BSc. VI Sem: Frequency Table

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Frequency table

- It is a grouping of data/numbers representing variables (characters)according to value of the data.
- It is a way of placing variables (difference in score/numbers) with a close values in a same group.
- Keeping of individual score/data in a familiar group/class
- Classification of data according to homogeneity.
- When homogeny data are presented in tabular form it is called frequency table.

Remark: for easy handling of data, Class intervals should in in between 5-20 or multiples of 5

3.2 Frequency Table or Frequency Distribution

Suppose there are 50 students in a class. Their heights in centimetres are given below :

105, 101, 101, 109, 103, 122, 103, 104, 102, 101, 105, 103, 106, 119, 120, 116, 115, 119, 118, 122, 109, 108, 107, 106, 105, 104, 103, 102, 106, 103, 109, 117, 114, 120, 122, 107, 116, 113, 119, 116, 101, 115, 110, 122, 107, 108, 105, 106, 101, 117.

The data given in the above form is **ungrouped data**. Therefore, to avoid confusion, we first of all write them in the ascending or the descending order. Arranging the above data in ascending order, we get

Array

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101, 101, 101, 101, 101, 102, 102, 103, 103, 103, 103, 103, 104, 104, 105, 105, 105, 105, 106, 106, 106, 107, 107, 107, 108, 108, 109, 109, 109, 110, 113, 114, 115, 115, 116, 116, 116, 116, 117, 117, 118, 119, 119, 119, 120, 120, 122, 122, 122, 122, 122.

We call this way of arrangement **array** and the data are said to be **arrayed**. To make the work easier, we can further group these figures and form a table.

Ungrouped data

3.2 Frequency Table or Frequency Distribution

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Arrayed data

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Frequency table/frequency distribution

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TABLE I

Heights (in cm)	*No. of students*	*Heights (in cm)*	*No. of students*
101	5	110	1
102	2	113	1
103	5	114	1
104	2	115	2
105	4	116	4
106	3	117	2
107	3	118	1
108	2	119	3
109	3	120	2
		122	4

The method of arranging the given data in the above form is known as **frequency distribution**. Here heights are called **variates** and the number of students whose heights are a particular number of centimetres is called **frequency of the variate**. Thus frequency is the number of times a variate has been repeated. Though the frequency table given above is an improvement over the arranged data, yet we can further simplify it by classifying it into groups :

Further simplification of the same data into groups called Group frequency table/grouped frequency distribution.
(in this table we can have 5 frequency of variates:
(101=lower limit,
105 =upper limit
of exclusive class interval of 101to 105.)

TABLE II

Heights (in cm)	*No. of students*
101-105	8
106-110	12
111-115	4
116-120	12
121-125	4
	50

Where do we place if a student's height is 105.5 ?

