

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). The median:

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 = $\frac{N+1}{2} = \frac{3+1}{2} = \frac{4}{2} = 2$,

=> 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 = $\frac{N+1}{2} = \frac{7+1}{2} = \frac{8}{2} = 4$,

=> 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 $2\frac{1}{2}$ 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 $= \sum f = 2 + 2 + 1 + 1 + 2$

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

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

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

\Rightarrow the 4th and 5th items = 3 and 4,

\Rightarrow the median = 3 and 4 or the median = $\frac{3+4}{2} = \frac{7}{2} = 3.5$

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

- the mean of ungrouped data.
- the mean of grouped data.
- 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/yr	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
$\Sigma f = 17$		$\Sigma fx = 101$

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

N/B: The symbol for the mean is \bar{x} .

– Σf = the total frequency and this had by adding together all the frequency (F) values.

– Σfx = 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
$\Sigma f = 12$		$\Sigma fx = 77$

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