I - BBA

Mathematics and Statistics for Mgrs

UNIT-3

classification :-

classification is the process of arranging into groups or classes according to the common characteristics possessed by the individual items.

According to Stoekton and clark "The Process of grouping a large number of individual facts or observation on the basis of similarity among the items is called classification."

Objects of classification :-

* Mass data can be reduced and simplified.
* classification is a separation of similar things.
* It is the easy comparison of one class of data into another.
* This helps to studying the

relationship between various characteristics.

* It Means to assess data properly.

* This is a base of tabulation.

Data :-

* Geographical classification
* Chronoly classification
* Quality classification
* Quantity classification

GEOGRAPHICAL CLASSIFICATION

Eg:-

Region	No.of companys
West	xxx
North	xxx
East	xxx
South	xxx

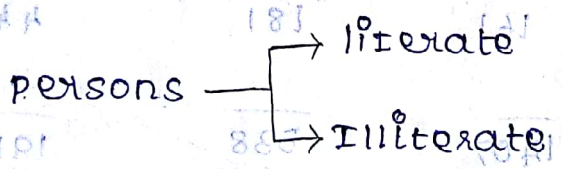
CHRONOLOGICAL CLASSIFICATION

Region	No. of companys
1990-1991	xxx
1991-1992	xxx
1992-1993	xxx
1993-1994	xxx
1994-1995	xxx
	xxx

