Statistics

classmate
Date 15/02/22
Page 55

Definition.

It is the study of the collection analysis representation and organization of data.

Data:

eg:→ Market, Price list, Mark sheet.

Representation of Data.

We can represent data by various way like :-

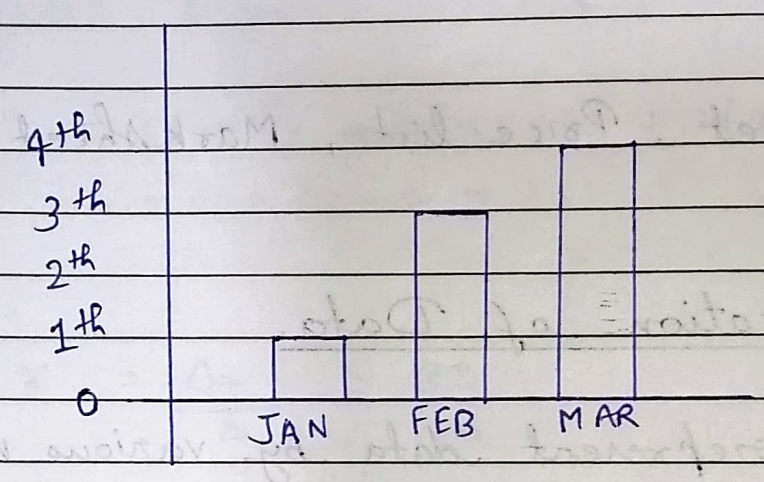
1. Table
2. Bar graph
3. Histograph
4. Frequency polygon
5. Pie chart.

1 ~~Pie chart~~. Table.

x	f
8	3
15	5
18	7

2. Bar graph

Manufacture of medicine in companies

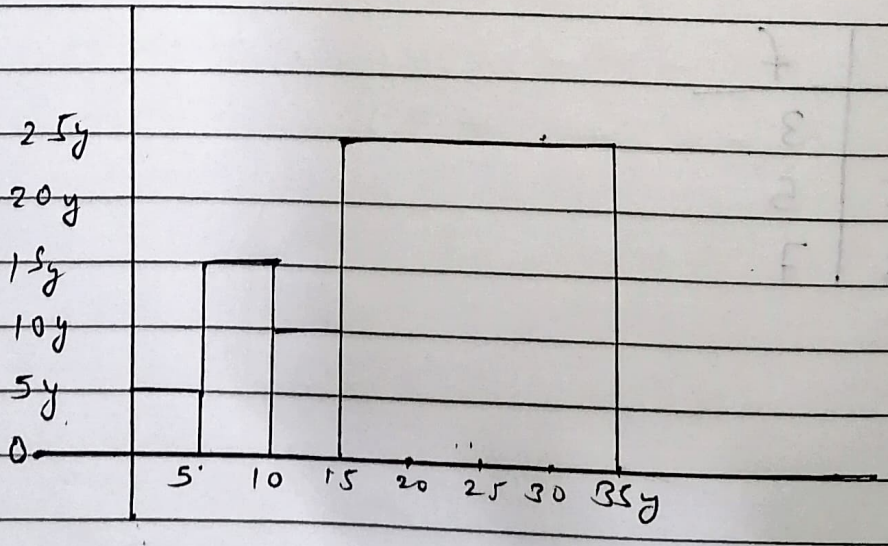


Note:

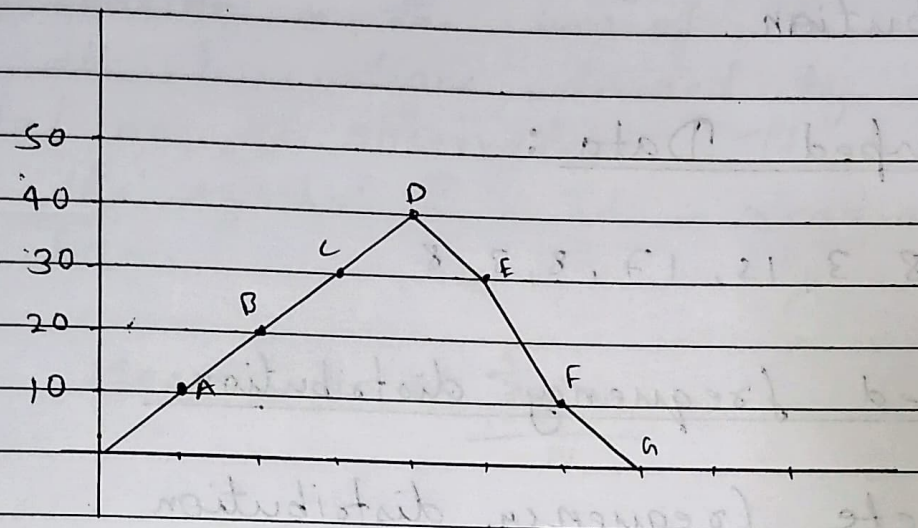
Breadth are same are called bar graph.