- use Including frequency table for such case

Exclusive vs Inclusive distribution

Exclusive/discontineous frequency distribution

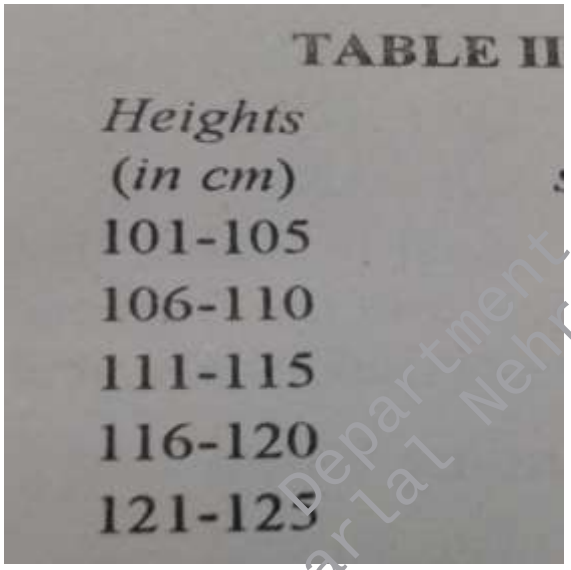


TABLE II

Heights (in cm)
101-105
106-110
111-115
116-120
121-125

Inclusive/contineous frequency distribution

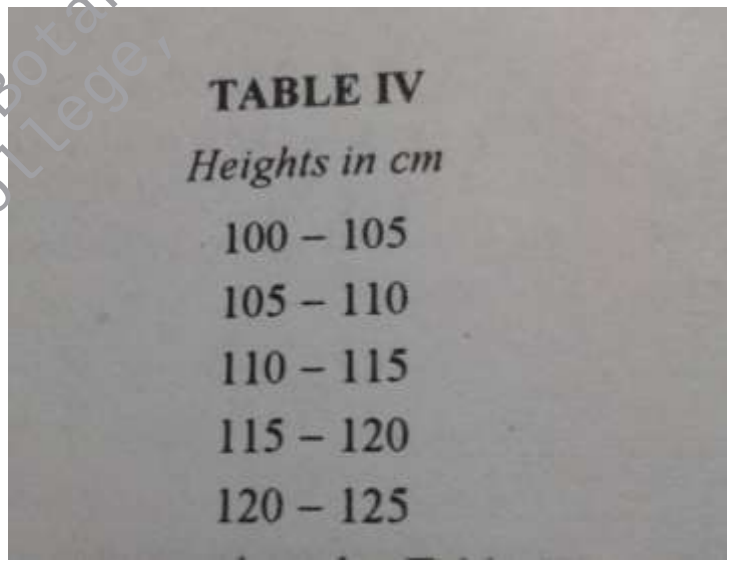


TABLE IV

Heights in cm
100 – 105
105 – 110
110 – 115
115 – 120
120 – 125

3.3 Preparation of a Frequency Table

(*i*) Arrange the scores or form an array.

(*ii*) Draw a table consisting of three columns :

(*a*) Class-interval, (*b*) Tally, (*c*) Frequency.

(*iii*) Bearing in mind the lower and the upper limits, write down the class–intervals or the variables in the first column.

(*iv*) Against each interval or the variable, write down as many vertical lines in the "Tally column" as the number of scores it contains.

(*v*) Count the number of vertical lines, crossing of 4 lines to be counted as 5 and put down the number in the 'frequency column'.