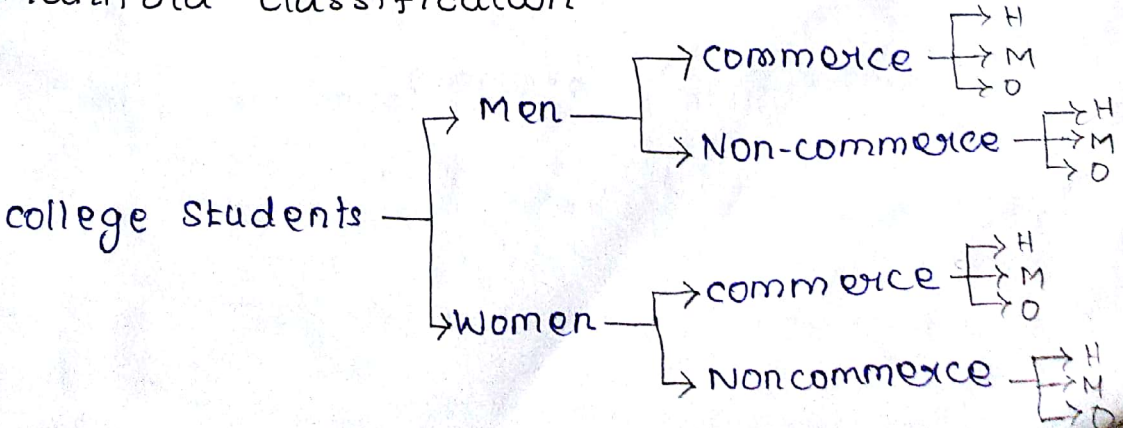
QUALITATIVE CLASSIPICATION

Gender	No. of companys
Male	xxx
Female	xxx
	xxx

a. simple classification



b. Manifold classification



QUANTITATIVE CLASSIFICATION

a. One Way

Marks	No. of students
0-39	124
40-49	471
50-59	908
60-100	442
TOTAL :	1945

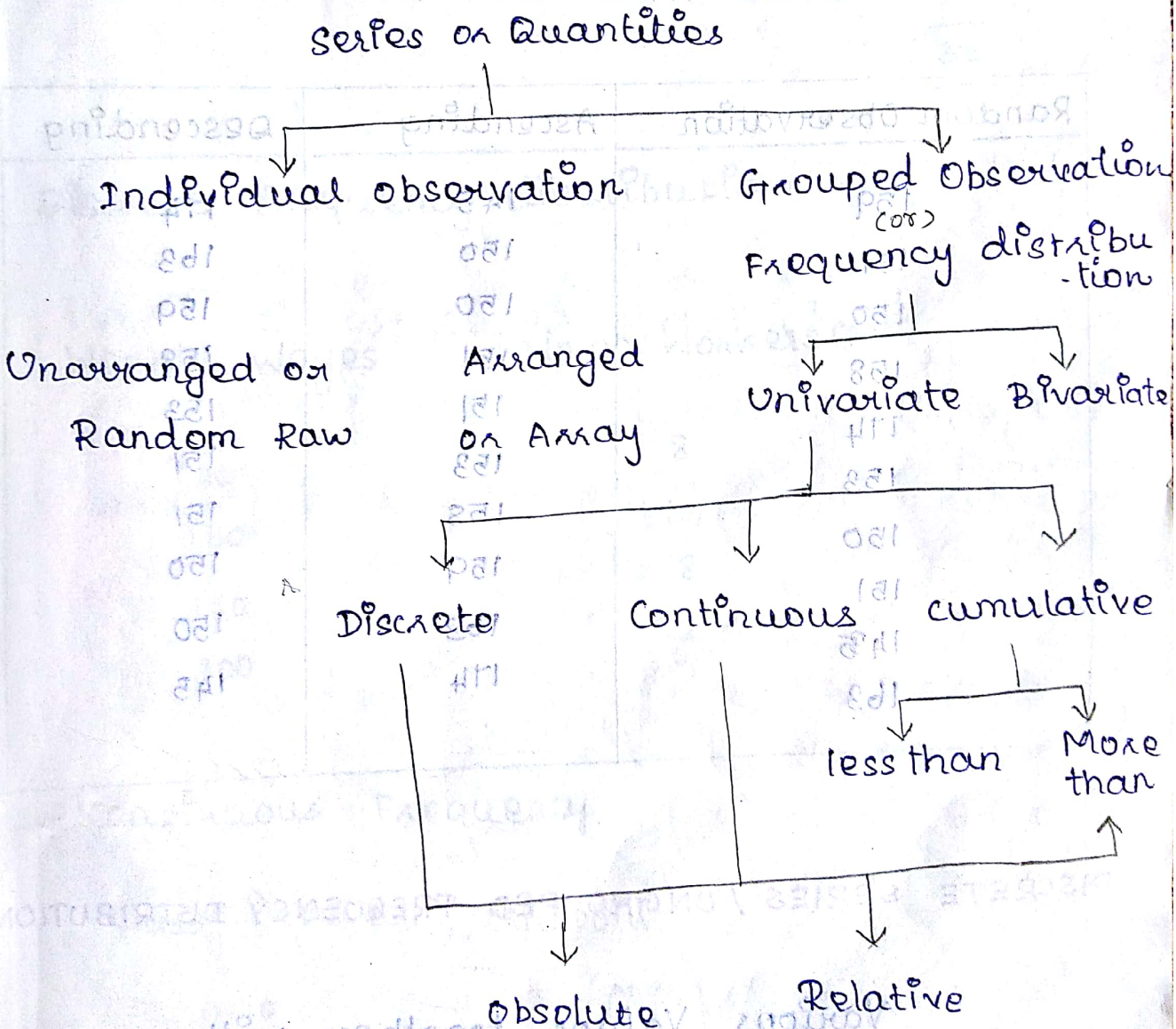
b. Two Way

Marks	No. of students		Total
	Male	Female	
0-39	123	1	124
40-49	314	157	471
50-59	709	199	908
60-100	161	181	442
	1407	538	1945

STASTICAL SERIES

Series Means a group of Quantities or Values

A series is used statistically, may be defined as things arranged according to some logical order.



ARRAY - Arrangement of data

A series of individual values in ascending or descending order is called Array.

Eg: Height of 10 students

159, 151, 150, 158, 174, 153, 150, 151, 145 163

Random Observation	Ascending	Descending
159	145	174
151	150	163
150	150	159
158	151	158
174	151	153
153	153	151
150	158	151
151	159	150
145	163	150
163	174	145

DISCRETE SERIES / UNGROUPED FREQUENCY DISTRIBUTI

Various values together with frequency (No. of times)

Eg: Weekly Wages of 30 workers

300, 240, 240, 150, 120, 120, 120, 150, 150, 240, 150, 240, 150, 150, 120, 300, 120, 150, 240, 150, 150, 120, 240, 150 240, 150, 120, 120, 240, 150

weekly wages	Tally Marks	frequency (f) No. of Workers
120	𝍸 III	8
150	𝍸 𝍸 II	12
240	𝍸 III	8
300	II	2
		30

Tally Bars

1) In a survay of 35 families in a village, the no. of children per family was recorded and the following data obtained

1	0	2	3	4	5	6
7	2	3	4	0	2	5
8	4	5	12	6	3	2
7	6	5	3	3	7	8
9	7	9	4	5	4	3

Represt the data in the form of describe frequency distribution

No. of children	Tally Bars	Frequency
0	II	2
1	I	1
2	IIII	4
3	IIII I	6
4	IIII	4
5	IIII I	5
6	III	3
7	IIII	4
8	II	2
9	II	2
10	0	0
11	0	0
12	I	1

Total = 35

2) Prepare a frequency distribution of the Marks obtained by 50 students in an examination with of each class intervals is 10. Use exclusive method of classification.

0-10 and 10-20 "10 is taken in 2nd term i.e. 10-20)

57	44	80	75	00	18	45	14	04	64
72	51	69	34	22	83	70	20	57	28
96	56	50	47	10	34	61	66	80	46
22	10	84	50	47	73	42	33	48	65
10	34	66	53	75	90	58	46	39	49

Inclusive → 0-10 & 10-20

"10 is taken in 1st order 0-10".

FREQUENCY DISTRIBUTION OF MARKS

EXCLUSIVE METHOD

Marks	Tally Bars	Frequency
0-10	II	2
10-20	𝍸	5
20-30	IIII	4
30-40	𝍸	5
40-50	𝍸 III	8
50-60	𝍸 III	8
60-70	𝍸 II	7
70-80	𝍸	5
80-90	IIII	4
90-100	II	2
	Total =	50

Tabulation of data :-

A table is a systamatic arrangements of data in columns and rows according to "karmel",

"A table summarizes the data by using columns and rows and entering figures in the body of the table".

