

Unit-3Diagrams:

A diagram is a visual form for presentation of statistical data. Diagrams refers to the various types of devices such as bars, circles, maps, pictorials, Gantt Cartograms, etc.

Advantages:

i) They are attractive and impressive!

Diagrams are attractive and create interest in the mind of the readers. They are more appealing to the eye. Even a layman can understand them very easily. Diagrams have greater attraction than mere figures.

ii) They save time and labour!

Diagram saves much time and labour to understand it and enables one to draw meaningful inferences from it. Human beings not like to go through numerical data, but may go through a diagram or graph because without strain one can understand it.

iii) They have universal applicability!

Diagrammatic presentation of statistical data is followed universally. It is greatly used in almost all walks of life as a good guide in economics, business, social institutions, administration and other fields.

iv) They make data simple!

Diagrams can be remembered easily, as they render comparison in an easy and possible way. They render the whole data readily intelligible.

vs They make Comparison easy!

Diagrams render comparison between two or more sets of data in absolute figures comparison may not be clear, but diagrammatic presentation makes it easier and simpler.

(vi) They provide more Inform. Information:

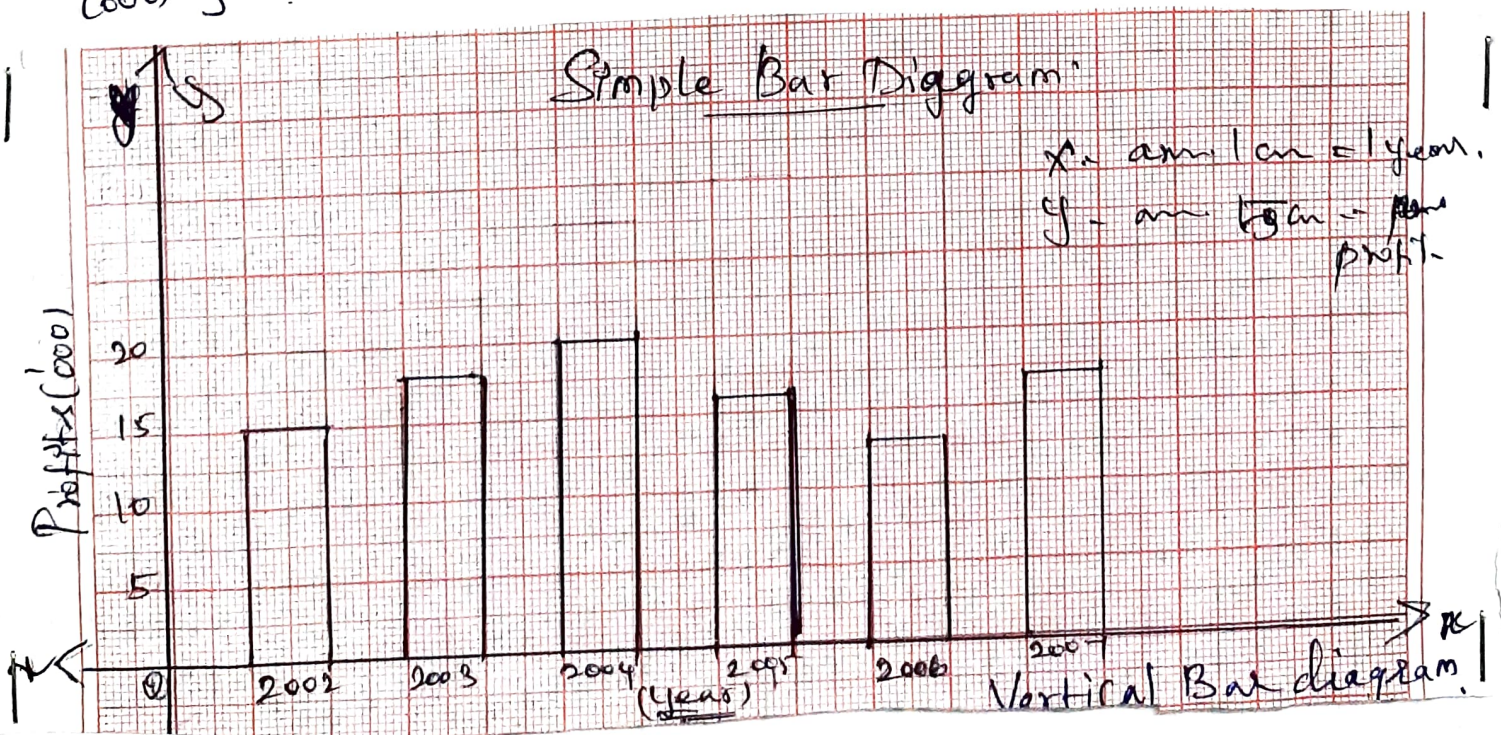
A diagram will reveal more information than the data in a table. Cold figures can speak in clear tones, if translated into diagrammatic language. Diagram plays an important role in the modern advertising campaigns. The newspapers, journals, etc., are filled with diagrams.

