STATISTICS

MEDIAN, MODE AND RELATIONSHIP

BETWEEN MEAN, MEDIAN AND MODE

MEDIAN

Median of a distribution is the value of the variable which divides then distribution into two equal parts i.e., it is the value of the variable such that the number of observations above it is equal to the number of observations below it.

Median of an ungrouped Data (Individual Observations) :

If the value x_i in the raw data are arranged in order of increasing or decreasing magnitude,

then the middle, most value in the arrangement is called the median.

Thus, for the ungrouped data x_1, x_2 ,, x_n , the median is computed by using the following steps.

Step I: Arrange the observations (value of the variate) in ascending or descending order of magnitude.

Step II : Determine the total number of observations, say n.

Step III:

(i) If n is odd, then, Median = Value of
$$\left(\frac{n+1}{2}\right)^{th}$$
 observation

(ii) When the number n of observations is even, the median is the arithmetic mean of the $\left(\frac{n}{2}\right)^{th}$ and $\left(\frac{n}{2}+1\right)^{th}$ observation when the data is arranged either in ascending or

descending order.

$$Meadin = \frac{value of \left(\frac{n}{2}\right)^{th} observation value of \left(\frac{n}{2} + 1\right)^{th} observation}{2}$$

CLASS 9

- **Ex.1** Find the median of the following data : 25, 36, 31, 23, 22, 26, 35, 28, 19, 32
- Sol. Arranging the data in ascending order, we get 19, 22, 23, 25, 26, 28, 31, 32, 35, 36

Here, the number of observations, n = 10 (even).

$$Meadin = \frac{value of \left(\frac{10}{2}\right)^{th} observation value of \left(\frac{10}{2} + 1\right)^{th} observation}{2}$$

$$\frac{Value of 5^{th} observation value of 6^{th} observation}{2}$$

$$Meadian = \frac{26 + 28}{2} = 27$$

Sol. Arranging the data in ascending order, we have 25, 31, 32, 37, 39, 42, 43, 45, 46, Here, the number of observation $n = 9 \pmod{25}$

Median = Value of
$$\left(\frac{9+1}{2}\right)^{th}$$
 observation = Value of 5th observation = 39.

Ex.3 The median of the observations 11, 12, 14, 18, x + 2, x + 4, 30, 32, 35, 41 arranged in ascending order it 24. Find the value of x.

Sol The number of observations n = 10, since n is even.

$$Meadin = \frac{value of \left(\frac{n}{2}\right)^{th} observation value of \left(\frac{n}{2} + 1\right)^{th} observation}{2}$$

$$24 = \frac{5^{h}observation 6^{h}observation}{2}$$
$$24 = \frac{(x+2) + (x+4)}{2}$$
$$24 = \frac{2x+6}{2}$$
$$24 = x+3$$
$$x = 21$$

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Mode

It is the observation which occurs most frequently in the data. That is, it is an observation which has the maximum frequency.

Some Points : For the computation of mode of an ungrouped data by inspection method, we may use the following steps.

- **Step 1:** Obtain the set of observations.
- **Step 2:** Count the number of times the various values repeat themselves. In other words, prepare the frequency distribution.
- **Step 3:** Find the value which occurs the maximum number of times i.e. obtain the value which has the maximum frequency.
- **Step 4:** The value obtained in step 3 is the mode.
- Ex.4 Find the mode from the following data 110, 120, 130, 120, 110, 140, 130, 120, 140, 120
- **Sol.** Arranging the data in the form of a frequency table.

Value	Tally bars	Frequency
110		2
120		4
130		2
140		2

Since the value 120 occurs maximum number of times, the modal value is 120.

Relationship between Mean, Mode and Median

Mode = 3 Median - 2 Mean

- Ex.5 If the value of mode and mean is 60 and 66 respectively, then find the value of median.
- **Sol.** Mode = 3 Median 2 Mean

Median $=\frac{1}{3}$ (mode + 2 mean) $=\frac{1}{3}$ (60 + 2 66) = 64.