UNIT – 6
STATISTICS

CHAPTER 34
COLLECTION AND TABULATION OF DATA

34.1 INTRODUCTION

The word *statistics* is used in two different senses :

1. Singular 2. Plural

1. In the singular sense, it implies the whole subject as a branch of knowledge to be used in collecting, analysing, presenting and interpreting some numerical informations (data).
2. In the plural sense, it implies the collection of numerical data in a systematic manner with some definite object in view.

   e.g. Statistics of :

(i) population (ii) taxes (iii) number of failures in your school, etc.

34.2 DATA

A set of numerical facts, collected with a definite object in view, is called ***data***.

e.g. consider the heights (in centimetre) of 9 children in your class :

Naresh	153	Ashok	150	Ritu	154
Manisha	147	Peter	152	Monu	153

Here, the set of numbers (numerical facts representing the heights, in cm, of different children), 153, 147, 150, 152, 154 and 153 is called a ***set of data***.

The data can be obtained by individuals (*e.g.* one may go from person to person to know his income, age, savings, etc.) and by government sources (*e.g.* the birth rate in a particular period, the rise in prices in a particular period, etc.)

Whatever be the method of collecting the data, once the data is collected, it must be arranged in a systematic form to get a fair idea of the essential points.

The arrangment of data in a systematic form, generally in a table form, is called tabulation.

e.g. consider the following tabulation :

Class	First division	Second division	Detained	Total
IX	42	37	10	89
X	30	25	nil	55
XI	22	27	8	57

This table represents the results of a particular examination in a certain school.

34.3 FREQUENCY

Consider the set of data : 5, 7, 3, 8, 7, 5, 5, 3, 5, 8, 7.

In this set of data, the number 5 occurs four times and we say, the frequency of number 5 is 4.

Similarly, the frequency of number 3 is 2, as it occurs two times in the given set of data, the frequency of number 7 is 3 (why?) and the frequency of number 8 is 2.

Thus *frequency is a number which tells how many times does a particular data* (number), *appear in the given set of data.*

34.4 RAW DATA, ARRAYED DATA AND FREQUENCY DISTRIBUTION

Let 30 students of a class score the following marks (out of 10) in a class test :

9, 8, 6, 10, 5, 6, 8, 7, 10, 5, 6, 4, 5, 7, 8, 10, 8, 9, 6, 5, 4, 8, 8, 9, 10, 6, 6, 6, 5, 4.

The data recorded in the original form, as above, is called ***raw data.***

If the given data is arranged in **ascending** or **descending** order of their magnitudes, it is called **arrayed data** or simply, an **array.**

Thus 4, 4, 4, 5, 5, 5, 5, 5, 6, 6, 6, 6, 6, 6, 6, 7, 7, 8, 8, 8, 8, 8, 8, 9, 9, 9, 10, 10, 10, 10 is an array in which, the given data is arranged in ascending order. Similarly, we can arrange it in descending order also.

The above arrayed data can also be represented in the form of a table as given below :

Marks	4	5	6	7	8	9	10
No. of students (Frequency)	3	5	7	2	6	3	4

Such a tabular arrangement of data, showing the frequency of each number (observation), is called a frequency distribution and the table formed is called a frequency distribution table or simply, a frequency table.

34.5 CONSTRUCTING A FREQUENCY TABLE

Example 1 :

The minimum temperature (in °C) during the day at Delhi has been recorded for 30 days, as given below :

11·8	11·6	11·6	11·4	11·3	11·4
11·7	11·7	11·3	11·4	11·7	11·7
11·6	11·3	11·7	11·5	11·8	11·3
11·3	11·4	11·5	11·3	11·5	11·5
11·8	11·5	11·4	11·3	11·6	11·5

Construct a frequency table for the above data.

Solution :

Temperature (in °C)	Tally Marks	Frequency
11·3	𝍸 II	7
11·4	𝍸	5
11·5	𝍸 I	6
11·6	IIII	4
11·7	𝍸	5
11·8	III	3

Steps :

1. In the first column, write the temperatures in ascending (or descending) order.
2. The temperatures of different days are recorded in the second column (headed by Tally Marks) by making a short vertical line called a stroke. The marking of strokes is done as follows :
   (i) The first temperature in the given data is 11·8, so make a stroke in the Tally marks column against temperature 11·8.
   (ii) The next temperature is 11·6, so make a stroke against temperature 11·6 and so on.

(iii) When four strokes are made against any particular temperature, don't make the fifth stroke in the same way but make a stroke across the first four (like 𝍸). This gives a bundle of five strokes. The next stroke starts a new bundle.

(iv) When the marking of the strokes is completed, count the strokes against each and write the numbers in the column headed by ***Frequency***.

The table obtained in Example 1 (above) represents ungrouped frequency distribution.

34.6 GROUPED FREQUENCY DISTRIBUTION

Example 2 :

Given below are the marks obtained by 40 students in an examination :

40	56	24	41	51	22	59	12	26	46
51	14	23	59	58	29	41	35	36	40
42	43	36	33	38	52	23	24	13	55
18	54	20	57	30	24	43	50	26	15

Taking class intervals 10-20, 20-30, ..., 50-60; construct a frequency table for the above distribution.

Solution :

The frequency table for the given distribution is :

Marks	Tally Marks	Frequency
10-20	𝍸	5
20-30	𝍸 𝍸	10
30-40	𝍸 I	6
40-50	𝍸 III	8
50-60	𝍸 𝍸 I	11

(Ans.)