Types of Diagram:

i) Simple bar Diagram:

A simple bar diagram can be drawn either on horizontal or vertical base. Bars on horizontal base are more common.

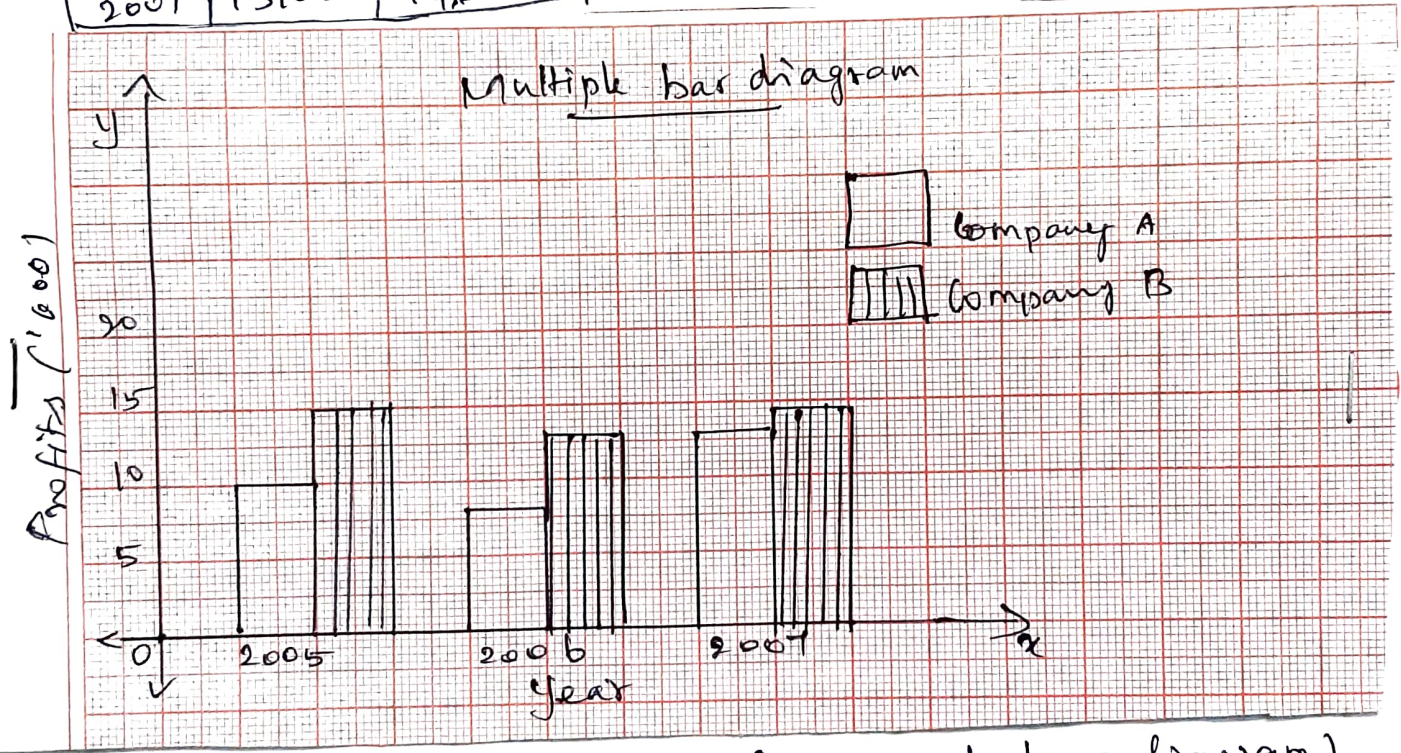
Year: 2002, 2003, 2004, 2005, 2006, 2007
Profits (000): 15,000, 18,000, 20,000, 16,000, 13,000, 17,000