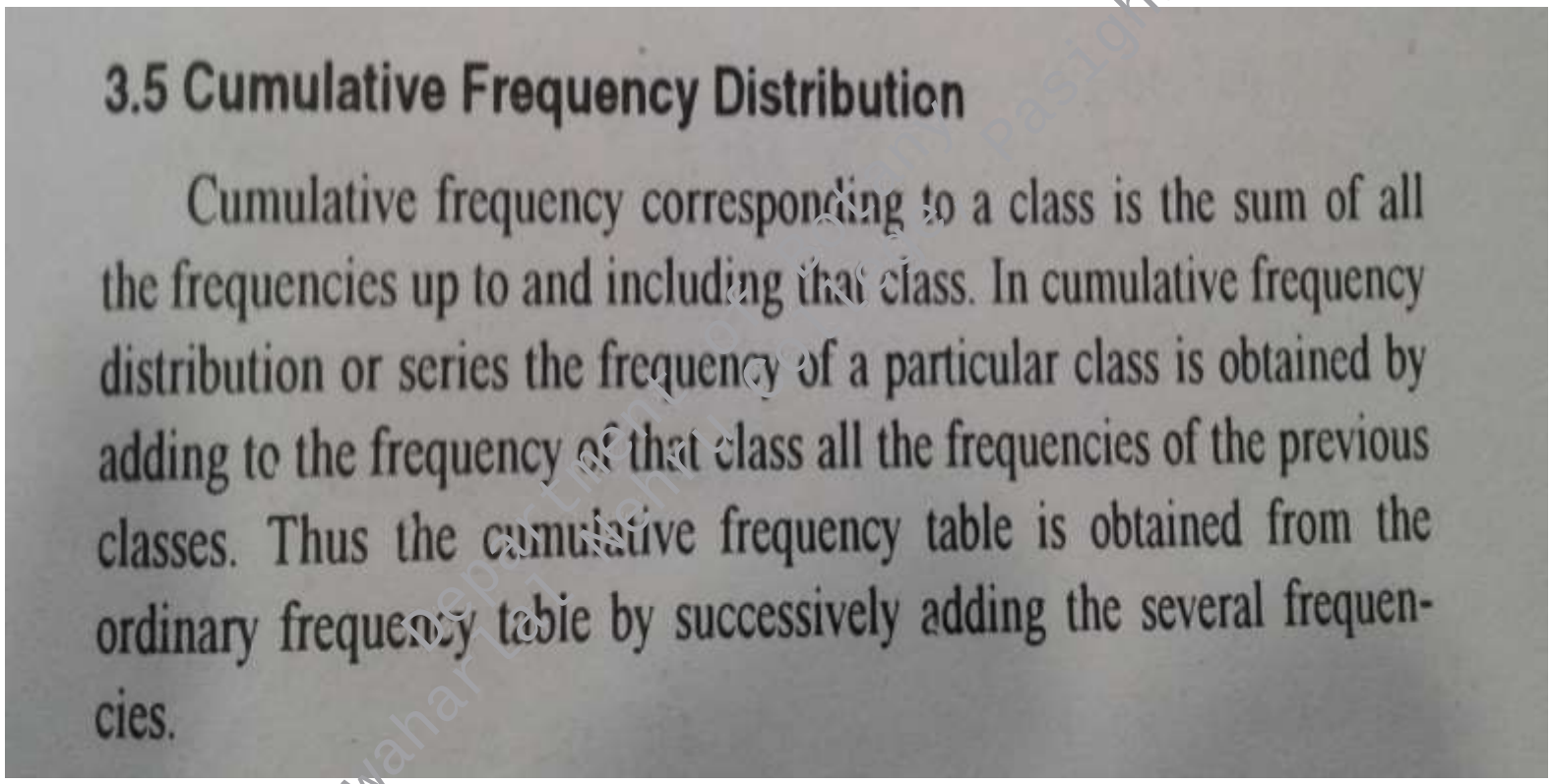
Note : The total of the frequency column must be equal to the total number of items of the given data.

We have discussed/seen

- 1. Frequency table

- Lets understand commutative frequency, which is simply a summation of frequency

summation



3.5 Cumulative Frequency Distribution

Cumulative frequency corresponding to a class is the sum of all the frequencies up to and including that class. In cumulative frequency distribution or series the frequency of a particular class is obtained by adding to the frequency of that class all the frequencies of the previous classes. Thus the cumulative frequency table is obtained from the ordinary frequency table by successively adding the several frequencies.

example

Example 3. *The marks obtained by 35 students of 11th class of a Government school are :*

628, 665, 560, 328, 421, 525, 326, 480, 470, 405, 421, 664, 668, 620, 300, 305, 520, 420, 370, 326, 440, 328, 480, 565, 650, 480, 360, 325, 450, 360, 426, 440, 306.

Form a cumulative frequency table with class interval of 50.

Solution. Let us arrange the given data in the ascending order of the magnitudes.

300, 305, 306, 325, 326, 326, 328, 328, 360, 360, 360, 370, 405, 420, 421, 421, 426, 426, 440, 440, 450, 470, 480, 480, 480, 520, 525, 560, 565, 620, 628, 650, 664, 665, 668.

Let us now put them in a group of class interval 50 in the following cumulative frequency distribution form :

Class interval	*Frequency*	*Cumulative Frequency*
300 — 350	8	8
351 — 400	4	12
401 — 450	9	21
451 — 500	4	25
501 — 550	2	27
551 — 600	2	29
601 — 650	3	32
651 — 700	3	35

