Median

The median is the measure of central tendency which takes place in the middle of an ordered sequence of values. It is the second important measure of central tendency.

The statisticians have defined the median as follows:

1. The median is a single value from the data set that measures the central item in the data.
2. The median is that value of the variable which divides the group into two equal parts.
3. Among the central values of a distribution a value such that smaller and greater values occur with equal frequencies is known as the median.

Definition:

The median is the value in a set of ranked or ordered observation that divides the whole set of observation into two parts ~~into~~ of equal size.

For group frequency distribution median is determined by the formula,

$$Me = L_1 + \frac{\frac{N}{2} - f_c}{f_m} \times C$$

where,

L_1 = Lower limit of the median class

N = total number of observation

f_c = Cumulative frequency of the pre-median class.

f_m = Frequency of the median class

C = class interval.

Problem:

Marks obtained by some students in an examination is given below. determine the median no.

Marks Obtained	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of Students	1	4	6	8	10	20	24	18	6	3

Soln:

Marks	Students (f)	Cumulative frequency
0-10	1	1
10-20	4	5
20-30	6	11
30-40	8	19
40-50	10	29
50-60	20	49
60-70	24	73
70-80	18	91
80-90	6	97
90-100	3	100
	N=100	

Here,

$N=100$, $\frac{N}{2} = \frac{100}{2} = 50$th observation

50, (60-70) is the median class because 50th observation lies in this class.

∴ Median,

$$Me = L_1 + \frac{\frac{N}{2} - fc}{fm} \times c$$

$$= 60 + \frac{\frac{100}{2} - 49}{24} \times 10$$

$$= 60 + \frac{50-49}{24} \times 10$$

$$= 60 + \frac{1}{24} \times 10$$

$$= 60.42 \text{ (Ans)}$$

Mode:

Mode is defined as the value which occurs most frequently in a distribution.

So mode is a value which occurs with maximum frequency in a series.

Mode may not exist in a distribution where all the values occurs with equal frequency.

Some distribution may have several mode.

Suppose we have given,

223 235 235 268 274 285 290

Here 235 occurs twice whereas the other data entries occurs only once.

So mode is 235.

Example:

Values	Frequency
2	1
(4)	3
6	1

The most frequent value is 4, since there are 3 of them, so the mode is 4.

From a group frequency distribution mode is determined by the formula

$$M_0 = L_1 + \frac{\Delta_1}{\Delta_1 + \Delta_2} \times c$$

where,

L_1 = Lower Limit of the modal class

Δ_1 = Difference between the frequency of the modal class and pre-modal class.

Δ_2 = Difference between the frequence of the ~~pre~~-modal class and post modal class.

Problem: Marks obtained by some students in an examination is given below: Determine the mode.

Marks Obtained	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of Students	1	4	6	8	10	20	24	18	6	3

Marks	No. of students
0-10	1
10-20	4
20-30	6
30-40	8
40-50	10
50-60	20
60-70	24
70-80	18
80-90	6
90-100	3

Here modal class is (60-70) because in that class frequency is maximum. that is 24

$$\therefore \text{Mode, } M_0 = L_1 + \frac{\Delta_1}{\Delta_1 + \Delta_2} \times c$$

$$= 60 + \frac{24-20}{(24-20)+(24-18)} \times 10$$

$$= 60 + \frac{4}{4+6} \times 10 = 64.$$

H.W Calculate the median and mode from the following frequency distribution:

Class interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	4	5	10	12	8	6	4	3

Ans: Median = 54.58

Mode = 52.5