ii) Multiple Bar Diagram (Compound bar Diagram):

Multiple bar diagrams are used to denote more than one phenomenon. eg. for import and export trend. Multiple bars are useful for direct comparison between two values. The bars are drawn side by side. In order to distinguish the bars, different colours, shades, etc. The data below gives the yearly profits of two companies A and B

Year	(A) Profits	(B)
2005	10,000	15,000
2006	8,000	13,000
2007	13,000	14,000

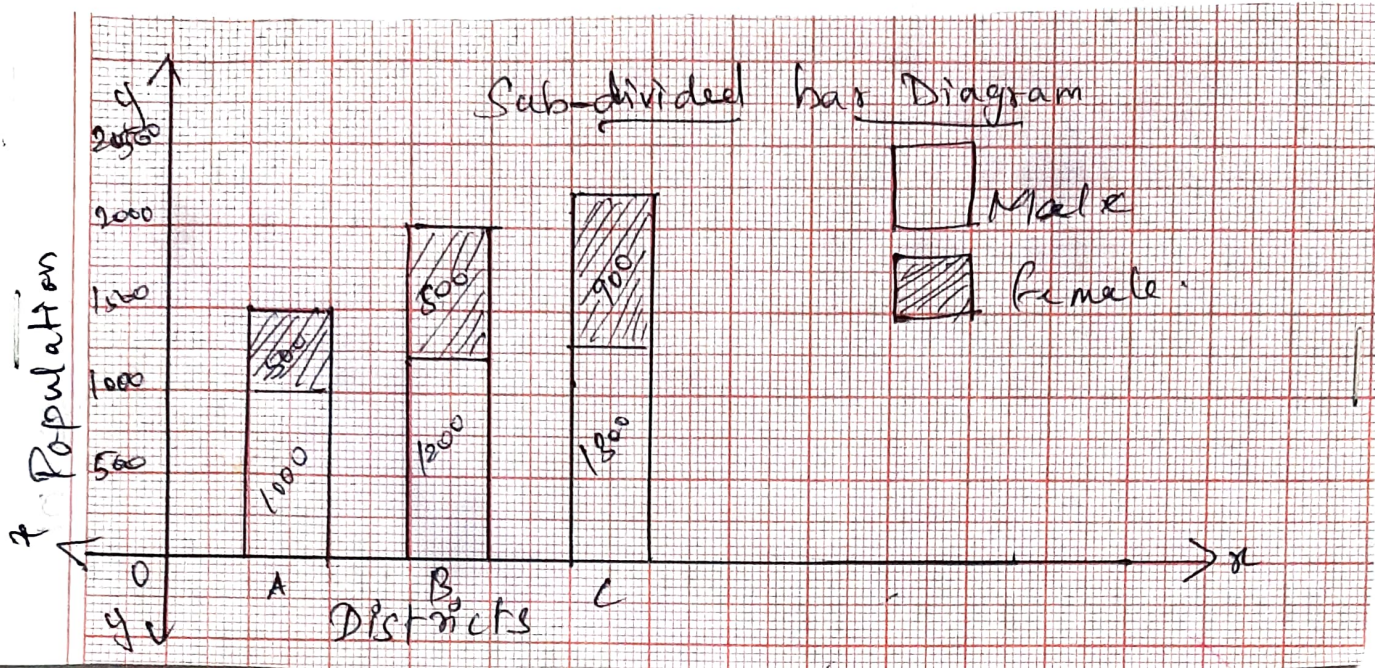


iii) Sub-divided bar diagram (Component bar diagram)

The bars are subdivided into various parts in proportion to the values given in the data and may be drawn on absolute figures or percentages. Each component occupies a part of the bar proportional to its share in the total.

