COMPUTATION OF MEDIAN

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Sem– 2, TC- 204

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The median is defined as the measure of the central term, when the given terms are arranged in the ascending or descending order of magnitudes. In other words the median is value of the variate for which total of the frequencies above this value is equal to the total of the frequencies below this value.

For example. The marks obtained, by seven students in a paper of Statistics are 15, 20, 23, 32, 34, 39, 48 the maximum marks being 50, then the median is 32 since it is the value of the 4^{th} term, which is situated such that the marks of 1^{st}, 2^{nd} and 3^{rd} students are less than this value and those of 5^{th}, 6^{th} and 7^{th} students are greater then this value.

(a) Median in individual series

Let n be the number of values of a variate (i.e. total of all frequencies). First of all we write the values of the variate (i.e., the terms) in ascending or descending order of magnitudes. Here two cases arise:

Case 1. If n is odd then value of (n+1)/2th term gives the median.

Case2. If n is even then there are two central terms i.e., n/2th and $\left(\frac{n+1}{2}\right)^{th}$ the mean of these two values gives the median.

(b) Median in continuous series (or grouped series).

In this case, the median (M_d) is computed by the following formula

$$M_d = l + \frac{\frac{n}{2} - cf}{f} \times i$$

Where M_d = median

l = lower limit of median class

cf = total of all frequencies before median class

f = frequency of median class

i = class width of median class.

Example 1 – According to the census of 1991, following are the population figure, in thousands, of 10 cities :

1400, 1250, 1670, 1800, 700, 650, 570, 488, 2100, 1700.

Find the median.

Solution. Arranging the terms in ascending order.

488, 570, 650, 700, 1250, 1400, 1670, 1800, 2100.

Here n = 10, therefore the median is the mean of the measure of the 5^{th} and 6^{th} terms.

Here 5^{th} term is 1250 and 6^{th} term is 1400.

Median (Md) = (1250+14000)/2 Thousands

= 1325 Thousands

Examples 2. Find the median for the following distribution:

Wages in Rs.	0-10	10-20	20-30	30-40	40-50
No. of workers	22	38	46	35	20

Solution: We shall calculate the cumulative frequencies.

Wages in Rs.	**No. of Workers (f)**	**Cumulative Frequencies (c.f.)**
0-10	22	22
10-20	38	60
20-30	46	106
30-40	35	141
40-50	20	161

Here N = 161. Therefore median is the measure of (N + 1)/2^{th} term i.e. 81^{st} term. Clearly 81^{st} term is situated in the class 20-30. Thus 20-30 is the median class. Consequently,

Median $M_d = l + \dfrac{\frac{n}{2} - cf}{f} \times i$

$= 20 + (½ \times 161 – 60)/46 \times 10$

$= 20 + 205/46$

$= 20 + 4.46$

$= 24.46.$

Example 3. Find the median of the following frequency distribution:

Marks	No. of students	Marks	No. of students
Less than 10	15	Less than 50	106
Less than 20	35	Less than 60	120
Less than 30	60	Less than 70	125
Less than 40	84		

Solution: The cumulative frequency distribution table :

Class (Marks)	**Frequency f (No. of students)**	**Cumulative Frequency (C. F.)**
0-10	15	15
10-20	20	35
20-30	25	60
30-40	24	84
40-50	22	106
50-60	14	120
60-70	5	125
Total	N=125	

Median = measure of $\left(\dfrac{125+1}{2}\right)^{th}$ term

= 63rd term.

Clearly 63rd term is situated in the class 30-40.

Thus median class = 30 - 40

Median $M_d = l + \frac{\frac{n}{2} - cf}{f} \times i$

$= 30 + (125/2 - 60) / 24 \times 10$

$= 30 + 25/24$

$= 30+1.04$

$= 31.04$

The End