Classification is the first step of tabulation.

Parts of table :-

* Table Number
* Title of the Table
* Caption - column heading
* Stub (row headings)
* body (Vital part Amnt)
* Headnote (Rs. 1000)
* footnotes (*)

Diagrams and graphs

1) "Stastical Results may be prescribed is through diagrams and graphs."

2) "They give a birds-eye view of the entire data"

3) "Diagrams helps in making quick and accurate comparison of data."

4)

Comparison of tables and diagrams

Table contain Quantity figures, diagrams are idea. Exact values are only read in table.

Types of Diagrams:-

i) One dimensional diagrams

Eg: Bar diagram

ii) Two dimensional diagrams

Eg: Rectangles, square and circles

iii) Three dimensional diagrams

Eg: cubes, cylinders, spheres

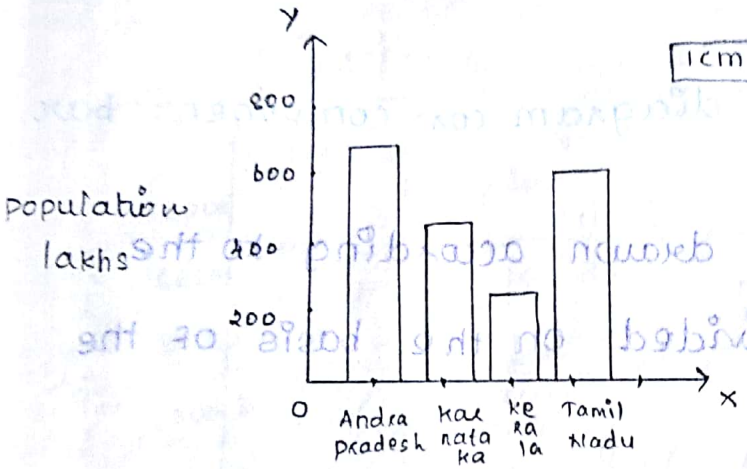
iv) Pictograms, cartograms

One Dimensional bar diagram

1. population of 4 souther states of India in 1991. Represent the data by suitable diagra

States	population (lakhs)
Andra pradesh	668
Karnataka	448
Kerala	290
Tamil Nadu	596

population in four southern states of India in 1991

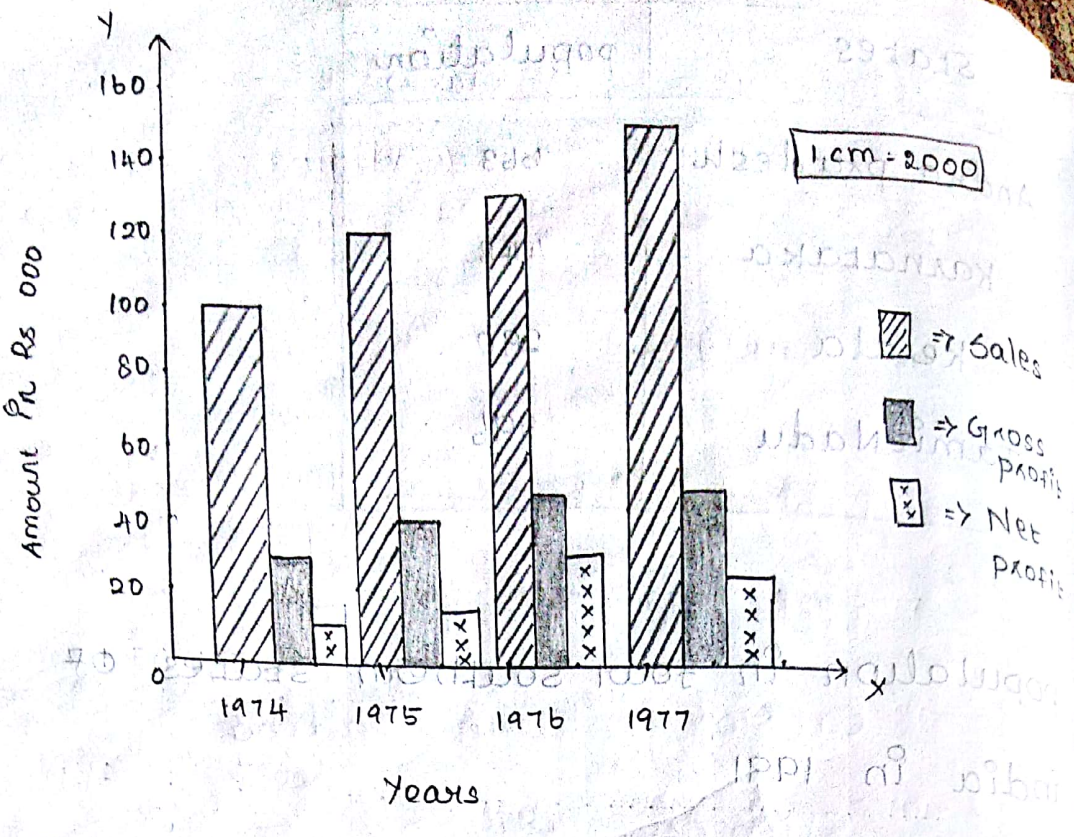


simple Bar diagram

Multiple Bar diagram :-

Draw the multiple bar diagram

year	(Rs in 000) sales	(Rs in 000) Grossprofit	(Rs in 000) Netprofit
1974	100	30	10
1975	120	40	15
1976	130	45	25
1971	150	50	25