3. Histogram

Population in village



4. Frequency polygon



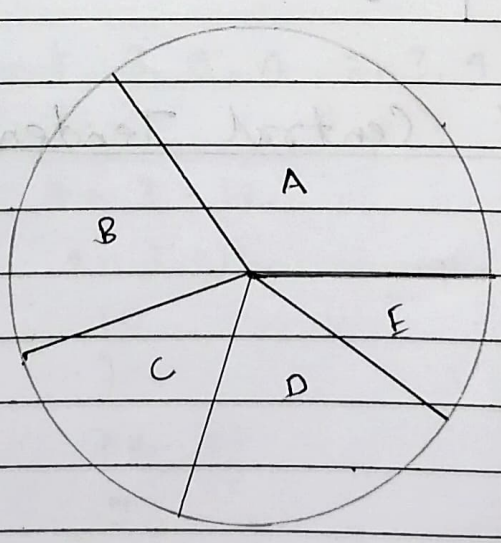
5. Pie Chart

Food items

A.

A.) Orange	- 35%	→	126°
B.) Mango	- 20%	→	72°
C.) Grapes	- 15%	→	54°
D.) Apples	- 20%	→	72°
E.) Extra	- 10%	→	36°

Degree = $\frac{\text{value}}{\text{Total value}} \times 360°$



Types of frequency Distribution

There are two types of frequency distribution.

1. Ungrouped Data :

Ex :- 8, 3, 15, 17, 8, 3, 8

2. Grouped frequency distribution.

a) Discrete frequency distribution

eg.

x_i	Fi
8	18
3	5
10	15

b) Continuous frequency distribution

eg.

C.I.	F
0-5	1
5-10	4
10-15	6

Measures of Central Tendency

1. Mean
2. Mode
3. Median

1. Mean

The mean (average) of a number of observation is the sum of the value of all observations divided by the total no. of observations. It is denoted by the symbol $\bar{x}$. It is read as x bar.

$$\text{Mean } (\bar{x}) = \frac{\sum_{i=1}^{n} x_i}{N}$$

Ex:

Q. Marks score in exam by 5 students 40, 50, 75, 80, 95.

$$\text{Mean} = \frac{\text{Sum of total obs.}}{\text{No. of obs.}}$$

$$\frac{\sum_{i=1}^{n} x_i}{N} = \frac{40+50+75+80+95}{5} = \frac{340}{5} = 68$$

Q. 4, 5, 3, 8, 7, 3, 9, 4, 8, 3, 4, 5, 3, 8.

Ans.

x_i	F_i	$F_i x_i$
3	4	$4 \times 3 = 12$
4	3	$4 \times 3 = 12$
5	2	10
7	1	7
8	3	24
9	1	9

$$\text{Mean } (\bar{x}) = \frac{\sum_{i=1}^{n} f_i x_i}{\sum f_i}$$

$$\bar{x} = \frac{12+12+10+7+29+9}{4+3+2+1+3+1}$$

$$= \frac{74}{14} = 5.28 \text{ Ans}$$

20/02/22

Mode.

Mode of the group of observation is the variable that occurs most foreqeuny in the distribution.

It is denoted by . Mo.

Modal class.

The maximum frequency is called Modal class.

eg. The given observations are 8, 5, ③, 6, ③, 8, 9, ③, 5, 6, ③

Mo = 4 Ans.

$$M_o = l + \left(\frac{F_1 - F_0}{2F_1 - F_0 - F_2}\right) \times h$$

Where,

l = lower limit of modal class.
h = size of class interval.
F_1 = Frequency of modal class.
F_0 = Frequency of the class preceeding.
F_2 = Frequency of the class succeeding the modal class.

Q. A survey conducted on 20 households in a locality by a group of students ~~servel~~ resulted in the following frequency table of the number of family member in a household.

Family size	1-3	3-5	5-7	7-9	9-11
No. of families	7	8	2	2	1

Find the mode of this data.

