



# STATISTICS

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## DEFINITION

"The word statistics is defined as a discipline that includes procedures and techniques used to collect, process and analyze numerical data and to make inferences and to reach decisions in the face of uncertainty."

$\bar{x}$  . S . S



## POPULATION:-

"A population is a statistical population is a collection or set of all possible observations whether finite or infinite, relevant to some characteristics of interest."

## Example:-

- 1- Height of all college students
- 2- age of all students
- 3- Fee of all students-



## SAMPLE :-



"Any representative part of population is called a Sample"

⇒ Take 1<sup>st</sup> year class

..... 10 books

## CONJANGI.

"A value that is unchangeable is called constant."



## VARIABLE

"A variable is a phenomena that may vary from one individual or object to another."

### Example:-

For example age that vary from person to person-

## TYPES

- Quantitative Variable
- Qualitative Variable

### Quantitative Variable:-

"A Variable is called Quantitative Variable when a characteristics can be expressed numerically such as weight, age and income."

### Qualitative Variable:

"if the characteristics is known"

Parameter:-

A characteristic / Numerical value from population Data - is called parameter.

Example  $11, 5^2, \dots$

non-numerical such as education, gender, eye color, and intelligence - Then the variable is referred to as a Qualitative Variable -

## A Quantitative Variable Classification

- Discrete Variable
- Continuous Variable

### 1- DISCRETE VARIABLE

"A Discrete Variable represent count data such as no of person in a family"

$\Rightarrow$  children  $\Rightarrow$  students in a class

### 2- CONTINUOUS VARIABLE:-

"A continuous Variable measurement data such as Height of a plant temperature at a place e.t.c."  
Height, Weight, age



### SAMPLING:-

"Sampling is the process of drawing Sample from the population"

## RANDOM SAMPLING

Any procedure from selecting members from a group on the basis of chance or Luck is called a Random Sampling.

PROCEDURE :- ☺

### Simple Random Sampling

A method of selecting items from a population so that every possible sample of a specified size has an equal chance of being selected.



### STRATIFIED RANDOM SAMPLING

In a stratified random sampling the population is first divided into sub groups, called strata and a random sample is taken from each stratum.



## DATA:-

Numbers or measurements that are collected as a result of observation -

## OBSERVATION:-

Anything that can be measured or observed is called an observation.

## TYPES OF DATA

- Quantitative data
- Qualitative data
- Discrete data
- Continuous data

### Quantitative data:-

Quantitative data are observations measured on a numerical scale.

### Qualitative data

Qualitative data are observations that are non-numerical.

## DISCRETE DATA

Data whose possible values are countable is called Discrete Data

## CONTINUOUS DATA

Data whose possible values are un-countable and which may assume any value in an interval, is called continuous data

## PRIMARY DATA

Primary Data are those which are collected for the first time and are original in nature -

## SECONDARY DATA

Data that are collected and compiled by any other source is called Secondary data -

## MEASURES OF LOCATION:-

### MEAN / ARITHMETIC MEAN

The mean of a set of data is found by adding up all the observations and dividing by the total number of observations.

#### FORMULA

$$\bar{x} = \frac{\sum x_i}{n}$$

where:-

$n$  = number of observation

The value of central data is called mean-  
measure of central tendency

### MEASURE OF CENTRAL TENDENCY

A descriptive measure that indicates the central position in a set of data is called measure of central tendency-

## QUESTION:- 1

Find mean of following data

$$\underline{x}$$

5

10

15

20

25

$$\text{Total} = 75$$

$$\bar{x} = \frac{\sum x_i}{n}$$

$$\bar{x} = \frac{75}{5}$$

$$\bar{x} = 15$$

## QUESTION:- 2

The marks obtained by 9 students  
are given below

45, 32, 37, 46, 39, 36, 41, 48, 36

Calculate A.M

$$\bar{x} = \frac{\sum x_i}{n}$$

$$\bar{x} = \frac{360}{9}$$

$$\boxed{\bar{x} = 40}$$

## QUESTION :- 03

Complete the mean of the following  
Sample Values:-

1.3, 7, 3.6, 4.1, 5

$$\bar{x} = \frac{\sum x_i}{n}$$

$$\bar{x} = \frac{\sum x_i}{n} \Rightarrow \frac{1.3 + 7 + 3.6 + 4.1 + 5}{5}$$

$$\bar{x} = \frac{21}{5} \Rightarrow 4.2$$

$$\boxed{\bar{x} = 4.2}$$

## QUESTION :- 04

The following table gives the hourly income of ten operators in a machine tool factory. Find A.M.

