Chapter Eight

STATISTICS-PART ONE

Introduction:

In a simplified version, statistics may be defined as the branch of mathematics which is concerned with the collection of data, subjecting it to a careful study and coming out with useful information. Some of the statistical parameters are:

(1) The frequency:

The frequency of a number is the number of times that it occurs. For example, consider the following data: 2,2,3,,5,2,4,2,3,7 and 5.
The frequency of 2 is 4 and the frequency of 5 is 2

(2) The range:

The range of a group of numbers is the difference between the lowest and highest number. For example consider the numbers 2, 8, 5, 2, 6, 3, 10, 6, 5 and 9.
The range = 10 – 2 = 8.

(3) The mode:

The mode of a group of numbers is the one which has the highest occurrence.

- For example consider the numbers 2, 7, 3, 7, 7, 5, 6, 7, 4, 5. The mode is 7.
- Also the mode of the following numbers i.e. 10, 10, 15, 10, 20, 11, 11 9, 15, 13, 14 is 10.
- It is possible for a data to have two or three modes.
- A data with two modes is said to be bimodal.
- For example considering the numbers 10, 11, 10, 9, 10, 12, 13, 12, 15, 20 and 12, the mode is 10 and 12 since they have the same frequency.
- A data with three modes is said to be trimodal.
- For example considering the numbers 10, 11, 10, 11, 9, 8, 13, 15, 7 and 7, the mode is 10, 11 and 7.
- Sometimes the mode may not exist at all. For example a data such as 10, 10, 11, 11, 12, 12, 13, 13 has no mode.

Q1.

Number	Frequency

2	4
3	8
4	2
5	1

Find the mode of the given table.
Soln.

The mode is 3 since it has the highest occurrence or frequency.

2).

Age/years	2	3	4	5	6	7
Frequency	10	2	30	21	25	17

Find the ages of pupils in a class are shown in the given table. Determine the mode.

Soln.
The mode is 4 since it has the highest frequency.

3). <u>The median:</u>

The median of a group of numbers is the one which comes exactly in the middle when they are arranged in order.
a). Find the median of 5, 2, 3, 7 and 1.

Soln.
Arrange them in order
=>1, 2, (3), 5, 7
The median is 3.

2). Find the median of 9, 4, 3, 8, 5, 3 and 2.
Solution
Arrange them in order =>

2, 3, 3, (4), 5, 8, 9.
The median is 4.
N/B: It is possible to get two numbers as the median.

3). Find the median of 5, 1, 4, 3.

Soln.
Arrange them in order
1, (3, 4), 5
The median is 3 and 4 or

$= \frac{3+4}{2} = 7/2 = 3.5.$

4). Find the median of 7, 10, 2, 3, 2, 1, 5, 12

Solution

Arrange them in order

=>1, 2, 2, (3, 5), 7, 10, 12.

The median is 3 and 5.

Formula for finding the median`s position :

The position of the median is given by $\frac{N+1}{2}$,

Where N = the number of items.

1). Find the median of 3, 1, 2.

Soln.

Arrange the numbers in order

=>1, 2, 3

N = 3, median`s position = $\frac{N+1}{2} = \frac{3+1}{2} = \frac{4}{2} = 2,$

$\Rightarrow$ the median is the second item after the numbers have been arranged in order i.e. the median = 2.

2). Find the median of 5, 2, 2 3, 1, 8, 4.

Soln.

Arrange the numbers in order

=> 1, 2, 2, 3, 4, 5, 8.

Since the numbers are 7=>

N = 7.

Position of the median = $\frac{N+1}{2} = \frac{7+1}{2} = \frac{8}{2} = 4,$

$\Rightarrow$ the fourth item is the median. The median = 3.

N/B: If we calculate the position of the median and get a decimal, then two numbers constitute the median .

3). Find the median of 2, 1, 7, 5

Solution

Arrange them in order

=>1, 2, 5, 7

N = 4.

Position of the median = $\frac{N+1}{2}$

$= \frac{4+1}{2} = \frac{5}{2} = 2\frac{1}{2}$ or 2.5

Since 2 ½ lies between 2 and 3 the median is the second and third items i.e. 2 and 5 or the median $\frac{2+5}{2}$ = 3.5.

4). Find the median of 5, 10, 6, 3, 7, 2, 1, 1.

Solution

Arrange them in order

$\Rightarrow$1, 1, 2, 3, 5, 6, 10.

$\Rightarrow$ N = 8.

The position of the median = $\frac{N+1}{2} = \frac{8+1}{2} = \frac{9}{2} = 4\frac{1}{2}$ or 4.5.

The median is the 4th and the 5th items = 3 and 5.

5) You are given the table below. Determine the median.

Number	Frequency
1	2
2	1
3	3
5	1
	$\sum f$ = 7

N/B: The given data can be represented as,

1, 1, 2, 3, 3, 3, 5.

The total frequency ($\sum f$) = N

$\Rightarrow$ N = 7.

Position of the median = $\frac{N+1}{2} = \frac{7+1}{2} = \frac{8}{2} = 4$.

$\Rightarrow$ the median is the fourth item = 3.

6). Find the median of the given table

X	F

2	2
3	2
4	1
5	1
6	2

Soln.
Total frequency = $\sum f$ = 2 + 2 + 1 + 1 + 2

$\Rightarrow \sum f$ = 8 => N = 8.

Position of the median = $\frac{N+1}{2} = \frac{8+1}{2} = \frac{9}{2}$ = 4 ½

$\Rightarrow$ the 4 th and 5th items constitute the median. The given data can also be represented as 2, 2, 3, 3, 4, 5, 6, 6.

$\Rightarrow$ th 4thand 5thitems = 3 and 4,

$\Rightarrow$ the median = 3 and 4 or the median = 3+4/2 = 7/2 = 3.5

The mean:

This is also known as the average.

Types of means :

- At this level, three types of means will be considered, and these are

a). the mean of ungrouped data.
b). the mean of grouped data.
c). the assumed mean.

N/B 1). An example of an ungrouped data is given next.

Age/years	10	11	12	13
Frequency	10	5	10	4

ii). An example of a grouped data is

Age/yrs	5 -10	11-16	17 - 22	23 - 28
Freq	2	9	10	3

The mean of an ungrouped data:

Mass/g	4	5	6	7	8
Frequency	1	3	10	2	1

The given table shows the masses of eggs collected by a farmer. Calculate the mean or the average.

Soln.

Mass X	Frequency F	FX
4	1	4
5	3	15
6	10	60
7	2	14
8	1	8
	$\sum f$ = 17	$\sum fx$ = 101

The mean = $\frac{\sum fx}{\sum f} = \frac{101}{17}$ = 5.9, $\Rightarrow \overline{x}$ = 5.9.

N/B: The symbol for the mean is $\overline{x}$.
$-\ \sum f$ = the total frequency and this had by adding together all the frequency (F) values.
$_\sum fx$ = the total value of all the FX values, and this is had by adding all the FX values.

- The frequency is also the same as the number of occurrence.

Q2.

Marks	4	5	6	7	8
Number of occurrence	1	3	0	6	2

A class teacher conducted an examination and the marks obtained by the students are as shown in the given table. Calculate the mean mark.

Soln.

Mark X	Frequency f	FX

4	1	4
5	3	15
6	0	0
7	6	42
8	2	16
	$\sum f$ = 12	$\sum fx$ = 77

The mean = $\overline{x} = \frac{\sum fx}{\sum f}$ = 77/12 = 6.4.