Sub divided Bar diagram (or) component bar diagram :-

Each bar is drawn according to the total and sub divided on the basis of the components.

Each bar has no. of colours or designs.

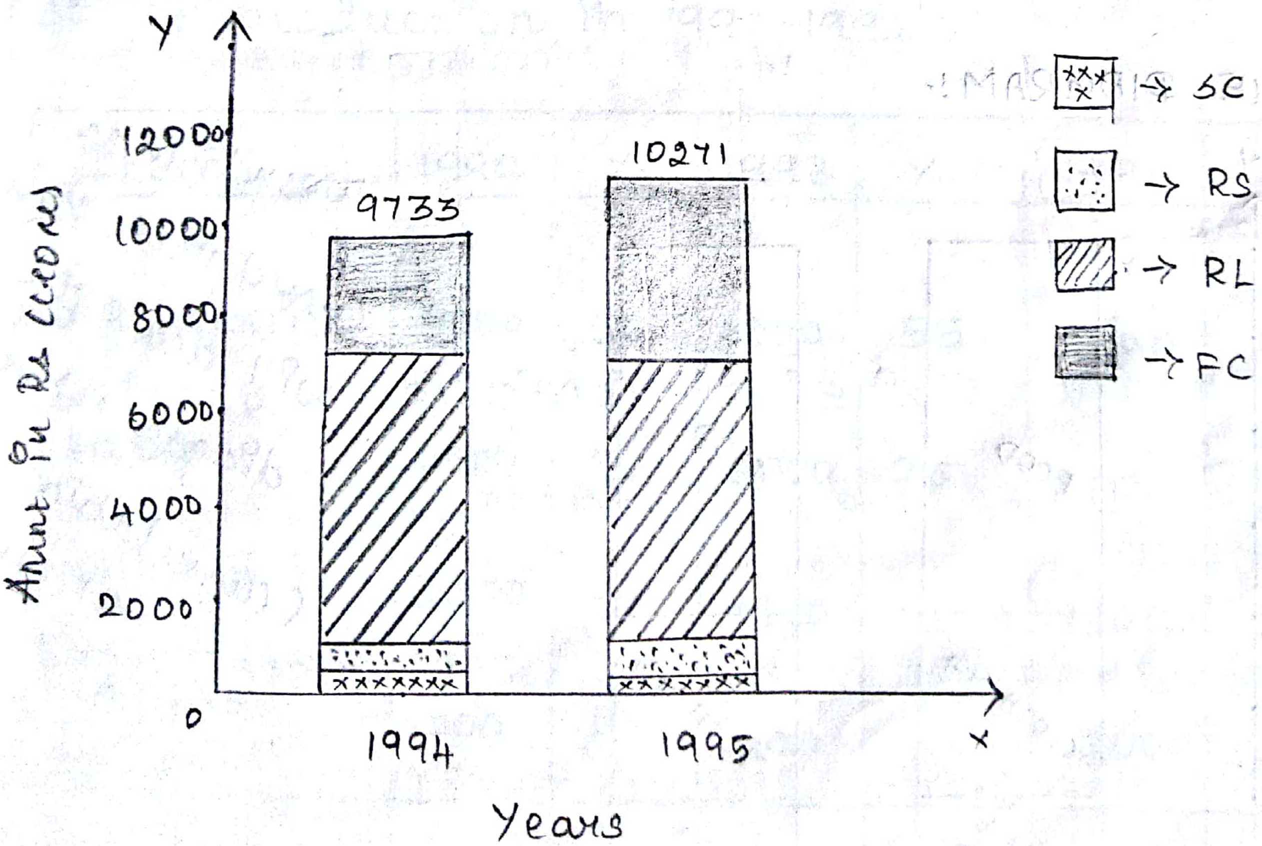
It is suitable for comparison among the absolute values.

PROBLEMS:-

1) The details of sources of funds of the IFCI on 31.03.94 and 31.03.95 are given below draw a suitable diagram.

Sources of funds	Amnt in crores	
	1994	1995
S. capital	339	352
Reserves & Smplus	998	1043
Rupee loans	5843	5614
Foreign currency loan	2553	3262
Total	9733	10271

Total value is given you will use this type.



