**Measurement of Dispersion**

In the earlier chapter we studied that two or more sets of data may have the same averages, but their individual observations are different from the mean/average value. It means that mean values are not fully explains the status of observation. This problem is called dispersion. So we need more additional techniques/information .this problem is solved by measuring of dispersion it can be defined as

“The quantity that measure this characteristics is called measurement of dispersion”

Measurement of dispersion is calculated when:

* In the same units is the observation.
* Independent of origin
* Multiplied or divided by constant
* Measurement of dispersion will be zero when all observation are same.

**Types of Dispersion:**

There are two types of dispersion.

1. Absolute measure of dispersion
2. Relative measure of dispersion.
3. **Absolute measure of dispersion:**

Absolute measure of dispersion is that type of dispersion which is calculated in terms of units or in the square of units are the units of the data.

Examples: Rupees, Kg, km etc.

1. **Relative Measure of dispersion:**

Relative measure of dispersion which is calculated in terms of ratio, co-efficient, percentage etc.

It is independent form the units, it is very useful for the comparison of data of different nature.

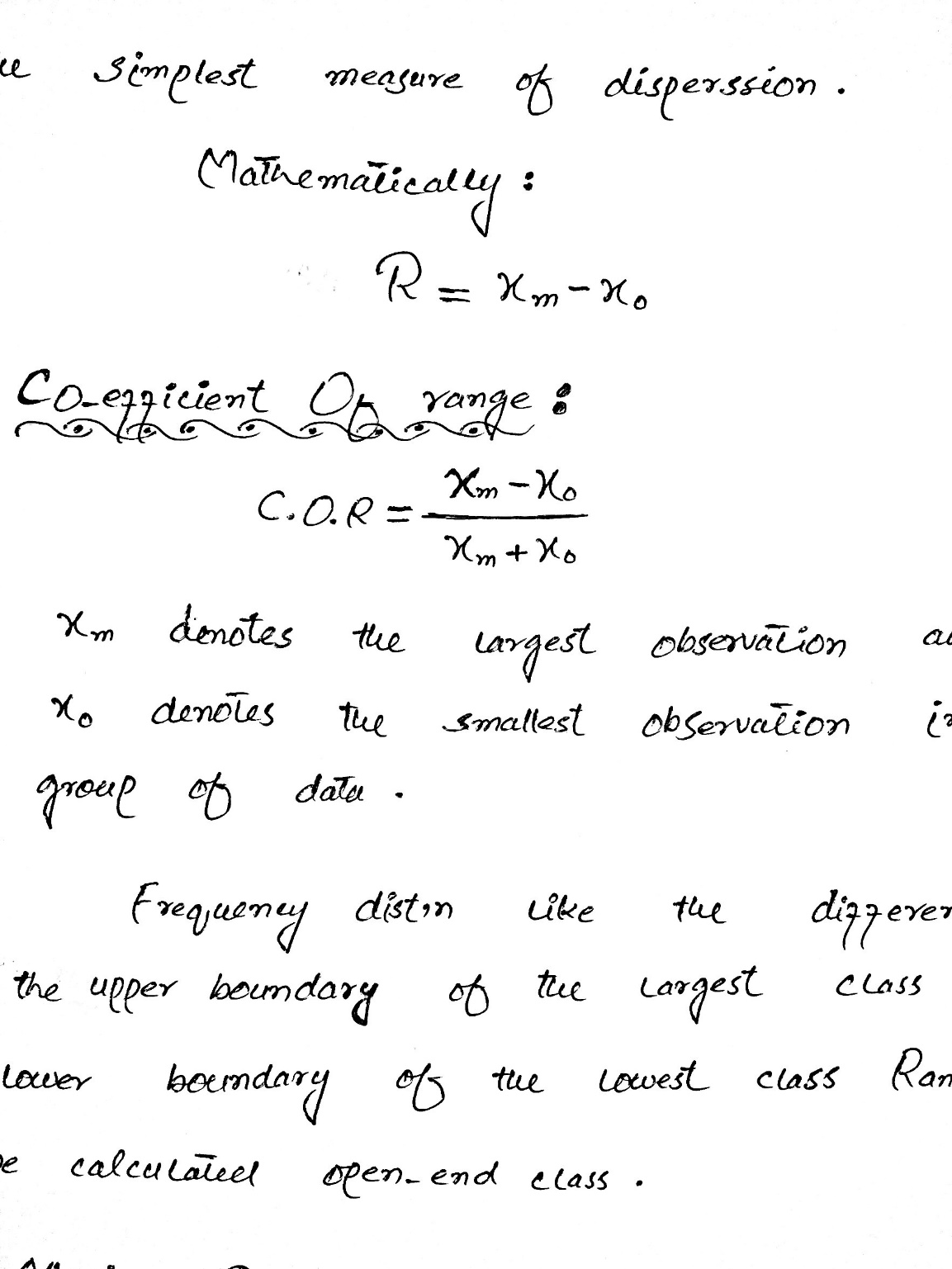
The main measure of dispersion is the following,