Represent the following data in a suitable diagram.

Districts	A	B	C
Population male	1000	1,200	1300
Population female	500	800	900
	1500	2000	2200



(iv) Angular (or) Pie Diagram.

The pie diagram ranks high in understanding. Just as we divide a bar or a rectangle to show its components, a circle can also be divided into sectors. As there are 360 degrees at the centre, proportionate sectors are cut taking the whole data equal to 360 degrees.

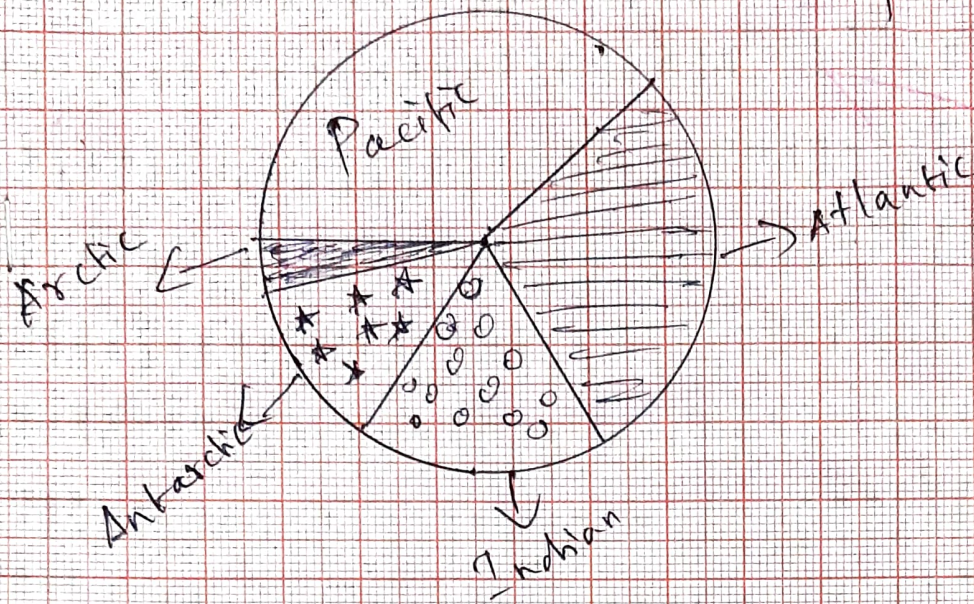
Ocean	Pacific	Atlantic	India	Antara	Antarctic	Arctic
Area (million)	70.8	41.2	28.5		7.6	4.8

Solution

Ocean	Area	Degrees
Pacific	70.8	$\frac{70.8 \times 360}{152.9}$

Ocean	Area	Degrees.
Pacific	70.8	$\frac{70.8}{152.9} \times 360 = 167$
Atlantic	41.2	$\frac{41.2}{152.9} \times 360 = 97$
India	28.5	$\frac{28.5}{152.9} \times 360 = 67$
Antarctic	7.6	$\frac{7.6}{152.9} \times 360 = 18$
Arctic	4.8	$\frac{4.8}{152.9} \times 360 = 11$
	<u>152.9</u>	<u>360°</u>

Pie Diagram showing area of Oceans of the world.



Graphs:

Unit-4

Graphic presentation of numerical data is becoming popular because of various merits. A graph is a visual form of presentation. Graphs are drawn on a special type of paper known as graph paper.

Advantages of Graphic Presentation:

When a graph is properly constructed, it readily shows information that might otherwise be lost and the details of numerical tabulations. It also shows the tendency. Prediction can be made while glancing on the graph. In brief the advantages are:

- 1) It provides an attractive and impressive view.
- 2) It simplifies complexity of data.
- 3) It provides easy comparison of two or more phenomena.
- 4) It needs no special knowledge of mathematics to understand a graph.
- 5) It provides the basis to locate the statistical measures, like median, mode, quartiles etc.
- 6) Graphic method is probably the simplest method of presenting statistical data.