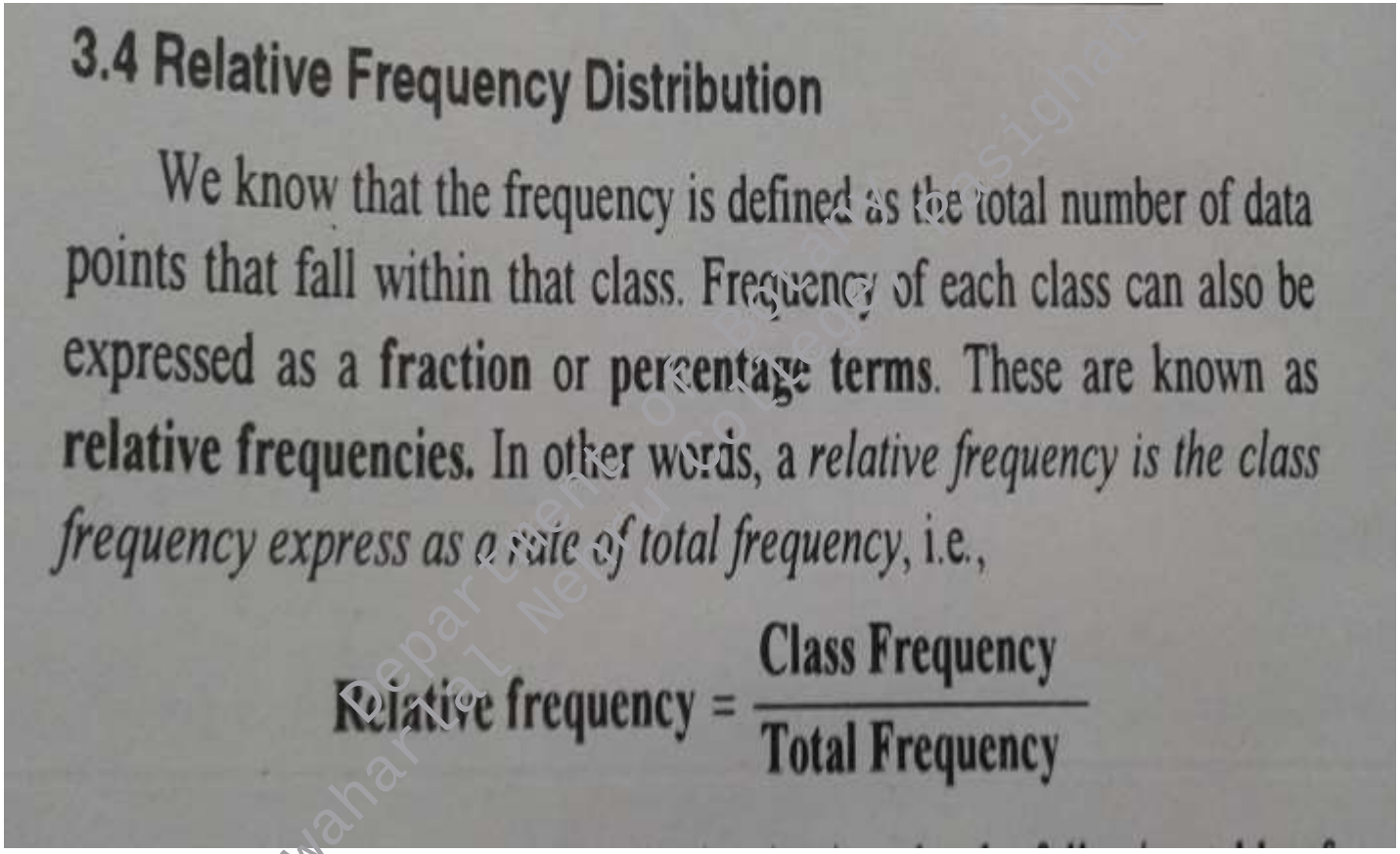
We have discussed/seen

- 1. Frequency table
- 2. commutative frequency, which is simply a summation of frequency.

Now:

- 3. lets understand percentage/relative frequency or how much the frequency relate one another.

percentage



3.4 Relative Frequency Distribution

We know that the frequency is defined as the total number of data points that fall within that class. Frequency of each class can also be expressed as a **fraction** or **percentage terms**. These are known as **relative frequencies.** In other words, a *relative frequency is the class frequency express as a rate of total frequency*, i.e.,

$$\text{Relative frequency} = \frac{\text{Class Frequency}}{\text{Total Frequency}}$$

A relative frequency distribution is given by the following table of marks secured by 25 students out of 100.

