

② Median:

For an ungrouped frequency distribution, if we arranged the data in ascending order ~~or decreasing order~~ (increasing), then

(a) when n is odd, then $(\frac{n+1}{2})^{\text{th}}$ term is the median.

(b) when n is even, then $\frac{1}{2}[(\frac{n}{2})^{\text{th}} \text{ term} + (\frac{n}{2} + 1)^{\text{th}} \text{ term}]$

is the median.

Eg:→ ① 1, 3, 6, 2, 4

If we arrange the values in ascending order then,

1, 2, 3, 4, 6, here $n = 5$
(odd)

$$\text{Median} = (\frac{n+1}{2})^{\text{th}} \text{ term}$$

$$= \underline{3^{\text{rd}}} \text{ term}$$

$$= 3$$

(11) 2, 4, 6, 8, 10, 12

here the values are already in ascending order and $n = 6$ (even)

$$\therefore \text{Median} = \frac{1}{2} \left[\left(\frac{n}{2} \right)^{\text{th}} \text{ term} + \left(\frac{n}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

$$= \frac{1}{2} \left[3^{\text{rd}} \text{ term} + 4^{\text{th}} \text{ term} \right]$$

$$= \frac{1}{2} [6 + 8]$$

$$= 7$$

For grouped frequency data:

$$\text{Median} = l + \frac{h}{f} \left(\frac{N}{2} - C \right)$$

where, l = lower limit of the median class

h = width of the median class

f = frequency of the median class

$$N = \sum f$$

C = Cumulative frequency of the ~~median~~ class preceding the median class.

~~Ques~~

Quantiles : Quantiles are those values of the variate which divide the total frequency into 4 equal parts.

The lower quantile is denoted by Q_1 and upper quantile is denoted by Q_3 and defined as,

$$Q_1 = l + \frac{h}{f} \left(\frac{N}{4} - c \right)$$

$$Q_3 = l + \frac{h}{f} \left(\frac{3N}{4} - c \right)$$

where, f is the frequency of the quantile class.

c is the cumulative frequency of the class preceding the quantile class.

Ex:- Find the median, lower and upper quartile from the following.

<u>Marks</u>	<u>No of students</u>
0 - 10	15
10 - 20	20
20 - 30	25
30 - 40	24
40 - 50	10
50 - 60	33
60 - 70	71
70 - 80	51

Solⁿ We construct the following table

Marks	No of students (f)	C.F. (C)
0 - 10	15	15
10 - 20	20	35
20 - 30	25	60
30 - 40	24	84
40 - 50	10	94
50 - 60	33	127
60 - 70	17	144
70 - 80	5	149

$$N = 249$$

Here,

$$N = 249$$

$$\frac{N}{2} = \frac{249}{2} = 124.5$$

Hence, the median class is, 50 - 60

$$\therefore l = 50, h = 10, f = 33, C = 94$$

$$\therefore \text{Median} = l + \frac{h}{f} \left(\frac{N}{2} - C \right) = 59.24$$

~~= 101~~ Now, you find upper and lower quartile.

Mode: Mode is the value which occurs most frequently, in a set of observations.

For discrete data, mode is the value where frequency is highest.

For frequency distribution:

$$\text{Mode} = l + \frac{f_m - f_1}{2f_m - f_1 - f_2} \times h$$

where l = lower limit of the modal class.

h = width of the modal class

f_m = frequency of the modal class

f_1 = frequency of the class preceding the modal class.

f_2 = frequency of the class succeeding the modal class

EX: Find the mode of the following data:

Marks

No of students

1-5

7

6-10

10

11-15

16

16-20

32

21-25

24

26-30

18

31-35

10

36-40

5

41-45

1

Soln. → here, the highest frequency is 32 and that lies in the class 16-20.

Hence, modal class is 16-20

But actual limits of the class is

15.5 - 20.5

~~$l = 16$~~

$$\therefore l = 15.5, \quad f_m = 32, \quad f_1 = 16, \\ f_2 = 24, \quad h = 5.$$

$$\therefore \text{Mode} = l + \frac{f_m - f_1}{2f_m - f_1 - f_2} \times h.$$

$$= 18.83$$