**The Range:**

The range is denoted by R and is define as “the difference between the largest and the smallest values in the data. It is the simplest measure of dispersion.

Mathematically:

R = Xm - Xo

**Co-efficient of Range:**

Xm denotes the largest observation and Xo denotes the smallest observation in a group of data.

Frequency distance b=like the difference between the upper boundary of the largest class and lower boundary of the lowest class range cannot be calculated open-ends class.

**Merits of Range:**

1. Range is simple to understand.
2. It is very easily calculated.
3. It is useful for daily temperature.
4. It is very helpful in the stock exchange.

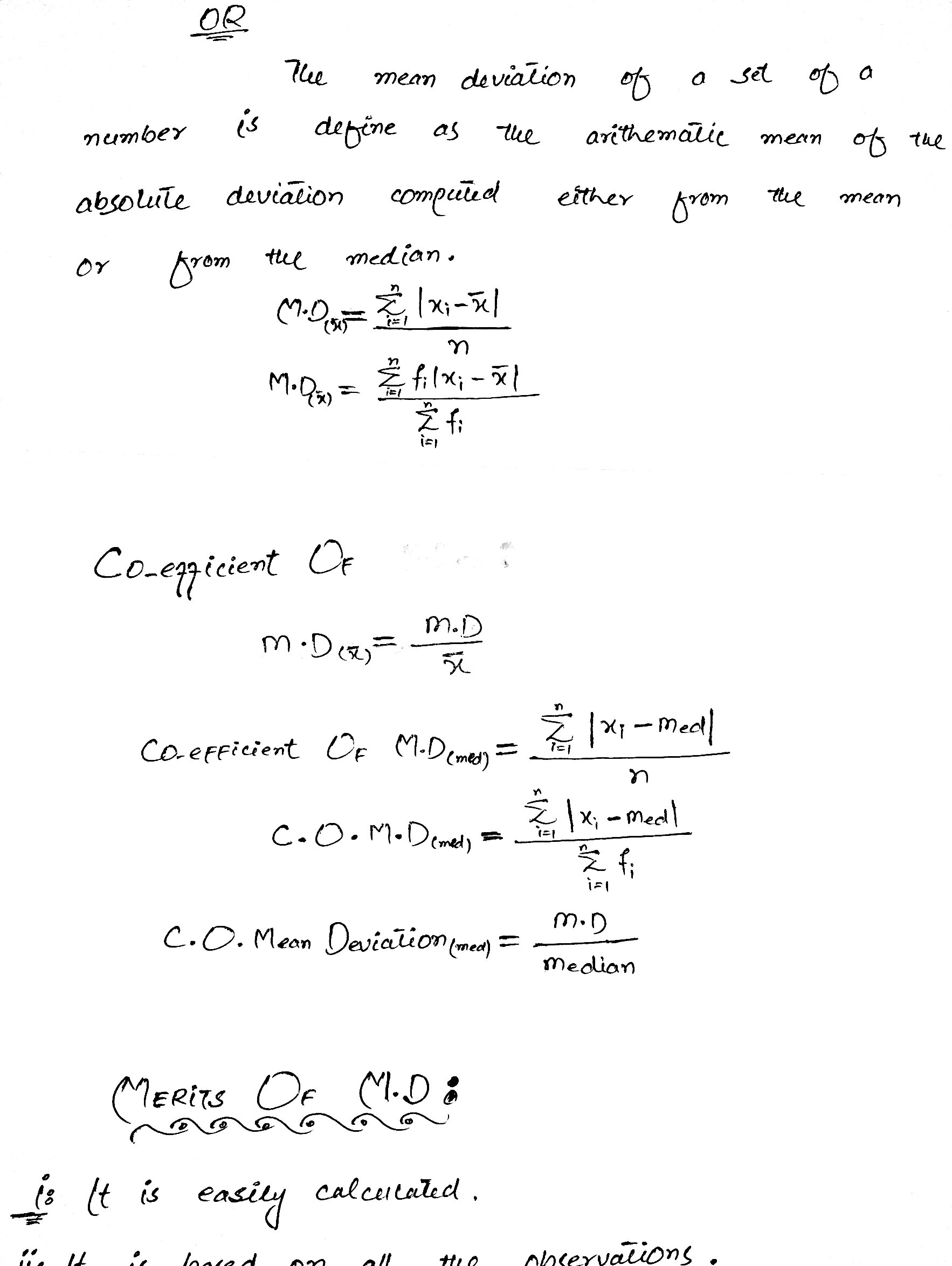
**Demerits of Range:**

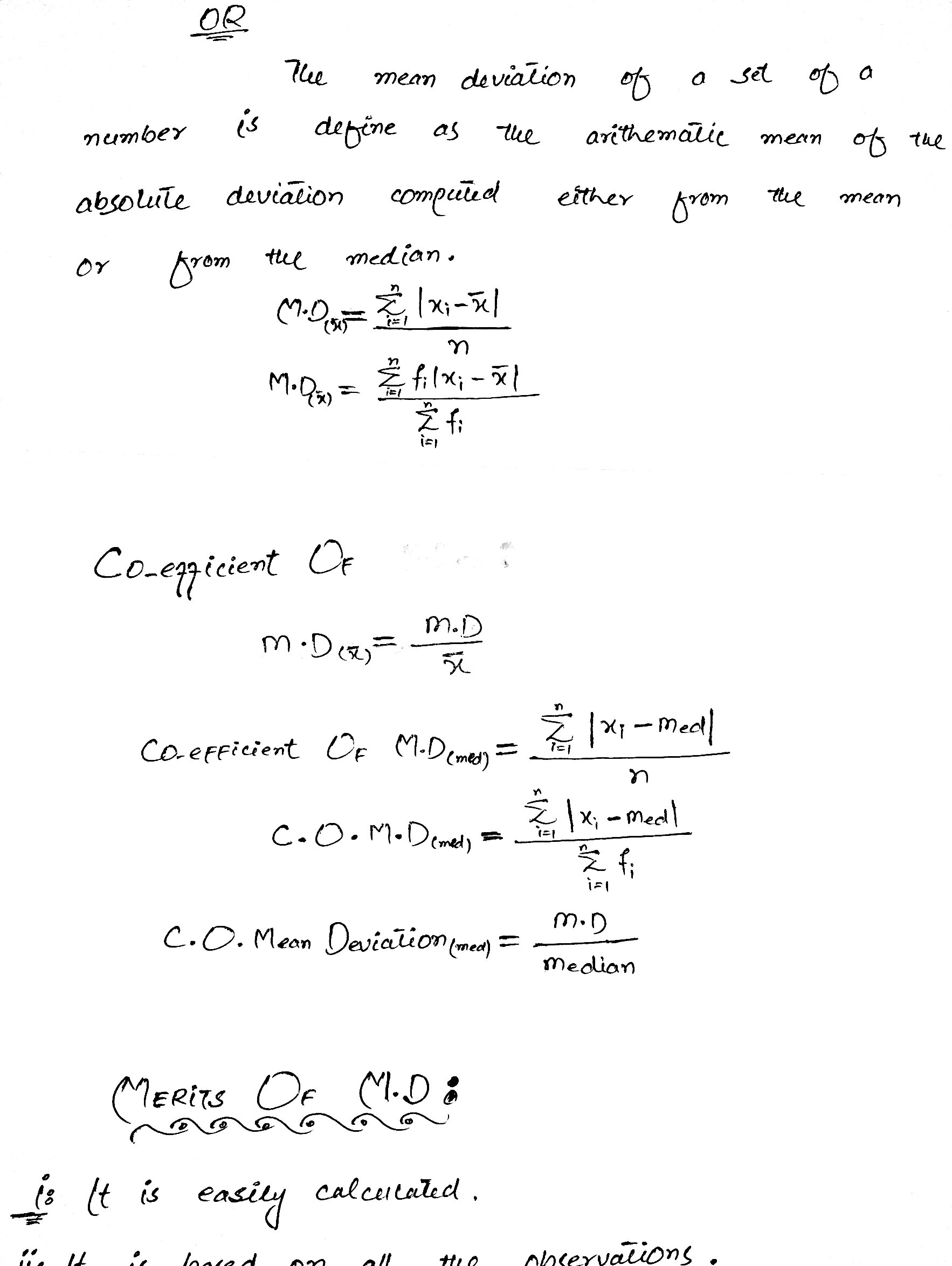
1. It is not based on all observation of the data.
2. It is based by extreme values.