TABLE : Relative Frequency Distribution for the Collection Days

Class (Marks)	*Frequency (No. of students)*	*Relative frequency*
20 — 40	6	6/25 = 0.24 or 24%
40 — 60	12	12/25 = 0.48 = 48%
60 — 80	4	4/25 = 0.16 = 16%
80 — 100	3	3/25 = 0.12 = 12%
Total	25	1.00 or 100%

It may be observed that the sum of all relative frequencies is 1.000 or 100 per cent because the frequency of each class has been expressed as a percentage of the total frequencies. (or data)

We have discussed/seen

- 1. Frequency table
- 2. commutative frequency, which is simply a summation of frequency.
- 3. I percentage/relative frequency or how much the frequency relate one another.

histogram

- Histogram is represented by a rectangular bar to depict frequency distribution.
- Size of the class interval is represented by width
- Size of the frequency is represented by height.
- Class boundaries/intervals is important in the construction of histogram and represent in horizontal or X axis of the graph.
- Frequency is represented as height in the graph on Y axis.
- Histogram is essentially an area diagram composed of series of adjacent rectangles.

Steps/procedure of histogram

age	10-19	20-29	30-39	40-49
No. of class	1	0	1	10

- If data is given in exclusive series, convert data into inclusive series.
- It is customary to take two extra class intervals one below and another above the given class.

age	9.5-19.5	19.5-29.5	29.5-39.5	39.5-49.5
No.of class	1	0	1	10

- Take actual lower limit of class intervals and plot it in X axis
- Then take the corresponding frequency and construct graph by joining lower and higher limit of class interval and frequency of that class intervals.

Example of inclusive data

Inclusive series

Age	10–19	20–29	30–39	40–49
Frequency	2	7	5	8

Convert inclusive data into exclusive data

Exclusive Series:

Age (class interval)		Size of interval	Frequency	Frequency density
Score limit	True limit			
10–19	9.5–19.5	10	2	$\frac{2}{10} = 0.2$
20–29	19.5–29.5	10	7	$\frac{7}{10} = 0.7$
30–39	29.5–39.5	10	5	$\frac{5}{10} = 0.5$
40–49	39.5–49.5	10	8	$\frac{8}{10} = 0.8$

(*ii*) The scores in the form of actual class limits

Draw graph

Exclusive Series:

Age (class interval)		Size of interval	Frequency	Frequency density
Score limit	True limit			
10–19	9.5–19.5	10	2	$\frac{2}{10} = 0.2$
20–29	19.5–29.5	10	7	$\frac{7}{10} = 0.7$
30–39	29.5–39.5	10	5	$\frac{5}{10} = 0.5$
40–49	39.5–49.5	10	8	$\frac{8}{10} = 0.8$