In this frequency distribution, the mark 20 is included in the class interval 20-30 and not in 10-20. Similarly, mark 30 is included in the class interval 30-40 and not in 20-30, and so on.

34.7 CLASS-INTERVALS AND CLASS-LIMITS

In example 2, given above, 10-20 is called a *class-interval* which is bounded by two numbers 10 and 20. These numbers (10 and 20) are called class-limits, the smaller number 10 is called the *lower class limit* and the larger number is called the *upper class limit*. Similarly, 20-30 is the second class-interval in the same example 2, 20 being the *lower class limit* and 30, the *upper class limit* and so on.

34.8 CLASS MARK

The *class-mark* of a class-interval is the value midway between its lower class limit and upper class limit.

Thus, $$\text{class-mark of a class-interval} = \frac{\text{its lower class limit} + \text{upper class limit}}{2}$$

e.g. $$\text{class mark of 10-20} = \frac{10+20}{2} = 15;$$

$$\text{class mark of 55-60} = \frac{55+60}{2} = 57{\cdot}5 \text{ and so on.}$$

TEST YOURSELF

1. In the set of data : 5, 4, 8, 9, 6, 4, 4, 5, 8, 9 and 9.

(a) data 4 appears ..... times; ∴ Frequency of 4 = ...

(b) data 4 and 9 have same .....

(c) ..... has least frequency.

2. 7, 8, 15, 6, 4, 2, 0 and 3 as an array in

(a) ascending order = ...

(b) descending order = ...

3. (a) Second class interval is : .....

(b) Class limits of class 24-32 are .....

(c) Upper limit of class 16-24 is .....

(d) Class mark for class 8-16 = ... = ...

Marks	Frequency
0-8	10
8-16	13
16-24	15
24-32	9

EXERCISE 34

1. Arrange the following data as an array (in ascending order) :
   (i) 7, 5, 15, 12, 10, 11, 16
   (ii) 6·3, 5·9, 9·8, 12·3, 5·6, 4·7
2. Arrange the following data as an array (descending order) :
   (i) 2, 0, 3, 4, 1, 2, 3, 5
   (ii) 9·1, 3·7, 5·6, 8·3, 11·5, 10·6
3. Construct a frequency table for the following data :
   (i) 6, 7, 5, 6, 8, 9, 5, 5, 6, 7, 8, 9, 8, 10, 10, 9, 8, 10, 5, 7, 6, 8
   (ii) 3, 2, 1, 5, 4, 3, 2, 5, 5, 4, 2, 2, 2, 1, 4, 1, 5, 4
4. Following are the marks obtained by 30 students in an examination :

15	20	8	9	10
16	17	20	24	30
44	47	38	36	40
27	25	28	30	19
7	11	21	31	41
37	47	23	20	17

Taking class intervals 0-10, 10-20, ..., 40-50; construct a frequency table.

5. Construct a frequency distribution table for the following data, taking class-intervals 4-6, 6-8, ..., 14-16.

11·5	6·3	7·8	9·2	10·5
4·5	6	8·3	12·5	15·8
7·4	5·3	8·4	15·2	8·9
9·8	8·25	6·5	5·8	10·5
4·6	6·4	8·9	10·8	12·7
14·2	15·3	11·7	9·9	8·8
6·6	4·3	4·7	9·4	10·1
15·5	14·4	12·2	7·7	5·5

6. Fill in the blanks :
   (i) Lower class limit of 15 - 18 is .....
   (ii) Upper class limit of 24 - 30 is .....
   (iii) Upper limit of 5 - 12·5 is .....
   (iv) If the upper and the lower limits of a class interval are 16 and 10, the class-interval is .....
   (v) If the lower and the upper limits of a class interval are 7·5 and 12·5, the class-interval is .....

ANSWERS

TEST YOURSELF

1. (a) three; 3 (b) frequency (c) 6 **2.** (a) 0, 2, 3, 4, 6, 7, 8 and 15 (b) 15, 8, 7, 6, 4, 3, 2 and 0

3. (a) 8-16 (b) 24 and 32 (c) 24 (d) $\frac{8+16}{2} = 12$

EXERCISE 34

1. (i) 5, 7, 10, 11, 12, 15, 16 (ii) 4·7, 5·6, 5·9, 6·3, 9·8, 12·3

2. (i) 5, 4, 3, 3, 2, 2, 1, 0 (ii) 11·5, 10·6, 9·1, 8·3, 5·6, 3·7

3. (i)

Date	Tally Marks	Frequency
5	IIII	4
6	IIII	4
7	III	3
8	𝍸	5
9	III	3
10	III	3

(ii)

Date	Tally Marks	Frequency
1	III	3
2	𝍸	5
3	II	2
4	IIII	4
5	IIII	4

4.

C.I.	Tally Marks	Frequency
0–10	III	3
10–20	𝍸 II	7
20–30	𝍸 IIII	9
30–40	𝍸 I	6
40–50	𝍸	5

5.

C.I.	Tally Marks	Frequency
4–6	𝍸 II	7
6–8	𝍸 III	8
8–10	𝍸 𝍸	10
10–12	𝍸 I	6
12–14	III	3
14–16	𝍸 I	6

6. (i) 15 (ii) 30 (iii) 12·5 (iv) 10–16 (v) 7·5 – 12·5