**Measure of Central Tendency**

A measure of central tendency is a single value that describes the way in which a group of data cluster around a central value. To put in other words, it is a way to describe the center of a data set.

There are several statistical measures of central tendency or “averages”. The three most commonly used averages are: Arithmetic Mean, Median and Mode. You should note that there are two more types of averages i.e. Geometric Mean and Harmonic Mean, which are suitable in certain situations.

**Arithmetic mean:**

Arithmetic mean is the most commonly used measure of central tendency. It is defined as the sum of the values of all observations divided by the number of observations and is usually denoted by $\overbar{X}$. Symbolically, it is written a$s $

$\overbar{X}=\frac{\in X}{N}$ Where, $\overbar{X}=$ Arithmetic Mean, $\in X=Total of the values of variable x$, N= Number of observation.

**Merits/ Advantages of Arithmetic Mean:**

1. It can be easily calculated; and can be easily understood. It is the reason that it is the most used measure of central tendency.

2. As every item is taken in calculation, it is effected by every item.

3. As the mathematical formula is rigid one, therefore the result remains the same.

4. Fluctuations are minimum for this measure of central tendency when repeated samples are taken from one and the same population.

5. It can further be subjected to algebraic treatment unlike other measures i.e. mode and median.

6. A.M. has also a plus point being a calculated quantity and is not based on position of terms in a series.

**Demerits/ Disadvantages of Arithmetic Mean:**

1. It cannot be located graphically.
2. It is affected by extreme values.
3. Its value will be effective only if the frequency is normally distributed. Otherwise in case skewness is more, the results become ineffective.

 **Median:**

Median is the middle number in a sorted list of numbers. To determine the median value in a sequence of numbers, the numbers must first be sorted, or arranged, in value order from lowest to highest or highest to lowest.

**Merits/ Advantages of Arithmetic Median:**

1. It is simple to understand and very easy to calculate.
2. Median lies at the middle part of the series and hence it is not affected by the extreme values.
3. In grouped frequency distribution it can be graphically located by drawing ogives.
4. It is specially useful in open-ended distributions since the position rather than the value of item that matters in median.

**Demerits/ Disadvantages of Median:**

1. While calculating median, all the data should be arranged in ascending or in descending order. In case of large number of items, it becomes tedious and time consuming.
2. Median provides correct result in case of odd observation. When the number is observation is even it fails to obtain accurate result.
3. It is not applicable for further algebraic calculation.
4. If the data of observation in a series is in fraction or in percentage, it becomes complicated to compute correct median.

**Mode:**

Mode is a type of [average](http://www.businessdictionary.com/definition/average.html) that refers to the most-common or most-frequently occurring [value](http://www.businessdictionary.com/definition/value.html) in a series of [data](http://www.businessdictionary.com/definition/data.html). For example, the mode of the series 1, 2, 2, 3, 4, 4, 4, 5, 5, 6 is 4 because it is the only value occurring thrice. In any series there may or may not be a mode, or two modes (called bimodal series) or more modes (called multimodal series). In a [frequency distribution](http://www.businessdictionary.com/definition/frequency-distribution.html) [graph](http://www.businessdictionary.com/definition/graph.html), the [peak](http://www.businessdictionary.com/definition/peak.html) represents the mode.

**Merits/ Advantages of Arithmetic Mode:**

1. It is easy to understand and simple to calculate.
2. It is not affected by extremely large or small values.
3. It can be useful for qualitative data.
4. It can be computed in an open-end frequency table.
5. It can be located graphically.

**Demerits/ Disadvantages of Mode:**

1. It is not well defined.
2. It is not based on all the values.
3. It is stable for large values so it will not be well defined if the data consists of a small number of values.
4. It is not capable of further mathematical treatment.

**Geometric Mean:**

In Mathematics, the **Geometric Mean** is the average value or mean which signifies the central tendency of the set of numbers by finding the product of their values. Basically, we multiply the numbers altogether and take out the nth root of the multiplied numbers, where n is the total number of values. For example: for a given set of two numbers such as 3 and 1, the geometric mean is equal to √(3+1) = √4 = 2.

**Merits/ Advantages of Geometric Mean:**

1. It is rigidly defined.
2. It is based upon all the observations.
3. It is suitable for further mathematical treatment.
4. It is not affected much by fluctuations of samplings.
5. It gives comparatively more weight to small items.

**Demerits/ Disadvantages of Geometric Mean:**

1. Because of its abstract mathematical character, geometric mean is not easy to understand and to calculate.
2. If any one of the observations is negative, geometric mean becomes imaginary regardless of the magnitude of the other items.

**Harmonic Mean:**

The Harmonic Mean (HM) is defined as the reciprocal of the arithmetic mean of the given data values. It is based on all the observations, and it is rigidly defined. Harmonic mean gives less weightage to the large values and large weightage to the small values to balance the values properly. In general, the harmonic mean is used when there is a necessity to give greater weight to the smaller items. It is applied in the case of times and average rates.

**Merits/ Advantages of Harmonic Mean:**

1. Value of harmonic mean is always fixed as it is rigidly defined.
2. Harmonic mean is suitable for the computation of average of time, rate and ratios.
3. Harmonic mean is suitable for algebraic calculation and other mathematical treatments.
4. Harmonic mean is totally based on all the items or observations of the series. So, all the items are required to determine it.

**Demerits/ Disadvantages of Harmonic Mean:**

1. Calculation of harmonic mean is a difficult process. Good mathematical knowledge is required to compute it. So, it is complex to determine and hard to understand.
2. Harmonic mean cannot be obtained if the value of any item in the series is zero.
3. Harmonic mean is highly affected by the extreme values in the series.
4. The sum of deviations of the items from their arithmetic mean is always zero, i.e. ∑(x – X) = 0.
5. The sum of the squared deviations of the items from Arithmetic Mean (A.M) is minimum, which is less than the sum of the squared deviations of the items from any other values.
6. The mean of n observations x1, x2, . . ., xn is $\overbar{x}$. If each observation is increased by p, the mean of the new observations is ($\overbar{x}$ + p).
7. The mean of n observations x1, x2, . . ., xn is $\overbar{x}$. If each observation is decreased by p, the mean of the new observations is ($\overbar{x}$ - p).
8. The mean of n observations x1, x2, . . .,xn is $\overbar{x}$. If each observation is multiplied by a nonzero number p, the mean of the new observations is p$\overbar{x}$.
9. The mean of n observations x1, x2, . . ., xn is $\overbar{x}$. If each observation is divided by a nonzero number p, the mean of the new observations is ($\overbar{x}$/p).