(ii) The scores in the form of actual class limits

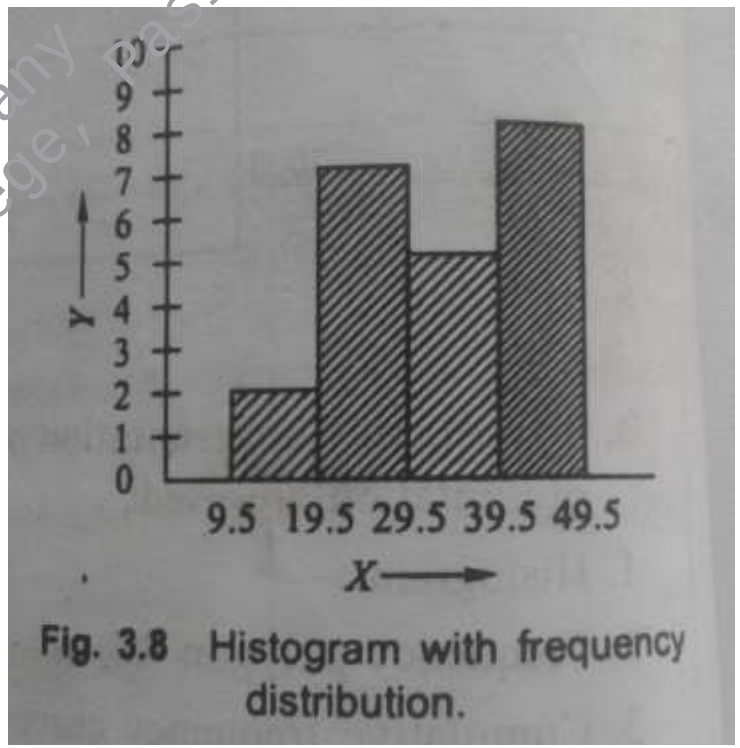


Fig. 3.8 Histogram with frequency distribution.

If data is equal class intervals, directly construct histogram

Example: Population of carp fishes in 100 ponds are as follows:

Number of carps per ponds	0–100	100–200	200–300	300–400	400–500	500–600
No. of ponds	12	18	27	20	17	6

Solution: This is the case of Histogram with equal class interval.

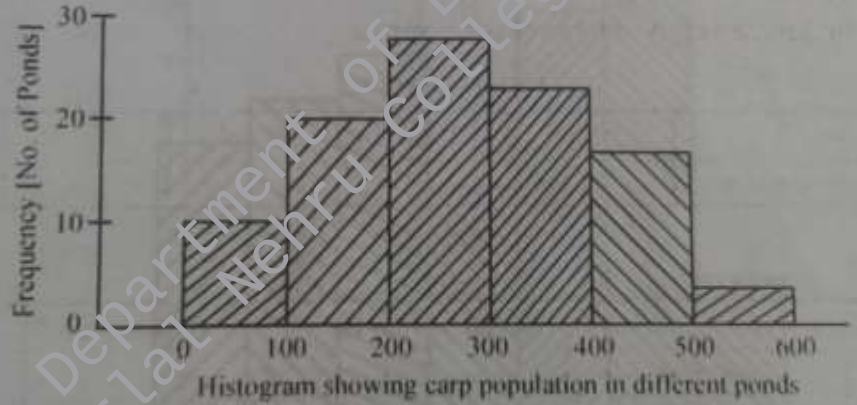


Fig. 3.9 Histogram with equal class intervals.

Objectives

- We have learned what is histogram
- Now
- Lets discuss frequency polygon

Frequency polygon

- A curve obtained by joining the middle of the histograms starts from (highest) histogram to immediate lower histogram successively and form into a figure with a many angles or polygon.
- It is used, where class intervals are equal with discrete (not joined) variables.
- It gives idea about the shape of the frequency distribution.

Example: Construct a histogram and frequency polygon for the following data:

100–150	150–200	200–250	250–300	300–350
4	6	13	5	2

Solution: We have the case of equal class interval.

Class Interval	Frequency	C.F.
100–150	4	4
150–200	6	10
200–250	13	23
250–300	5	28
300–350	2	30