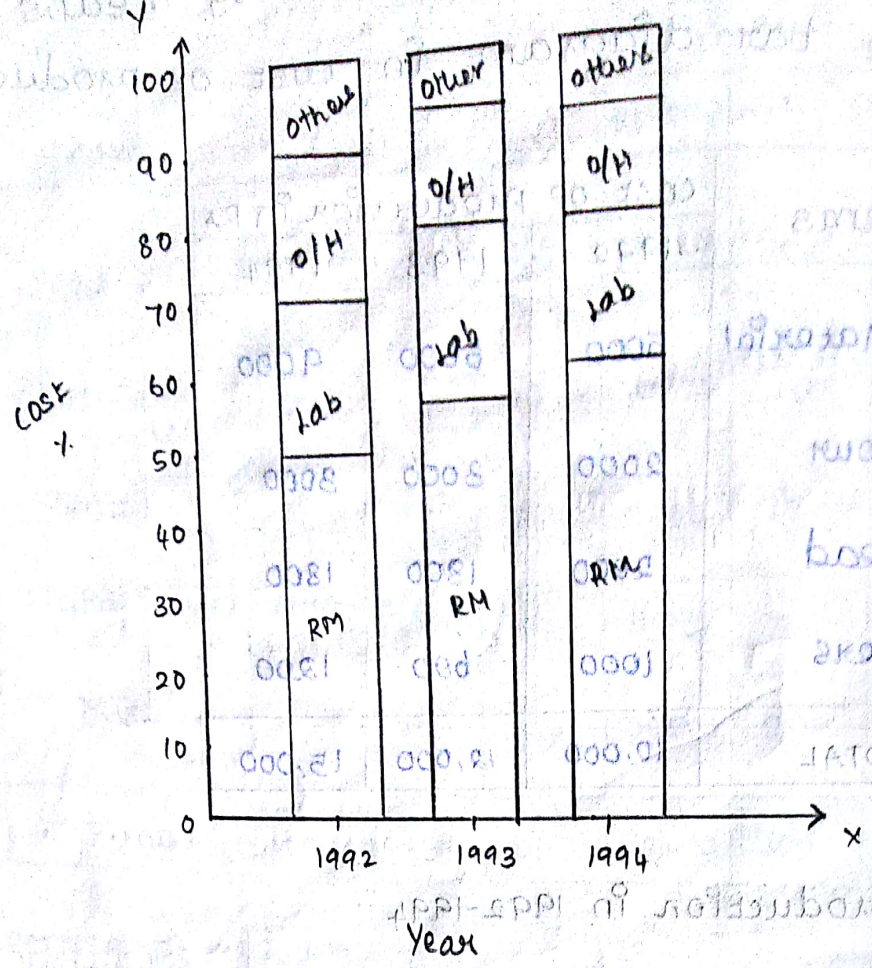
339
998
1337
5843
7180

3) Represent the following data by means of Percentage bar diagram in cost of production.

Items	Cost of Production in Rs		
	1992	1993	1994
Raw Material	5000	6600	9000
Labour	2000	3000	3000
Overhead	2000	1800	1800
Others	1000	600	1200
TOTAL	10,000	12,000	15,000

Cost of production in 1992-1994

Items	1992	%	1993	%	1994	%
Raw Material	5000	50	6600	55	9000	60
Labour	2000	20	3000	25	3000	20
Overhead	2000	20	1800	15	1800	12
Others	1000	10	600	5	1200	8
TOTAL	10,000	100	12,000	100	15,000	100



PIE DIAGRAM

It shows the percentage breakdown with the help of pie diagrams.

Eg: Government enperditure distributed in different departments.

The Model of pie diagram the total circle 360° slices cut from pie

PROBLEM 1:-

Draw a pie diagram for the following data of 6th five year plan in public sector.