Difference between Diagram and Graph!

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Diagram

1. Ordinary paper can be used.
2. It is attractive and is easily understandable.
3. It is appropriate and effective to represent one or more variable.
4. ~~It can't be used for interpolation and extrapolation~~
4. It cannot be used for interpolation and extrapolation technique.
5. Median and mode cannot be estimated.
6. It is used for comparison only.
7. Data are presented by bars, rectangles.
8. Diagrams are used for publicity as they are attractive. They give only approximate information. To a statistician or a researcher, diagrams are not helpful in analysis.

Graph

1. Graph paper is needed.
2. It needs some effort to understand.
3. It creates problem.
4. It is helpful in interpolation and extrapolation techniques.
5. The value of median and mode can be estimated.
6. It represents a ~~math~~ mathematical relationship between the two variables.
7. Data are presented by points or lines of different kinds - dots, dashes, etc.
8. Graphs are very much useful to statisticians or researchers in analysis.

Types of Graphs:-

- i) Histogram
- ii) frequency polygon
- iii) frequency Curve.

1) Histogram:

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One of the most important and useful methods of presenting frequency distribution of continuous series is known as histogram. The magnitude of the class interval is plotted along the horizontal axis the frequency on the vertical axis. Each class has lower and upper values. Histogram is also known as 'block diagram' or 'staircase chart'.

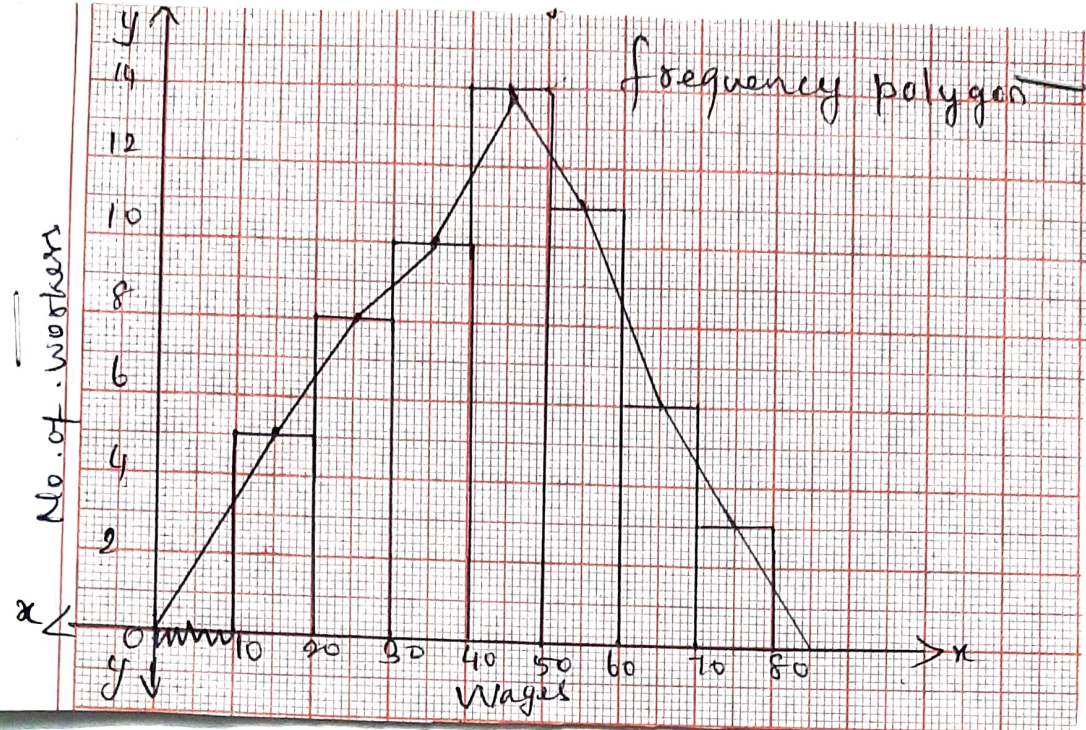
Wages in Rs	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of workers	5	8	10	14	11	6	3



2) Frequency polygon:

A ~~group~~ grouped frequency can be represented by a histogram. A simple method of smoothing the histogram is to draw a frequency polygon. This is done by connecting the mid-point of the top of each rectangle with the mid-point of the top of each adjacent rectangle by straight lines. This is done under the assumption that the frequencies in a class interval are evenly distributed throughout the class. The area of the polygon is just equal to the area included in it. Mode can easily be found out.

