**MEASURES OF CENTRAL TENDENCY**

**Measures of central tendency:-**

A measure of central tendency attempts to describe the **"Center"** of a Data Set.

**In short**, **the single value which represents the characteristics of entire universe is termed as central value.**

According to **Crum** and **Smith**, ‘’ An average is sometimes called a measure of central tendency, because individual values of variables cluster around it.

**Objectives of statistical Average**:-

(i) To represent a concise picture of data/whole group.  
(ii) Facilitating Comparison.  
(iii) Formulation of Policies.   
(iv) Basis of Statistical Analysis.  
(v) One value for all the group or series.

**Essentials/Qualities of a Good Average:-**

(i) Easy to understand.  
(ii) Easy to compute  
(iii) Rigidly defined.  
(iv) Based on all the items of series.  
(v) Certain in character  
(vi) Least effect of a change in the sample.  
(vii) Capable of algebraic treatment.

**Kinds Of Statistical Average or Central Tendency:-**

There are Three Measures of central tendency:-

1. Arithmetic Mean or Mean

2. Median

3. Mode.

**1. Arithmetic mean or Mean :-**

Arithmetic mean or mean is the number which is obtained by adding the values of all the items of a series and dividing the total by the number of items.

**Types of Arithmetic Mean:-**

1. Simple Arithmetic Mean

2. Weighted Arithmetic Mean

(1) **Simple Arithmetic Mean:-**  
When all items of a series are given equal importance than it is called simple arithmetic mean.

(2) **Weighted Arithmetic Mean:-**

When different items of a series are given different weights according with their relative importance is known weighted arithmetic mean.

**Formulae of calculating Simple arithmetic mean:-**

|  |  |  |  |
| --- | --- | --- | --- |
| **Types of Series** | **Direct Method** | **Shortcut Methods** | **Step deviation Methods** |
| **Individual Series** | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image002.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image003.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image004.png |
| **Discrete series** | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image005.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image006.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image007.png |
| **Continuous Series** | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image008.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image006.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image009.png |

**rmulae of calculating Weighted arithmetic mean:-**

|  |
| --- |
| http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image011.png  **Weighted Mean** |

**Calculation of Mean from Ungrouped Data:-**

The formula for the mean of a series of ungrouped measures is:

|  |
| --- |
| http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image002.png |

**Advantages/Merits of the Arithmetic Mean:-**

Of all the types of averages, the **arithmetic mean is more commonly used** is even **known as ‘Common average**. There are many reasons for this popularity.

**Some of the reasons are**:-

1. It can be **Easily Calculated** and is **Simplest to Understand**. It can be determined in most of the cases.

2. It is most **Readily Understood** by persons of mediocre intelligence. It is most popular because it can be readily understood of all the averages.

3. It can be subject to **Algebraic Manipulation** and helps in further analysis and interpretation of statistical data.

4. It is affected by the presence of every item in the group and in this way average is **based on all the Observations** a characteristic that an average must possess.

5. If the number of observations or items is sufficiently large, it is more accurate and more reliable **Basis for Comparison**.

6. It is rigidly defined and leaves no scope for deliberate prejudice or personal bias. It’s **Value is Definite**.

7. It can be located even without arranging data in a set form.

8. It can be determined even when the aggregate and the number of items are known and the information about the individual items is missing. Similarly, if the number of items and the average of the series are known, we can calculate the aggregate.

9. It satisfies most of the conditions laid down for an ideal average.

**Limitations/Demerits of Arithmetic Mean:-**

1. The mean, sometimes, gives us **Results which are Absurd**. For example the mean of the family size (No. of persons in the family) in a locality may be 4.62 which seems to be absurd. (A person can’t be divided into fractions).

2. Sometimes, the mean values **Do not exist in the Series** at all. For example, the mean of 10, 17, 18 and 19 is 16 which does not exist in the series. The students may confuse as to how a score which is net there in the series can represent the scores.

3. Sometimes Mean of a **Distribution is Highly Misleading** especially when some of the observations are too large or too small as compared to the others.