i) Agricultural and rural developement - 12.9%

ii) Irrigation - 12.5%

iii) Energy - 27.2%

iv) Industry and Mineral - 15.4%

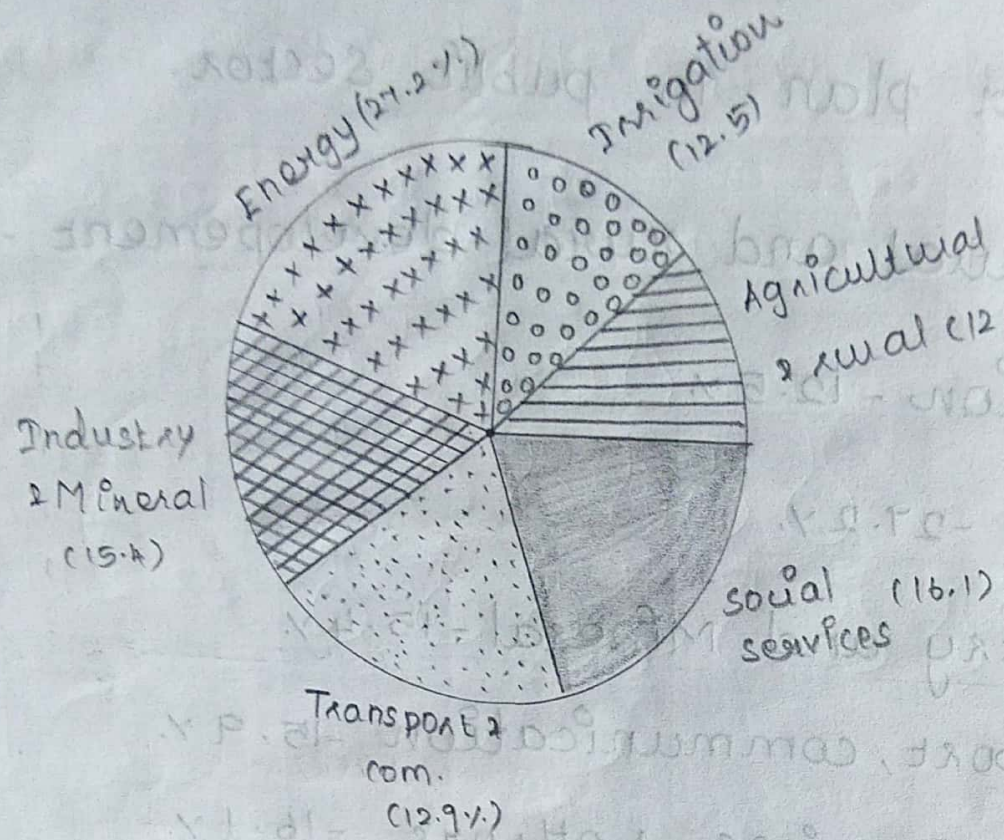
v) Transport, communication - 15.9%

vi) Social services & others - 16.1%

Computation for pie diagram				
Sector	%	Angle 360°	∠ in des. ord. sector	
Agriculture & Rural	12.9	12.9 × 3.6 = 46.44	Energy	98
Irrigation	12.5	12.5 × 3.6 = 45	soci. ser	58
Energy	27.2	27.2 × 3.6 = 98	Tra & com	57
Industry & Mineral	15.4	15.4 × 3.6 = 55	Ind. Mi	56
Transport & com.	15.9	15.9 × 3.6 = 57	Agri & Ru	46
social ser. & others	16.1	16.1 × 3.6 = 58	Irriga	45
Total	100.0	360°		360°

$$\text{Angle} = \frac{\%\text{ outlay}}{100} \times 360 = \frac{36}{10} = \%\ \times 3.6$$

Six-year plan - public sector outlays :-



MEASURES OF CENTRAL TENDENCY :-

An average is a value which is typical or representative of a set of data. Measures of central tendency gives a single representative Value for a set of usually unequal values. It is also called "Measures of Location".

Types :-

* Arithmetic Mean (AM)
* Median
* Mode
* Geometric Mean (GM)
* Harmonic Mean (HM)

Arithmetic Mean:-

It is the total of the values of the items divided by their number.

AM - is the abbreviation read $\bar{x}$ bar. It is also called Mean and average.

AM => Individual observation

$$AM (\bar{x}) = \frac{\Sigma x}{N}$$

AM => Discrete Distribution

$$\bar{x} = \frac{\Sigma fx}{\Sigma f}$$

Shortcut Method:-

$$\bar{x} = A + \frac{\Sigma fd}{\Sigma f}$$

AM => continuous series

$$\bar{x} = A + \frac{\Sigma fd}{\Sigma f} \times C$$

(Direct Method)

$$\bar{x} = \frac{\Sigma fm}{N\ (\Sigma f)}$$

SUM 1:

The expenditure of 10 families in Rs are given. below (compute the arithmetic mean)

Families	A	B	C	D	E	F	G	H	I	J
Expenditure	30	70	10	75	500	8	42	250	40	36

Family	Expenditure
A	30
B	70
C	10
D	75
E	500
F	8
G	42
H	250
I	40
J	36

$AM, \bar{x} = \frac{\Sigma x}{N(\Sigma f)}$ $\Sigma x = 106$

$N = 10$

$\bar{x} = 1061/10$

$\bar{x} = 106.1$

2) Compute the AM

Serial No:	1	2	3	4	5	6	7
Values:	19	20	21	23	18	25	26

N :→ How Many times)

Σx :→ Total Number.

S.No	values
1	19
2	20
3	21
4	23
5	18
6	25
7	26

$AM, \bar{x} = \frac{\Sigma x}{N}$ $\Sigma x = 152$

$N = 7$ (known)

$= \frac{152}{7}$

$\bar{x} = 21.7$

SUM 3:-

DISCRETE

The following data represents no. of refrigerator Sold In a Month BY some sales representative. calculate