Name of operator	A	B	C	D	E	F	G	H	I	J
Income	12, 15, 18, 20, 25, 30, 22, 35, 37, 26									

Find Arithmetic mean

$$\bar{x} = \frac{\sum x_i}{n}$$

$$= \frac{12 + 15 + 18 + 20 + 25 + 30 + 22 + 35 + 37 + 26}{10}$$

$$\bar{x} = 240$$

10

$$\boxed{\bar{x} = 24}$$

## QUESTION :- 05

Find mean temperature of the following temperature recorded man experiment in the laboratory

81, 94, 64, 80, 75, 69, 96, 66, 80, 91  
85, 79

Find mean

$$\bar{x} = \frac{\sum x_i}{n}$$

$$= 81 + 94 + 64 + 80 + 75 + 69 + 96 + 66 + 80 + 91 + 85 + 79$$

12

$$= \frac{960}{12}$$

$$\boxed{\bar{x} = 80} \text{ Answer.}$$

## MEAN FOR GROUPED DATA

$$(2) \bar{X} = \frac{\sum f X}{\sum f}$$

(1)

Given below is the frequency distribution of number of apples on Hundred Apple Trees, Find The average number of apple per tree.

NO of Apple (x)	No of Frequency	fx
500	15	7500
550	25	13750
590	30	17700
620	20	12400
700	7	4900
740	3	2220
	100	<u>58470</u>

$$\bar{X} = \frac{\sum f X}{\sum f}$$

$$\bar{X} = \frac{58470}{100} \Rightarrow 584.7$$

(2)

Find mean of the following

Income (RS)	F	X	FX
35 - 39	13	$\frac{35+39}{2} = 37$	481
40 - 44	15	$\frac{40+44}{2} = 42$	630
45 - 49	28	$\frac{45+49}{2} = 47$	1316
50 - 54	17	$\frac{50+54}{2} = 52$	884
55 - 59	12	$\frac{55+59}{2} = 57$	684
60 - 64	10	$\frac{60+64}{2} = 62$	620
65 - 69	5	$\frac{65+69}{2} = 67$	335
	100		4950

$$(\therefore) \bar{X} = \frac{\sum FX}{\sum F}$$

$$\frac{4950}{100} \Rightarrow 49.5 \text{ Ans}$$

(3)

Calculate mean

Mark	F	X	FX
0 - 10	5	$\frac{0+10}{2} = 5$	25
10 - 20	12	$\frac{10+20}{2} = 15$	180
20 - 30	15	$\frac{20+30}{2} = 25$	375
30 - 40	25	$\frac{30+40}{2} = 35$	875
40 - 50	8	$\frac{40+50}{2} = 45$	360
50 - 60	3	$\frac{50+60}{2} = 55$	165
60 - 70	2	$\frac{60+70}{2} = 65$	130
	70		2110

$$\bar{X} = \frac{\sum f_x}{\sum f}$$

$$\bar{X} = \frac{2110}{70}$$

$$\boxed{\bar{X} = 30.14}$$

## MERITS OF ARITHMETIC MEAN

1- It is easy to calculate and simple to follow-

2- It is based on all observation-

3- It is least affected of by fluctuations of Sampling-

## DEMERITS OF ARITHMETIC MEAN

1- It cannot be computed if any item is missing.

2- It cannot average the ratios and percentage properly.

3- It is highly effected by the extreme value.

## MEDIAN:-

► Median is the middle most values after they have been ordered from Smallest to the Largest OR Largest to the smallest.

► If n is odd there is one term in the middle which is called Median - There is no formula for odd-

If n is even - the average of two values is called Median.

MEDIAN = Value of  $(\frac{n+1}{2})$ th value

## Example :- 1

The weight of 5 workers in the rupees are 1800, 1900, 1700, 2000 and 2200. Find the Median.

Convert value in ascending order

1700, 1800, 1900, 2000, 2200

Median is 1900.

## Example :- 2

The minimum temperature in the muzee for the first 10 days

of March -1, -2, 1, 0, 3, 3, 4, 3, 2, 6. Find Median:-

Solution:-

After arranging observations into ascending orders we get-

-2, -1, 0, 1, 2, 3, 3, 3, 4, 6

→ Median = Value of  $\left(\frac{n+1}{2}\right)$ th item

→ Value of  $\left(\frac{10+1}{2}\right)$ th item

## MEDIAN FOR GROUPED DATA

$$\text{Median} = l + \frac{h}{f} \left( \frac{n}{2} - C.F \right)$$

where

$l$  = Lower limit of median class

$h$  = size of the class interval of median class.

$f$  = Frequency of median class-

$n$  = Sum of frequency

↑ add

$C.F$  = Cumulative frequency of the class preceding the median class.

Find median from the following grouped data regarding heights of student in a college -

inches

Height

NO of stu..(F)

C.F

56-58

25

25 media class

58-60

40

$$25 + 40 = 65 \uparrow$$

60-62

250

$$65 + 250 = 315$$

62-64

130

445

64-66

60

505

66-68

20

525

$$n = \sum f = 525$$

Median = value of  $\left(\frac{n}{2}\right)^{\text{th}}$  item

= Value of  $\left(\frac{525}{2}\right)^{\text{th}}$  item

= 262.5<sup>th</sup> item

$l = 60$

$\downarrow$  Lower Limit of median class

$h = 2$

$f = 250$

$$\text{Median} = l + \frac{h}{f} (A - l)$$

$$= 60 + \frac{2}{250} (197.5)$$

$$= 60 + \frac{39.5}{250}$$

$$= 60 + 1.58$$

$$\boxed{\text{Median} = 61.58}$$