Frequency polygon

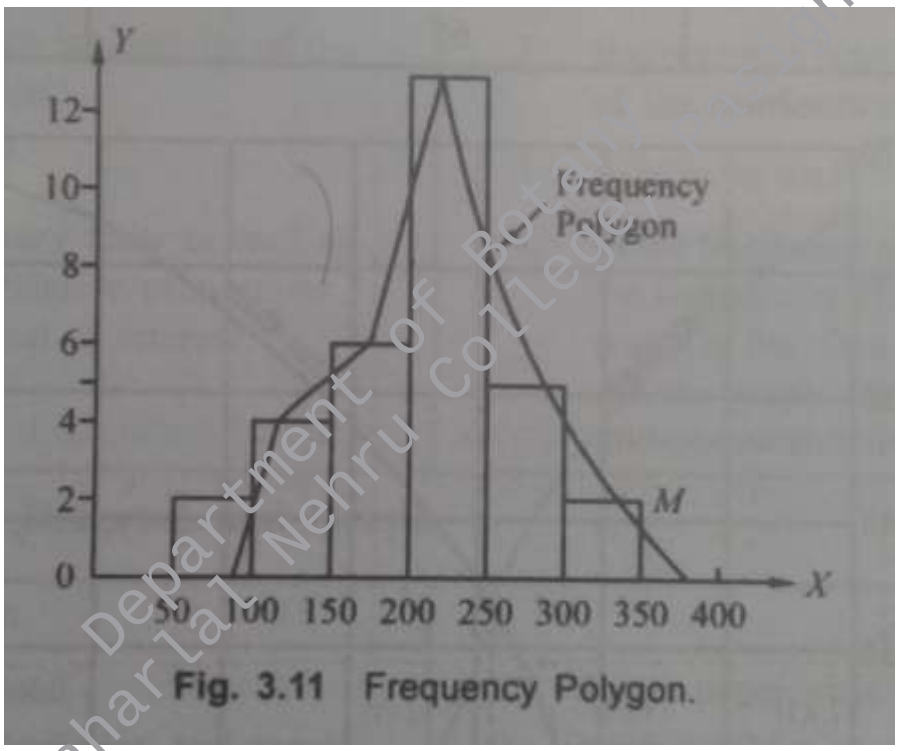


Fig. 3.11 Frequency Polygon.

Objectives

- We have learned what is histogram
- Discussed frequency polygon
- Now
- Lets see cgive/ commutative frequency

Ogive/cumulative frequency

- It is a graph to represent data of cumulative frequency distribution.
- Ogive gives a curve form graph.
- When the curve is drawn from the cumulated data downward is called less than ogive (table) while when curve is drawn from the cumulated upward is called more than ogive.
- It is an important graph to find out median.
- Upper limits (class intervals)are presented along X axis.
- Cumulative frequencies are presented along Y axis

Example 14. *Draw a cumulative frequency graph and estimate the number of persons between the ages 32 — 42 in the following table :*

Age	20 —25	25—30	30—35	35—40	40—45	45—50	50—55	55—60
No. of persons	50	70	100	180	150	120	70	59

Class-interval (Age)	Class-boundary (Age)	Frequency (No. of persons)	Cumulative Frequency (Less than Ogive)
	20	0	0
20 — 25	25	50	50
25 — 30	30	70	120
30 — 35	35	100	220
35 — 40	40	180	400
40 — 45	45	150	550
45 — 50	50	120	670
50 — 55	55	70	740
55 — 60	60	59	799
		799	

Keep on adding the commulative frequency

Add to get less than ogive but deduct to get more than ogive in commulative frequency

Example 15. *Plot less than Ogive and more than Ogive for the following data :*

Cost of production	4 — 6	6 — 8	8 — 10	10 — 12	12 — 14	14 — 16
No. of farms	13	111	182	105	19	7

Class interval (Cost of production)	*Class boundary*	*Frequency (No. of farms)*	*Cumulative Frequency (Less than Ogive)*	*(More than Ogive)*
	4	0	0	437
4 — 6	6	13	13	424
6 — 8	8	111	124	313
8 — 10	10	182	306	131
10 — 12	12	105	411	26
12 — 14	14	19	430	7
14 — 16	16	7	437	0
		437		