AM :-

No. of Sales representa	10	13	15	22	24
No. of refrigerator sold	12	15	20	34	08

Sales Rep(x)	No. of ref. sold (f)	f(x) fx
10	12	120
13	15	195
15	20	300
22	34	748
24	08	192
	89	1555

$$\bar{x} = \frac{\Sigma fx}{\Sigma f}$$

[$\Sigma fx = 1555$

$\Sigma f = 89$]

$$= \frac{1555}{89}$$

$\bar{x} = 17.47$ or 17

SHORT CUT METHOD:-

Sales Rep x	No. of Ref. sold (f)	A=15 d = x-A	fd
10	12	(10-15) -5	-60
13	15	(13-15) -2	-30
15	20	(15-15) 0	0
22	34	(22-15) 7	238
24	08	(24-15) 9	72
	89	9	220

$$\bar{x} = A + \frac{\Sigma fd}{\Sigma f}$$

$A = 15$

$\Sigma fd = 220$

$\Sigma f = 89$

$$= 15 + \frac{220}{89}$$

$$= 15 + 2.47$$

$\bar{x} = 17.47$ or about 17

CONTINUOUS SERIES

SUM 5:-

calculate arithmetic mean for following data

Marks	20-30	30-40	40-50	50-60	60-70	70-80
No. of students	5	8	12	15	6	4

Marks	No. of Students (f)	Mid Value (M)	fm
20-30	5	25	125
30-40	8	35	280
40-50	12	45	540
50-60	15	55	825
60-70	6	65	390
70-80	4	75	300
	50	300	2460

$m = \frac{\text{Upp. lim} + \text{low. lim}}{2}$

$\bar{x} = \frac{\Sigma fm}{\Sigma f}$ Σfm Σf

$= \frac{2460}{50}$

$\bar{x} = 49.2$ or 49

SUM 6:-

Calculate AM :-

x	40-50	50-60	60-70	70-80	80-90	90-100
f	3	6	8	12	7	5

$M = \frac{1.1+0.1}{2}$ $\bar{x} = \frac{\Sigma fm}{\Sigma f}$

$\Sigma fm = 2955$

$\Sigma f = 41$

$= \frac{2955}{41}$

$\bar{x} = 72.07$ or 72

x	f	Mid value M	fm
40-50	3	45	135
50-60	6	55	330
60-70	8	65	520
70-80	12	75	900
80-90	7	85	595
90-100	5	95	475
	41		2955

SUM 11:-

The Mean marks of 100 students were found to be 40. Later on it was discovered that a score of 53 was misread as 83. Find the correct mean corresponding to the correct score.

$N = 100$, $\bar{x} = 40$, $\Sigma x = ?$ (Incorrect Σx)

Correct Σx = Incorrect Σx - Wrong item + correct item

$$\bar{x} = \frac{\Sigma x}{N}$$

$$40 = \frac{\Sigma x}{100}$$

$$\therefore \Sigma x = 4000$$

∴ Wrong Item = 83

∴ correct item = 53

$$= 4000 - 83 + 53$$

$$= 4000 - 30$$

∴ correct, $\Sigma x = 3970$

MEDIAN

"Middle value in a distribution"

Eg: Income of 5 employees 25900, 26900, 27200, 27020, 28280

Ascending order

Middle value

A.O :- 25900, 26900, 27020, 27200, 28280

Median : 27020

SUM ME 1 :-

Wages of 7 Workers. Find Median (wages in Rs.)

14100, 14150, 16080, 17120, 15200, 16160, 17400

AO : 14100, 14150, 15200, 16080, 16160, 17120, 17400

Median : 16080

EVEN NUMBERS

$$\text{size of } \frac{N+1}{2}^{\text{th}} \text{ item}$$

SUM ME 2 :-

The Monthly Income of 10 employees :-

14391, 15384, 25591, 15407, 16672, 26522, 16777, 26753, 27850, 37490

AO : 14391, 15384, 15407, 16672, 16777, 25591, 26522, 26753, 27850, 37490

(In table)

S.NO	AO
1.	14391
2.	15384
3.	15407
4.	16672
5.	16777
6.	25591
7.	26522
8.	26753
9.	26850
10.	37490

N = No. of item

size → Not by Number

$$\frac{N+1}{2}^{\text{th}}$$

$$\frac{10+1}{2} = 11/2 = 5.5$$

$$\frac{16777 + 25591}{2} = \frac{42368}{2}$$

∴ Ans = 21184

∴ Median = 25591 lies

DISCRETE SERIES (EN)

CF

5	5
10	15
12	27
20	47

→ Ascending order

→ cumulative frequency (CF)

→ size of $\frac{N+1}{2}^{th}$ item or Next bigger Number

SUM NE3 :- (discrete series)

From the following data find the value of Median

Income (Rs)	15000	15500	16800	18000	18500	17800
No. of persons	24	26	16	20	6	30

Income	No. of person	CF
15000	24	24
15500	26	50 (24+26)
16800	16	66 (50+16)
17800	30	96 (66+30)
18000	20	116 (96+20)
18500	06	122 (116+6)

Median = size of $\frac{N+1}{2}^{th}$ ∴ N=122

= size of $\frac{122+1}{2}$

= size $\frac{123}{2}$

= 61.5 (Choose the no. in CF)