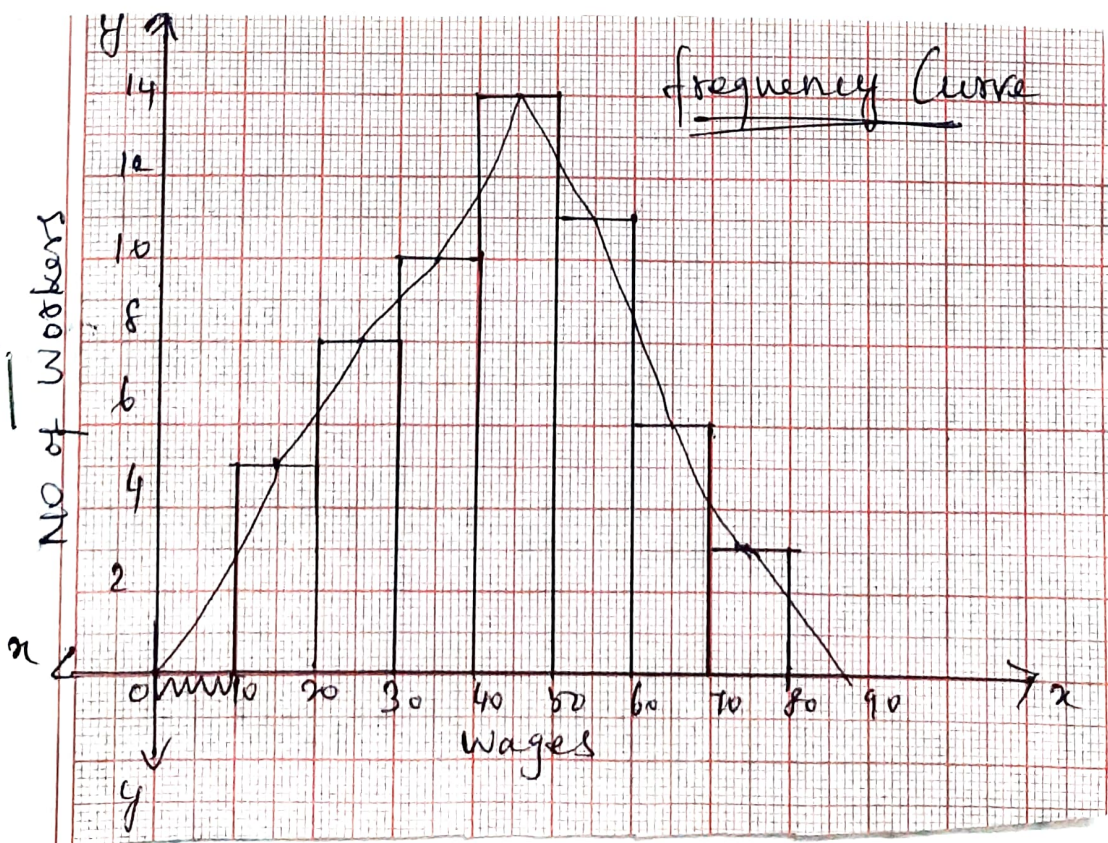
Wages in Rs	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of workers	5	8	10	14	11	6	3



3) Frequency Curve!

A frequency Curve is drawn by smoothing the frequency polygon. It is smoothed in such a way that the sharp turns are avoided. A frequency polygon, if smoothed further so as to minimise sudden changes, results into a continuous smooth curve known as frequency or smooth frequency Curve.

wages in Rs!	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No of workers!	5	8	10	14	11	6	3



Population:

The group of individuals under study is called population or universe. Thus in statistics population is an aggregate of objects animate or inanimate under study. The population ~~may be~~ ^{can be} finite or infinite. population can be either a finite population or an infinite population.

finite population:

When the number of observations can be counted and definite, it is known as finite population.