**Mean Deviation:**

It is very simple and consistent technique to find the measurement of dispersion. It is denoted by M.D and can be define as the sum of absolute deviation of the observation from their mean and also median is called M.D.

OR

The mean deviation of a set of a number is defined as the arithmetic mean of the absolute deviation computed either from the mean or from the media.

**Co-Efficient of Mean Deviation:**

**Merits of M.D:**

1. It is easily calculated.
2. It is based on all the observation.
3. It can be calculated from mean and median.
4. It is more useful than Range.
5. It is absolute measure of dispersion.

**Demerits Of M.D:**

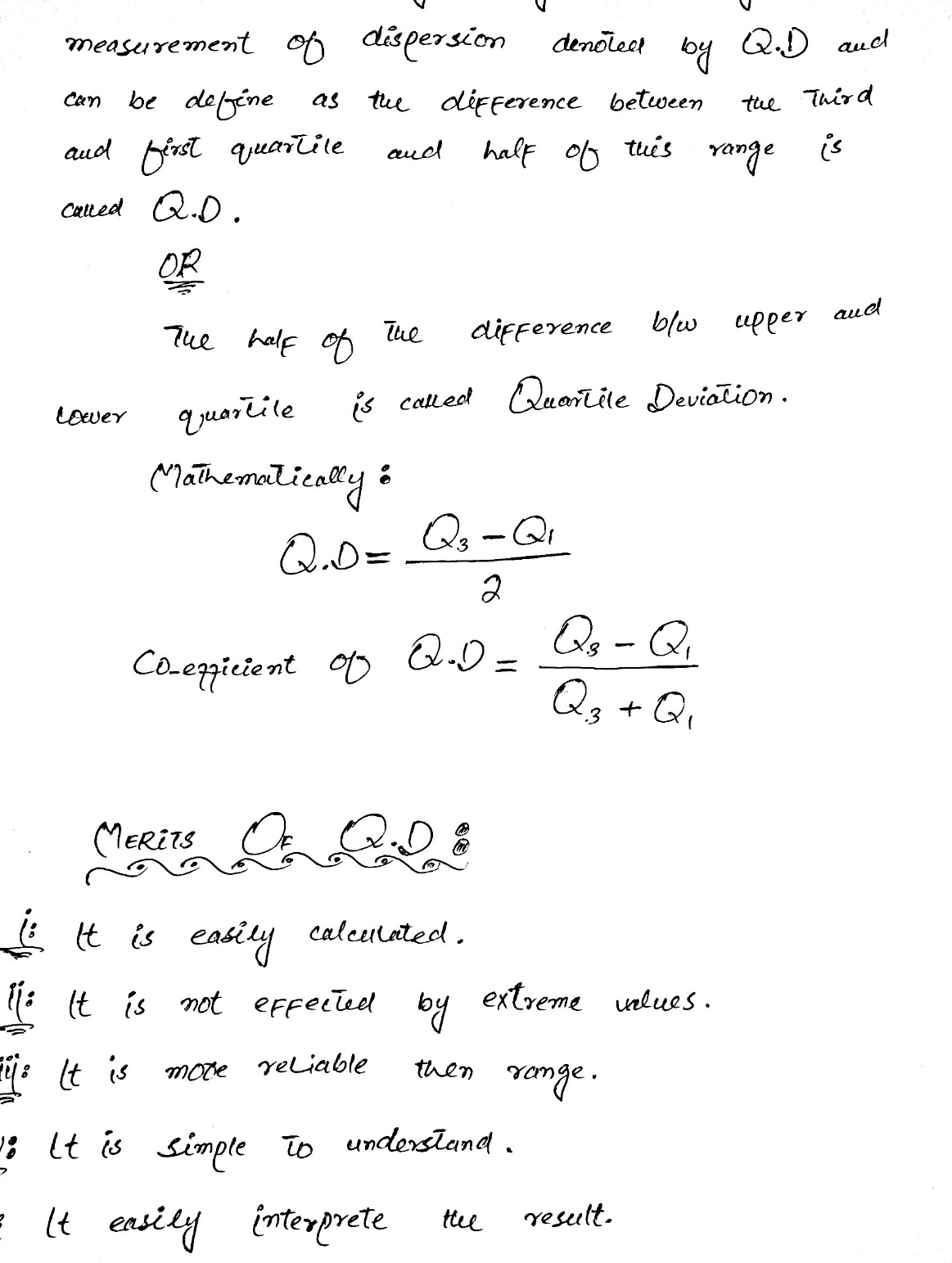
1. It is affected by the extreme values.
2. It ignores the negative sign of deviation from the average.

**Quartile Deviation:**

It is very easily and simply calculated measurement of dispersion denoted by Q.D and can be define as the difference between the third and first quartile and half of this Range is called Q.D

OR

The half of the difference between the upper and lower quartile is called Quartile deviation.

Mathematically:

**Merits of Q.D:**

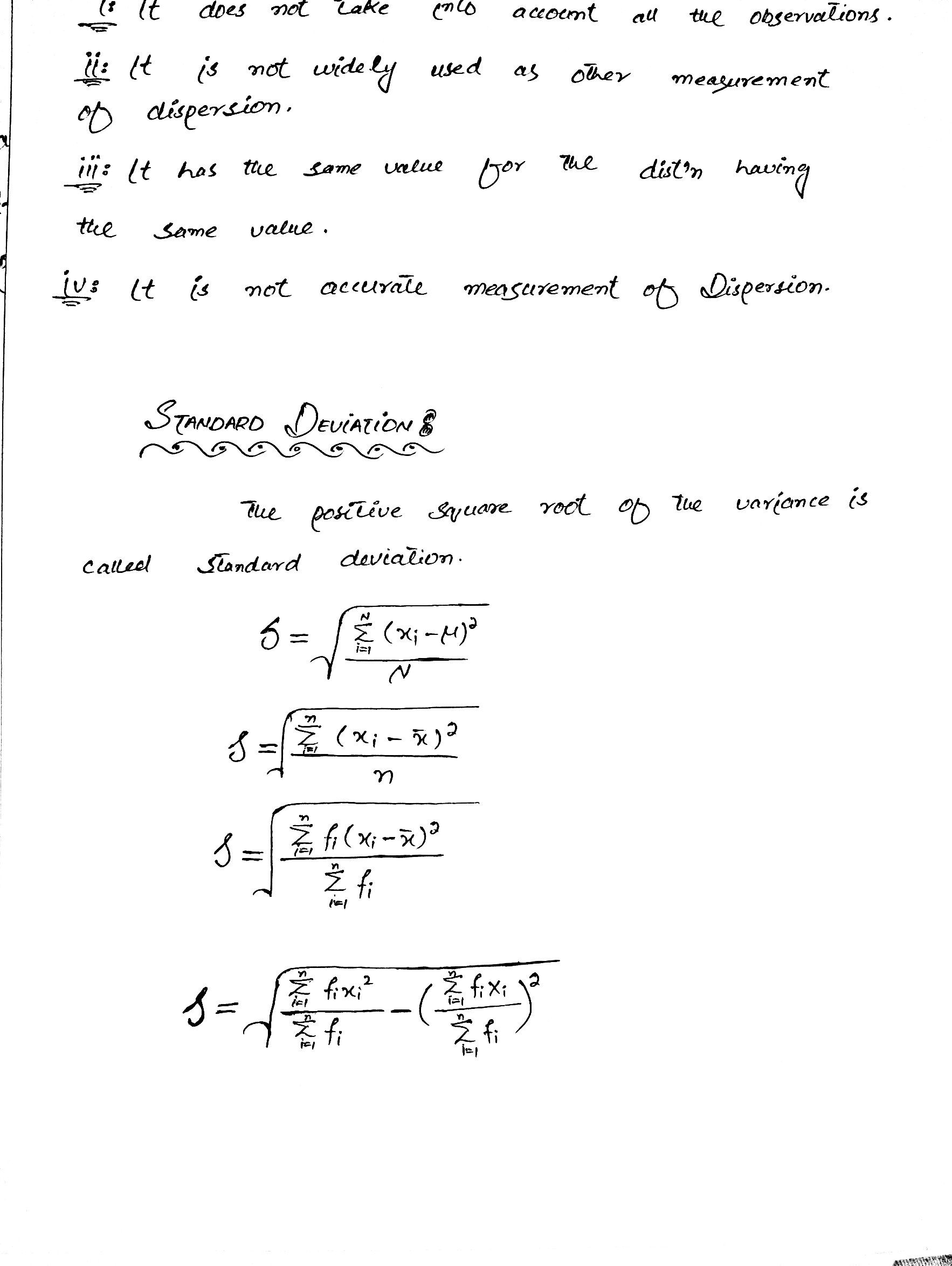
1. It is easily calculated.
2. It is not affected by extreme values.
3. It is more reliable then range.
4. It is simple to understand.
5. It easily interprets the result.

**Demerits Of Q.D:**

1. It doesn’t take into account all the observation.
2. It is not widely used as other measurement of dispersion.
3. It has the same value for the dist having the same value.
4. It is not accurate measurement of dispersion.

