

Measures of Central Tendency(cont.)

MEDIAN

It is a tool to measure the center of a numerical data set. It summarizes large amounts of data into a single value. It can be defined as the middle number of a group of numbers that have been sorted in ascending order.

Median Calculation (Step by Step)

- **Step 1:** Firstly, arrange the numbers in ascending order. The numbers are said to be in ascending order when it is arranged from the smallest to the largest order in that group.
- **Step 2:** Method of finding a median of the odd/even numbers in the group is mentioned below:
- **Step 3:** If the number of elements in the **group is odd** – Find the $\{(n+1)/2\}$ th term. The value corresponding to this term is the median.
- **Step 4:** If the number of elements in the **group is even** – Find the $\{(n+1)/2\}$ th term in that group and the midpoint between the numbers on either side of the median position. For instance, if there are 8 observations, a median is $(8+1)/2$ th position which is the 4.5th Median can be computed by adding the 4th and 5th terms in that group which is then divided by 2.

Individual series

Example 1: List of numbers: 4, 10, 7, 15, 2. Calculate the median.

Solution: Let us arrange the numbers in ascending order.

- In ascending order, the numbers are: 2, 4, 7, 10, 15
- There are a total of 5 numbers. Median is $(n+1)/2$ th value. Thus, the Median is $(5+1)/2$ th value.
- Median = 3rd value.
- The 3rd value in list 2, 4, 7, 10, 15 is 7.
- Thus, the Median is 7.

OTHER PARTITION VALUES:

Partition values: The variate values dividing the total number of observations into equal number of parts is known as **partition values**. The equal parts may be two, four, ten or hundred.

Quartiles are the values dividing the whole observations into 4 equal parts.

Similarly deciles and percentiles divides the whole date in ten and hundred equal parts respectively

Quartile : There are three quartiles denoted by Q_1 , Q_2 and Q_3 divides the frequency distribution in to four equal parts

That is 25 percent of data will lie below Q_1 , 50 percent of data below Q_2 and 75 percent below Q_3 . Here Q_2 is called the Median. Quartiles are obtained in almost the same way as median

- **Quartiles for Raw or Ungrouped data:**

If the data set consist of n items and arranged in ascending order then

$Q_1 = [(N+1)/4]$ th item

$Q_2 = 2[(N+1)/4]$ th item

$Q_3 = 3[(N+1)/4]$ th item

Compute Q_1 and Q_3 for the data relating to the marks of 8 students in an examination given below 25, 48, 32, 52, 21, 64, 29, 57

Solution: $n = 8$

Arrange the values in ascending order

21, 25, 29, 32, 48, 52, 57, 64 we have

$Q_1 = [(N+1)/4]$ th item

$[(8+1)/4]$ th item = 2.25 th item

$= 2^{\text{nd}} + .25 (3^{\text{rd}} \text{ item} - 2^{\text{nd}} \text{ item})$

$= 25 + 1.0$

$= 26$

$Q_3 = 3[(N+1)/4]$ th item

$= 3 * (2.25)$ th item

$= 6.75$ th item

$= 6^{\text{th}} + .75 * (7^{\text{th}} - 6^{\text{th}})$ item

$= 52 + 3.75$

$= 55.75$

Quartiles for Discrete Series (grouped data)

- **Step 1:** Find cumulative frequencies
- **Step 2 :** Find $((N+1)/ 4)$
- **Step 3 :** See in the cumulative frequencies, the value just greater than $((N+1)/ 4)$ the corresponding value of x is Q_1
- **Step 4 :** Find $3((N+1)/ 4)$
- **Step 5 :** See in the cumulative frequencies, the value just greater than $3((N+1)/ 4)$ then the corresponding value of x is Q_3 .

Compute Q_1 and Q_3 for the data relating to age in years of 543 members in a village

Age	20	30	40	50	60	70	80
No. Of Members	3	61	132	153	140	51	3

SOLUTION:

x	f	cf
20	3	3
30	61	64
40	132	196
50	153	349
60	140	489
70	51	540
80	3	543

$Q_1 = [(N+1)/4]$ th item

$= [(543+1)/4]$ th item

$= 136^{\text{th}}$ item

$Q_1 = 40$

$Q_3 = 3 [(N+1)/4]$ th item

$Q_3 = 3 [(543+1)/4]$ th item

$Q_3 = 3 * 136^{\text{th}}$ item

$Q_3 = 408^{\text{th}}$ item

$Q_3 = 60$

Quartiles for Continuous series (grouped data)

- **Step 1:** Find cumulative frequencies
- **Step 2 :** Find $(N/4)$
- **Step 3 :** Q_1 class is the class interval corresponding to the value of the cumulative frequency just greater than $(N/4)$
- **Step 4 :** Q_3 class is the class interval corresponding to the value of the cumulative frequency just greater than $3 (N/4)$

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