

M.D = 2.265 .