

Nature of Statistics

1) Statistics is an Art: Statistics is an Art because it suggests ways to solve the various problems.

2) Statistics is a Science: Statistics is a systematised study of knowledge and it analyses the collected data on the basis of cause and effect.

According to above discussion, it is collected that statistics is both a science and an art dealing with the study of the methods of collection, presentation, analysis and interpretation of aggregates of quantitative data.

Limitations of Statistics

Statistical methods are now used in almost all branches of study. But statistics is not fully free of statistics. Some of them are as follow:

1. It does not study the qualitative aspect of a problem.
2. It does not study individuals.
3. Lack of standard conclusions.
4. Statistics is true only to its averages.
5. All statistical methods are subject to bias.
6. Statistics can be misused.

Chapter: Classification
Frequency Distributions and Statistical
Series

The collected data are not well arranged for drawing any conclusion. Data collected by the investigator is called raw data. Raw data is complex and difficult to understand. To remove this difficulty and to make a large mass of data intelligible, data have to be organised in a proper way. Classification is the first step in organisation of data.

Classification is a process of arranging data in groups or classes according to resemblances and similarities.

There are many types of classification such as Geographical Classification, Chronological Classification, qualitative classification and Quantitative (Numerical) Classification.

Quantitative Classification

When data are classified according to some characteristics that can be numerically measured such as weight, height, income, age etc. It is called Quantitative Classification. Thus the measurable quality varying from one individual to another is termed as variable.

Variable

Variable refers to those things which is capable of being measured in numerical terms and changes its value over time is called a variable. It is denoted by 'x'.

For Example

<u>Income of families</u>	<u>Marks of Students</u>	<u>Production (tons)</u>
x	x	x
200	10	10
300	20	12
400	30	15
500	35	20
	45	22
	Etc.	· · ·

2. Frequency (F): The Number of time each value of a variable occurs is known as its frequency. and it is denoted by 'F'.

For Example

<u>Marks (x)</u>	<u>No. of student (F)</u>
10	2
15	3
20	1
25	2

3. Class Cumulative frequency (CF): frequency are converted into cumulative form.

Example

<u>Marks (x)</u>	<u>No of student (F)</u>	<u>CF</u>
10	2	2
15	3	5 (3+2)
20	1	6 (2+3+1)
25	2	8 (2+3+1+2)

Types of Statistical Series

On the basis of Construction, the Statistical Series are of three types:

1. Individual series: A Series of Individual Observations where the items are listed separately is known as an Individual Series. Individual Series may be presented in following three ways:

(A) Alphabetical order or Serial Number

Example

<u>S.N.</u>	<u>Marks</u>	<u>Name</u>	<u>Marks</u>
1	60	A	60
2	50	B	50
3	70	C	70
4	65	D	65
5	30	E	30

(B) According to Marks Arranging in Ascending order

<u>SN</u>	<u>Marks</u>
1	30
2	50
3	60
4	65
5	70

(C) Arranging in Descending order

<u>S.N</u>	<u>Marks</u>	<u>S.N.</u>	<u>Marks</u>
1	70	4	50
2	65	5	30
3	60		

2. Discrete Series : When the distinct values of a variable are presented in an ascending order or descending order along with their frequencies, the series is called discrete series.

Discrete Series is one where the individual variables differ from each other by definite amounts.

For Example

<u>Marks</u> <u>X</u>	<u>NO. of Students (F)</u>
10	5
15	8
20	2
25	4
30	3

3. Continuous Series : When the variables are arranged in class intervals along with their frequencies is called Continuous Series. If the continuity of the groups is not broken, the arrangement is called a Continuous Series.

For Example

<u>Marks</u>	<u>NO. of Student</u>
0-10	4
10-20	10
20-30	5
30-40	7
40-50	3

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Frequency Distributions & Statistical Series

Terms to be Understood

i) Class: Various groups formed in a quantitative classification are called classes. Each given interval is called as a class. For Example

0-10

10-20

20-30

30-40

etc.

ii) Class limit: There are two limits of each class.

i) lower limit (L_1)

ii) upper limit (L_2)

For example in a class of 0-10

~~low~~ L_1 is 0

L_2 is 10

in a class of 10-20

$L_1 = 10$

$L_2 = 20$

iii) Class Interval (C.I): The difference

between the upper and lower limits of a class is known as class interval.

For example: class interval of the class 20-30 is $= 30 - 20 = 10$

$$30 - 40 \text{ is } = 40 - 30 = 10$$

iv) Mid values (MV): The Mid value of the class interval of a class is called as mid value or mid point.

$$\begin{aligned} MV &= \frac{L_1 + L_2}{2} \\ &= \frac{10 + 20}{2} = 15 \end{aligned}$$

v) Magnitude of class interval or width of the class: The difference between upper limit and lower limit of a class is called magnitude of class interval. It is denoted by 'i'

$$\begin{aligned} i &= L_2 - L_1 \\ &= 20 - 10 = 10 \end{aligned}$$

vi) Range: The Range of a frequency distribution can be defined as the difference between the lower limit of first class interval and the upper limit of last class interval

For example

0-10	20-30	R = H - L
10-20	30-40	

$$= 40 - 0 = 40$$

Types of Continuous Series

There are five types of Continuous Series

- (1) Exclusive Series
- (2) Inclusive Series
- (3) Open end Series
- (4) Cumulative frequency Series
- (5) Mid value Series

(1) Exclusive Series: In this Series the upper limit of one class interval is the lower limit of the next class interval.

For Example

Marks (X)	M. of students (F)
0-10	4
10-20	5
20-30	3
30-40	2

(2) Inclusive Series: In this Series, upper limit of the class is not the lower limit of the next class group

For Example

Marks (class)	M. of students (F)
0-9	2
10-19	5
20-29	3
30-39	4

Conversion of Inclusive Series into Exclusive Series

0.5-9.5	2
9.5-19.5	5
19.5-29.5	3
29.5-39.5	4

(3) Open end series classes

Open end classes are those classes wherein either the lower limit of the first group or the upper limit of the last group are not given.

Class Marks	Frequency No. of Students
less than 10	2
10-20	5
20-30	6
More than 30	3

(4) Cumulative frequency distribution:-

In this frequency distribution, frequencies are expressed not in simple form but are converted into cumulative form.

Marks	No. of Students	Marks	No. of Students
less than 20	2	10-20	2
30	5	20-30	3 (5-2)
40	10	30-40	5 (10-5)
50	14	40-50	4 (14-10)

Marks	No. of Student	Marks	No. of Student
More than 10	18	10-20	3 (18-15)
20	15	20-30	6 (15-9)
30	9	30-40	5 (9-4)
40	4	40-50	4

(5) Mid values frequency series

Mid value	No. of Students	Class	F
10	3	0-10	3
20	9	10-20	9
30	3	20-30	3
40	2	30-40	2