OGIVE

Class interval (Cost of production)	Class boundary	Frequency (No. of farms)	Cumulative Frequency (Less than Ogive)	Cumulative Frequency (More than Ogive)
	4	0	0	437
4—6	6	13	13	424
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8—10	10	182	306	131
10—12	12	105	411	26
12—14	14	19	430	7
14—16	16	7	437	0
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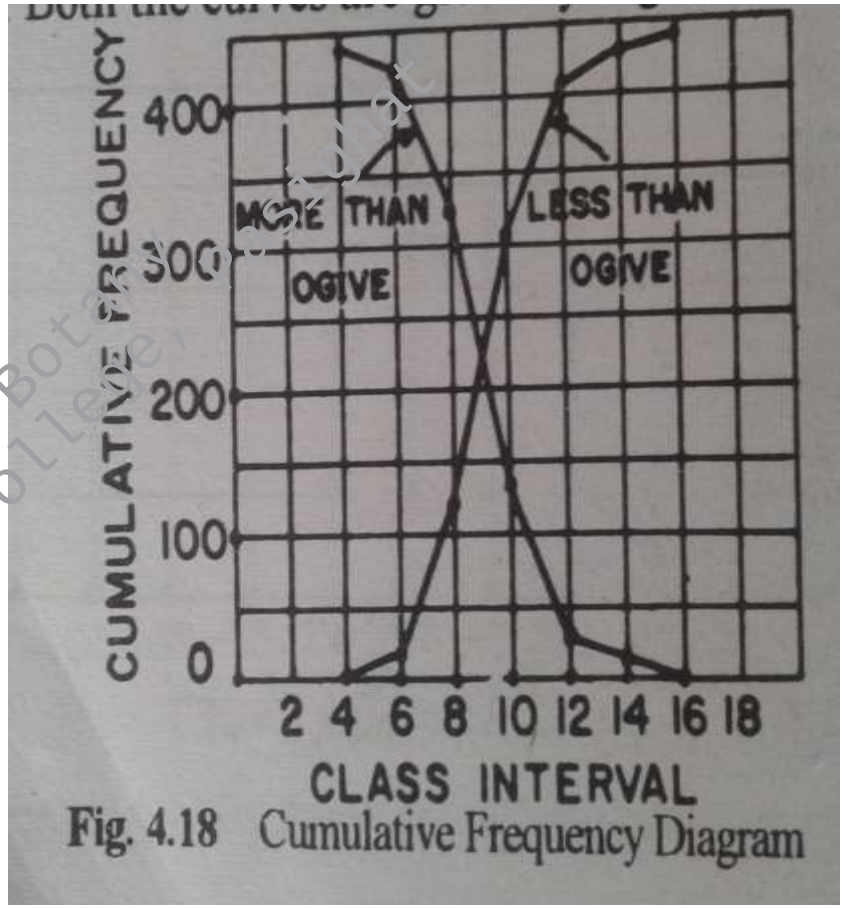

Fig. 4.18 Cumulative Frequency Diagram

Example 14. *Draw a cumulative frequency graph and estimate the number of persons between the ages 32 — 42 in the following table :*

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No. of persons	50	70	100	180	150	120	70	59

Class-interval (Age)	Class-boundary (Age)	Frequency (No. of persons)	Cumulative Frequency (Less than Ogive)
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35—40	40	180	400
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45—50	50	120	670
50—55	55	70	740
55—60	60	59	799
		799	

HINT: Age between 32 to 42=35+40+45=120 divided by 3=40.

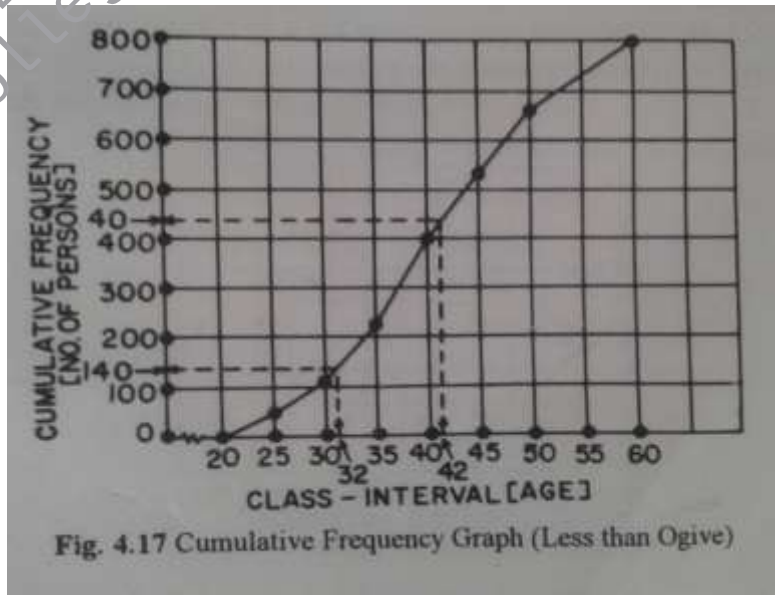

Fig. 4.17 Cumulative Frequency Graph (Less than Ogive)

Mughal garden, N. Delhi