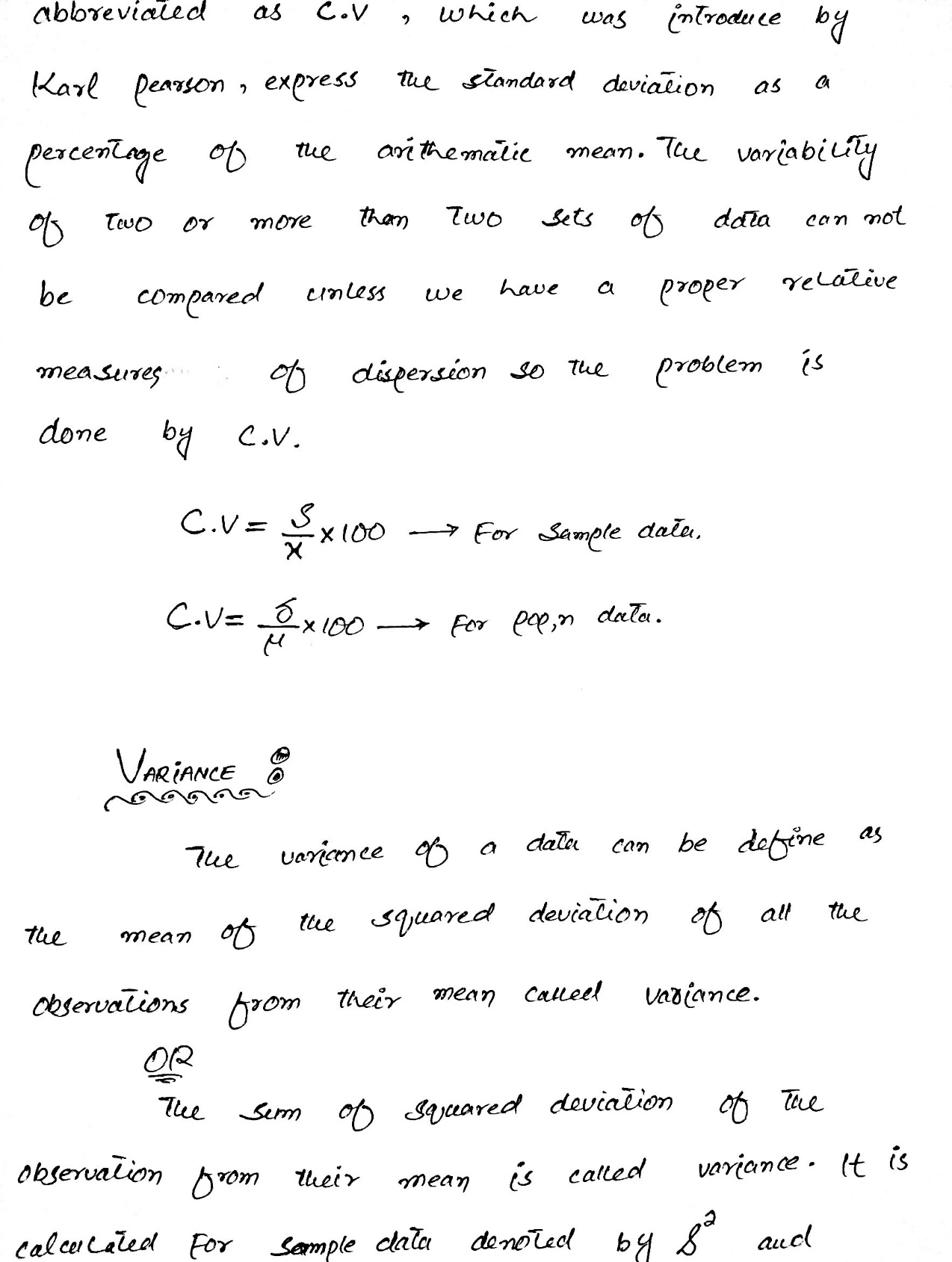
**Standard Deviation:**

The positive square root of the variance is called standard deviation.