Infinite population:

When the number of observations cannot be measured or number and is infinite, it is known as infinite population.

Sample:

A finite subset of statistical individuals in a population is called a sample.

Sample size:

The number of individuals in a sample is called the sample size.

Parameter and statistic

In order to avoid verbal confusion with the statistical constants of the population, viz, mean (μ), Variance σ^2 , etc. which are usually referred to as a parameter, statistical measures computed from the sample observations alone. ~~by~~ Ex. mean (\bar{x}), Variance (s^2)

etc., have been termed by professor R.A. Fisher as statistics.

In practice parameter values are not known and the estimates based on the sample values are generally used. This statistic which may be regarded as an estimate of parameter, obtained from the sample, is a function of the sample values only. It may be pointed out that a statistic, as it is based on sample values and there are multiple choices of the samples that can be drawn from a population, varies from sample to sample. The determination or the characterisation of the variation that may be attributed to chance or fluctuations of sampling, is one of the fundamental problems of the sampling theory.

Census Method:

Information on population be collected in two ways - Census method and sample method. The object of a census or complete enumeration is to collect information for each and every unit of the population. In census or universal coverage every element of the population is included in the investigation. When we make a complete enumeration of all items in the population, it is known as census method of collection of data.

Sample method: -

Only a part of the whole group of population will be studied in the case of sample enquiry.

(11)

According to Croxton and Cowdon, "It may be too expensive or too time-consuming to attempt either a complete or a nearly complete coverage in a statistical study. Further to arrive at valid ~~and~~ conclusions, it may not be necessary to enumerate all or nearly all of a population. We may study a sample drawn from the large population and, if that sample is adequately representative of the population, we should be able to arrive at valid conclusions."

Merits of Census method:

1. The data are collected from each and every item of the population.
2. The results are more accurate and reliable, because every item of the universe is enquired.
3. Intensive study is possible.
4. The data collected may be used for various surveys, analyses, etc.

Demerits of census method:

1. It requires a ~~big~~ large number of enumerators and it is a costly method. Therefore the government alone can use this method for conducting population census, production census, etc.
2. It requires more money, labour, time, energy, etc.
3. It is not possible in some circumstances where the universe is infinite.

Sample method: Merits of sample method:

1. It saves time, because fewer items are collected and processed. When the results are urgently required, this method is very helpful.

Methods of Sampling:

i) Simple Random Sampling:

It is a technique in which sample is so drawn that each and every unit in the population has an equal and independent chance of being included in the sample. Several methods have been adopted for random selection of the sample. They are:

i) Lottery Method:

This is the most popular and simplest method. In this method, all the items of the universe are numbered on separate slips of paper of same size, shape and colour. They are folded and mixed up in a drum or container. A blindfold selection is made. The required number of slips are selected for the desired sample size. The selection of items thus depends on chance. This method also called unrestricted random sampling, because units are selected from the population without any restriction.

ii) Table of Random Numbers: -

As the lottery method cannot be used, when the population is infinite, the alternative method is that of using the table of random numbers.

ii) Stratified Sampling: -

When the population is heterogeneous or of different segments or strata with respect to the variable or characteristic under study, then it is stratified. First the population is divided into a number of sub-groups or strata. Each stratum is homogeneous. A sample is drawn from each stratum, at random. There are two types of stratified random sampling.

They are proportional and non proportional. In the proportional sampling, equal and proportionate representation is given to sub-groups or strata. If the number of items is large in the population, the same will have a higher size and vice-versa.

In disproportionate or non-proportionate sample, equal representation is given to all the sub-strata regardless of their existence in the population.

iii) Systematic Sampling!

It is also known as quasi-random sampling. A systematic sample is selected at random sampling. When a complete list of the population is available, this method is used. We arrange the items in numerical, alphabetical, geographical, ~~under this method is used.~~ or any other order. If we want to select a sample of 10 students from 100 students, under this method kth item is picked up from the sample frame and k is the sample interval.

$k = N/n$, k = Sampling interval,
N = Size of universe, n = Sample size.