**Median**

**Median means the middle value of distribution. It is the value in the series which divides the series into two equal parts, one part consisting the values equal to median or smaller than it and other part having the value equal to median and larger than it.**

**Formulae of Calculating Median and Partition Values:-**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Measure | Individual Series | Discrete Series | Continuous Series | |
| Size of item | Size of item | Size of item | Size of item | Formula |
| Median | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image012.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image012.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image013.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image014.png |
| First Quartile http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image015.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image016.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image016.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image017.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image018.png |
| Third Quartile http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image015.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image019.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image019.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image020.png | http://media.mycbseguide.com/images/static/revise/11/eco/ch05/image021.png |

**Limitations of Median:-**

(i) It does **not give equal weightage** to each score in the series. Thus it may not be the true representative score.

(ii) A median **is not capable of further algebraic treatment** because its computation is not based on all the observations. For example, if the median of an array of observations is known, say 40, then one can hardly guess about the sum of observations in the array.

(iii) It does **not take the extreme scores into considerations**. For example, the median of the series 2, 7, 11, 12, 14, 17, 17, 20 and 400 is 14 and 14 is not representative of the series.

(iv) he arrangement of items in the ascending or descending order is sometimes

**very tedious.**

(v) When median is calculated in a continuous series it is assumed that all the frequencies are uniformly spread over their values. This assumption may not be actually true.

(vi)A median is more likely to be affected by the fluctuations of sampling than the mean.

(vii) We confuse to locate the median when there are gaps in the middle of the distribution and when N/2=f

(viii)Combined medians cannot be computed whereas we can compute the combined mean.

(ix) It cannot be used for computing other statistical measures such as SD, or coefficient of correlation.

(x) It cannot be used as the centre of gravity of the distribution.

(xi)It cannot be used for inferential statistical analysis.

Uses of Median:

**Median is used in the following situations:-**

(i) When the exact mid-point the 50% point of the distribution is wanted.

(ii) When extreme scores affect the mean at that time median is the best measure of central tendency.

(iii) When it is desired that certain scores should influence the central tendency.

(iv) When the distribution has an upper or lower class interval of unspecified length.

(v) When a distribution is described and interpreted in terms of percentiles, it is used as a member of the percentile system.

(vi) When interest is limited to finding the placement of eases in the lower half or upper half of the distribution and not in finding how far they are from the central point.

**Partition value:-**

**When a series is divided into more than two parts, the dividing values are called Partition values**.

**use/ application of Mode:-**

Mode may be used in the following situations:

1. When the most typical value is wanted as a measure of central tendency. For instance, the most liked boy in the class, the most popular belief of students about vocational courses etc., etc.

2. When a quick and approximate measure of central tendency is required.

3. When it is necessary to find out the point of maximum concentration.

4. When data is incomplete or the distribution is skewed, where most of the

     values are towards the extremes.

**Merits of Mode:-**

1. It possesses the merit of simplicity. In a discrete series, the mode can be located even by inspection.

2. It is commonly understood. A mode is an average which people use in their day-to-day expressions; e.g., sale of a commodity, size of families, etc., are expressed in their mode values.

3. Unlike the mean, it cannot be a value which is not found in the series.

4. A mode is not affected by the values of extreme items, provided they adhere to the natural law relating to extremes.

5. It can be determined from an open ended class interval.

For determination of mode it is not necessary to know the values of all items of a series. If the point of maximum concentration is known, it is enough.

6. It helps in analysing qualitative data.

7. Mode can also be determined graphically through histogram or polygon.

**Demerits of Mode:-**

1. Mode is not defined rigidly like mean.

2. It does not include all the observations of a distribution but on the concentration of frequencies of the items.

3. Further algebraic treatment cannot be done with mode like mean.

4. Mode cannot be determined from unequal class intervals.

5. There are different methods and different formulae which yield different results of mode and so it is rightly remarked as the most ill-defined average.

6. Mode has the limitations associated with the scale of measurement for which it stands.

7. Mode can obviously not be subjected to further statistical analysis.

8. It remains as only a rough estimate. Sometimes we may come across bimodal distributions (having two modes) and we do not easily find one composite measure.