∴ Median = Rs. 16,800

CONTINUOUS SERIES:-

SUM NE4 :-

calculate the median from the following series

Marks	145-150	150-155	155-160	160-165	165-170	170-175
No. of students	2	5	10	8	4	1

$$\text{Median} = L + \left(\frac{N/2 - CF}{f} \times i\right)$$

Height (cms)	No. of students	CF
145-150	2	2
150-155	5	7
155-160	10	17
160-165	8	25
165-170	4	29
170-175	1	30

$N/2 = 30/2$, $i = 5$, $f = 10$, $L = 155$, $CF = 7$

$N/2 = 15$

$= 155 + \left(\frac{15-7}{10}\right) \times 5$

$= 155 + \left(\frac{8 \times 5}{10}\right)$

$= 155 + \frac{40}{10} = 155 + 4$

$= 159$

Median = 159 cms

CONTINUOUS SERIES :-

- → class in intervals check, ascending order
- → Find "less" than CF (CF find pani vra ans-oda less value edukkanum)
- → calculate N/2
- → Identify L, f, i and CF
- → Substitute the formula
- → Find M. (M → Median)

L → Lower limit

f → Frequency

i → intervals.

MEDIAN

$$L + \frac{N/2 - CF}{f} \times i$$

SUM ME5:-

Calculate the Median

Marks	10-25	25-40	40-55	55-70	70-85	85-100
Freque	6	20	44	26	3	1

Marks	Freque	CF
10-25	6	6
25-40	20	26
40-55	44	70
55-70	26	96
70-85	3	99
85-100	1	100

$$\text{Median} = L + \left(\frac{N/2 - CF}{f} \times i \right)$$

$N/2 = \frac{100}{2}$

$N/2 = 50$

$CF = 26$

$F = 44$

$i = 15$

$L = 40$

$= 40 + \left(\frac{50 - 26}{44} \times 15 \right)$

$= 40 + \frac{24 \times 15}{44}$

$= 40 + 8.18$

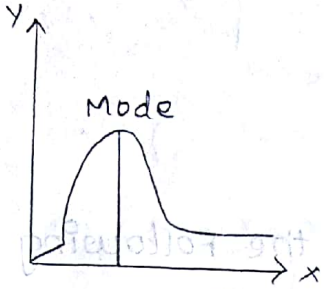
$\therefore$ Median $= 48.18$ (or) 48

MODE

The mode is the most frequently repeat occuring value in a set of observation.

EX: 5, 6, 3, 4, 5, 2, 5 and 3 **Mode = 5**

With diagram 2m



Discrete series

The highest value of corresponding frequency.

continuous series

$$\text{Mode} = L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i \text{ or } c$$

(OR)

$$\text{Mode} = L + \frac{\Delta_1}{\Delta_1 + \Delta_2} \times i \text{ or } c$$

SUMMO 1 :-

From the following samples find the mode

5, 3, 6, 5, 4, 2, 8, 6, 5, 4, 8, 5, 6, 5, 4, 8, 2, 4, 5

Mode = 5 (6 times)

SOM MO2 :- Find Mode :-

size	5	6	7	8	10
Frequency	15	20	30	25	08

x	5	6	7	8	10
f	15	20	30	25	08

→ Find highest Frequency → 30

→ Select corresponding x - 7

∴ Mode : 7

SUM MOS:-

calculate the mode for the following distribution

No. of Wages	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Fre	4	8	18	30	15	10	8

Wages	Fre
0-10	4
10-20	8
20-30	18 → f_0
30-40	30 → f_1
40-50	15 → f_2
50-60	10
60-70	8
70-80	7

Find Highest Frequency

$$\text{Mode} = L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

$\therefore f_1 = 30$
$f_0 = 18$
$f_2 = 15$
$i = 10$
$L = 30$

$$= 30 + \frac{30-18}{(2\times 30) - 18 - 15} \times 10$$

$$= 30 + \frac{12}{60 - 33} \times 10$$

$$= 30 + \frac{12 \times 10}{27} = 30 + \frac{120}{27}$$

$$= 30 + 4.44$$

∴ Mode = 34.44

choose the highest frequency f_1 and related x is called L.

Upper number of $f_1 \rightarrow f_0$

SOM MO4 :-

compute the Mode of the following distribution

x	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
f	20	24	32	28	20	16	37	10	8

x	F
0-5	20
5-10	24
10-15	32
15-20	28
20-25	20
25-30	16 $\rightarrow F_0$
30-35	37 $\rightarrow F_1$
35-40	10 $\rightarrow F_2$
40-45	8

$$\text{Mode} = L + \frac{F_1 - F_0}{2F_1 - F_0 - F_2} \times i$$

$$= 30 + \frac{37-16}{(2\times 37)-16-10} \times 5$$

$$= 30 + \left[\frac{21 \times 5}{74-26}\right] \times 5$$

$$= 30 + \frac{105}{48}$$

$$= 30 + \left(\frac{21}{48}\right) \times 5$$

$$= 30 + (0.43 \times 5)$$

$$= 30 + 2.187$$

$$\therefore \text{Mode} = 32.187$$