**Co-Efficient of variation:**

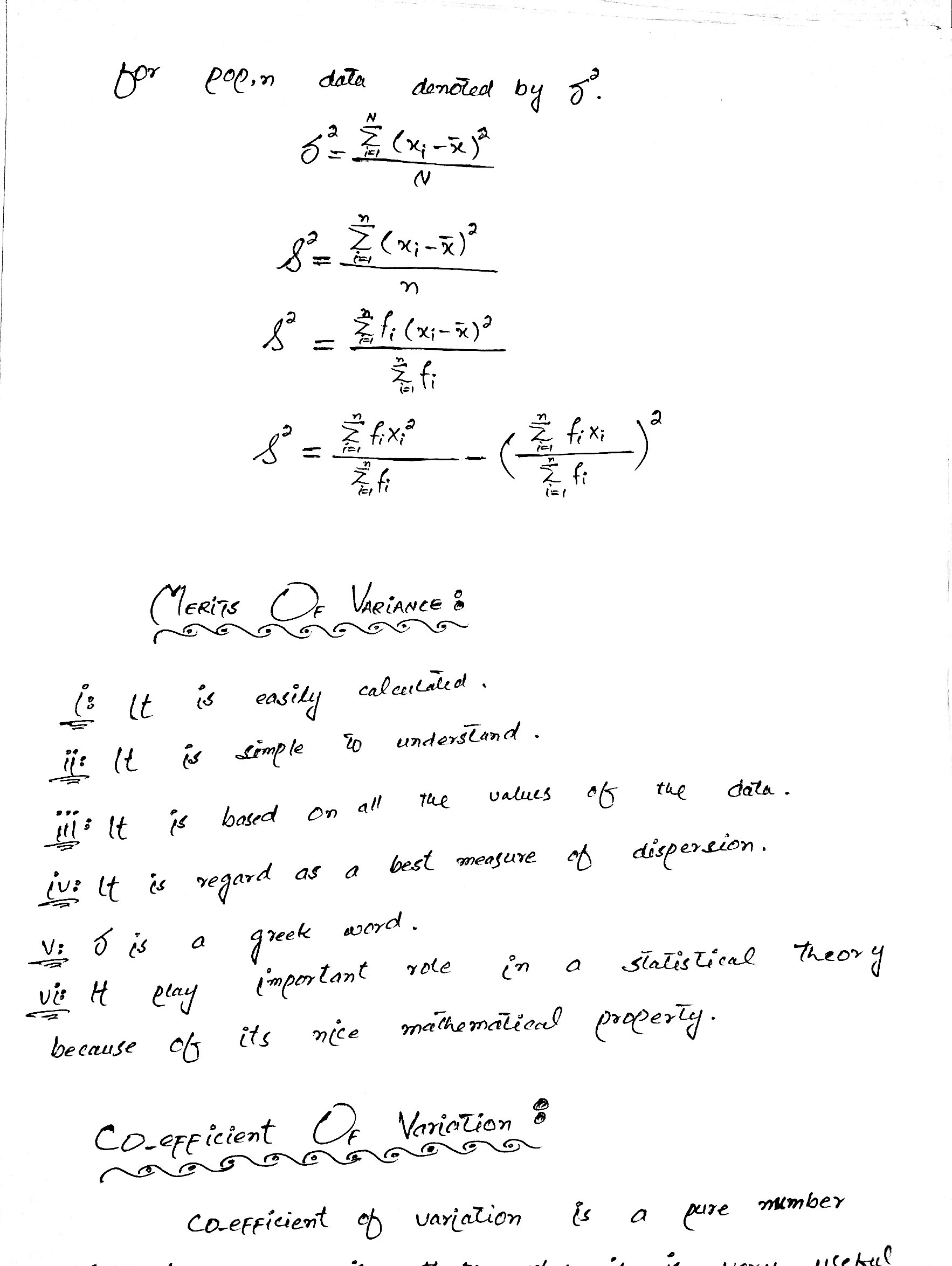
Co-efficient of variation is abbreviated as C.V, which was introduced by Karl Pearson; express the standard deviation as a percentage of the arithmetic mean. The variability of two or more than two sets of data cannot be compared unless we have proper relative measures of dispersion so the problem is done by C.V.



**Variance:**

The variance of a data can be defined as the means of squared deviation of all the observation from their mean called variance.

Or

The sum of squared deviation of the observation from their mean is called variance.

**Merits of variance:**

1. It is easily calculated.
2. It is simple to understand.
3. It is based on all the values of the data.
4. It is regard as a best measure of dispersion.
5. It play important role in a statistical theory because of its nice mathematical property.

**Co-efficient of Variance:**

Coefficient of Variance is a pure number which have no units that’s why it is very useful for the comparison of two or more data sets having different unit.

A large value of C.V indicated that the variability is greater and vise versa.

Note:C.V is unreliable when the Arithmetic mean is very small.