⇒

F_i	x_i	$F_i x_i$
7	2	14
8	4	32
2	6	12
2	8	16
1	10	10
20		84

higher frequency = (3-5)

$$\text{Mean} = \frac{\sum F_i x_i}{\sum F_i} = \frac{84}{20} = 4.2$$

Then,

Modal class $= (3-5)$

$h = 2$

$l = 3$

$F_1 = 8$

$F_0 = 7$

$F_2 = 2$

$$M_o = l + \left(\frac{F_1 - F_0}{2F_1 - F_0 - F_2}\right) \times h$$

$$= 3 + \left(\frac{8-7}{16-7-2}\right) \times 2$$

$$\Rightarrow 3 + \frac{1}{7} \times 2$$

$$= \frac{23}{7} = 3.28$$

Median.

Median of group of observations is the value of observation is divides the group into two equal parts.

i) Data:

Arrange in ascending order.

ii) Find the number of observation.
If n is odd,

$$\text{median} = \frac{(n+1)^{th}}{2} \text{ observation}$$

Q. 12, 16, 12, 18, 38, 15, 36, 12, 14.

⇒ In ascending order the obs.

12, 12, 12, 14, 15, 16, 18, 36, 38

$n = 9$.

$$\text{Median} = \frac{(n+1)^{th}}{2} \text{ obs} = \left(\frac{9+1}{2}\right) \text{ obs.}$$

$$= \left(\frac{10}{2}\right)^{th} \text{ obs} = 5^{th} \text{ obs.}$$

$= 14$ Ans.

If n is Even.

$$\text{Median} = \frac{\left(\frac{n}{2}\right)^{th} \text{ obs} + \left(\frac{n}{2}+1\right)^{th} \text{ obs}}{2}$$

Q. 8, 3, 5, 13, 10, 9, 5, 7.

In ascending order

3, 5, 3, 7, 8, 9, 10, 19

$\therefore n = 8$

$$\text{Median} = \frac{\left(\frac{8}{2}\right)^{th} \text{ obs} + \left(\frac{8}{2}+1\right)^{th} \text{ obs.}}{2}$$

$$= \frac{4^{th} \text{ obs} + 5^{th} \text{ obs}}{2}$$

$$= \frac{7+8}{2}$$

$$= \frac{15}{2}$$

$$= 7.5$$

If given question in class interval!

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

where,

The median class is just greater than or equal to cumulative frequency $\frac{N}{2}$.

where,

l = lower limit of median class.
n = number of observations
C.F. = Cumulative frequency of class preceeding the median class.

f = frequency of median class.
h = class size (assuming class size to be equal).

Ex. 14.3

Q.

Monthly consumption (units)	x_i	No. of consumer	F_i	C.F.
65-85	75	4	300	4
85-105	95	5	475	9
105-125	115	13	1495	22
125-145	135	20	2700	42
145-165	155	14	2170	56
165-185	175	8	1400	64
185-205	195	4	780	68

$\frac{N}{2} = \frac{68}{2} = 34$

Median class > 34.

• Median class = 125 - 145

$l = 125, \frac{N}{2} = 34, CF = 22, f = 20, h = 20.$

$\text{Median} = 125 + \left(\frac{34-22}{20}\right) 20.$

$= 125 + 12 = 137$ Ans

$\text{Mode} = l + \left(\frac{f_i - f_0}{2f_i - f_0 - f_2}\right) \times h$

$= 125 + \left(\frac{20-13}{40-13-14}\right) \times 20$

$= 125 + \frac{7}{13} \times 20.$

$= 125 + 10.7$

$= 135.7$

Relation between three measures of central tendency (mean, mode, median).

3 Median = Mode + 2 Mean

Q.

C. I.	F_i	x_i	$F_i x_i$
0-10	5	5	25
10-20	3	15	45
20-30	6	25	150
30-40	4	35	140
40-50	1	45	45

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{405}{15} = 21.3 \quad \text{Ans}$$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h.$$

$$= 20 + \left(\frac{6 - 3}{12 - 3 - 4}\right) \times 10.$$

$$= 20 + \frac{3}{5} \times 10$$

$$= 26 \quad \text{Ans}$$

$$3 \text{ Median} = \text{Mode} + 2 \text{ Mean}$$

$$\therefore \text{Median} = \frac{26 + (21.3) \times 2}{3} = \frac{26 + 42.6}{3} = 22.8$$