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MEDIAN

In a series, if observations are arranged in ascending or descending order "the median is that value of the variable which divides the group of data in two equal parts." One part comprising all the values greater and the other values lesser than the median.

Calculation of median is done differently in individual discrete and continuous series.

(A) Ungrouped data (Individual Series) :- Following formula is used to find median in individual series of both add and even numbers of observations.

$$Md^n = \frac{(n+1)^{th}}{2} \text{ item.}$$

where Md^n = stands for median

n = stands for number of items.

① In case of odd number :- Ex - Hb% of seven fishes was recorded as 6, 7, 4, 5, 5, 3 & 4 gm/100ml. Find the median.

Ans: - First step is to arrange data in ascending order.

3, 4, 4, 5, 5, 6, 7.

$$Md^n = \frac{(n+1)^{th}}{2} \text{ item} \quad Md^n = \frac{(7+1)^{th}}{2} \text{ item} = \frac{8}{2} = 4^{th} \text{ item}$$

Since 4th item in arranged data is 5 $\therefore Md^n = 5 \text{ gm/100ml}$ Ans.

② In case of even number :- The process is same as above but in case of even no. Median falls between 2 observations. To find median one has to add both adjacent (upper & lower) observations where Median falls & then divided by two.

Ex - Wt. of 8 rats was obtained as 35, 44, 38, 36, 39, 40, 42 & 41 gram. Find out Median of the Series.

First of all, observations are arranged in ascending order i.e. 35, 36, 38, 39, 40, 41, 42 & 44 grams.

$$Md^h = \frac{(n+1)th}{2} \text{ item. Here No. of items are 8 which is even number.}$$

$$Md^h = \frac{(8+1)th}{2} = \frac{9th}{2} \text{ item} = 4.5th \text{ item.}$$

Here median is falling between 4th & 5th observations denoted by 4.5th item. The 4th item is 39 & 5th item is 40 in arranged data.

$$\therefore \text{Median} = \frac{39(4th \text{ item}) + 40(5th \text{ item})}{2} = \frac{79}{2} = 39.5 \text{ gms. Ans.}$$

③ Grouped (Discrete series) - Formula is $Md^h = \frac{n+1}{2} \text{th item}$ in discrete series but we find Median by using cumulative frequencies. Ex - Height of herbs and their frequencies were obtained in a survey report of plot. Find Median of the obtained data.

Height of herbs in cms: - 45, 25, 35, 15, 5

Frequency: - 20, 46, 35, 38, 22

Ans - First step is to arrange data in ascending or descending order.

Height: 5, 15, 25, 35, 45

Frequency: 22, 38, 46, 35, 20

Second step to find cumulative frequency on ascending table

SL.NO.	Height	Frequency	Cumulative frequency
		22	22
1	5	38	22 + 38 = 60
2	15	46	60 + 46 = 106
3	25	35	106 + 35 = 141
4	35	20	141 + 20 = 161
5	45		

Here $N = 161$

$$\text{Median} = \frac{(n+1)^{\text{th}}}{2} \text{ item} = \frac{(161+1)^{\text{th}}}{2} \text{ item}.$$

$$= \frac{162}{2} \text{ item} = 81^{\text{st}} \text{ item}.$$

Now 81st item in cumulative frequency column of above table.

81st item lies in 3rd step. $\therefore$ Median = 25 Ans.

(C) Grouped (Continuous Series) :- $Md^n = L_1 + \frac{(N/2 - cf)}{f_m} \times i$

This formula is applied in continuous series to find Median

Where - Md^n stands for median

L_1 stands for lower limit of median class.

$N/2$ stands for half of total no. of observations.

cf stands for cumulative frequency of class

preceding to the median class.

f_m stands for frequency of median class.

i stands for width of class interval.

Merits & Demerits of Median :-

Merits :- It is rigidly defined & is better indicator of an average of position.

(ii) It is easy to calculate & understand.

(iii) It can also be used in qualitative measures.

Demerits :- Arithmetic explanation of Median is not possible.

(i) For an even number of ungrouped data, we estimate it as the arithmetic mean of the two middle observations.

(iii) If data is not arranged in ascending or descending order then Median cannot be ascertained.

(iv) It gives equal importance to all observations.

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