

Median

- Median of a distribution is the value of the variable which divides it into two equal parts.
- It is the value which exceeds and is exceeded by the same number of observations. Thus the median is called as a “positional average”.

Evaluation of Median: For ungrouped data,

- (i) Odd number of observations. (middle value after the values has been arranged in ascending or descending order of magnitude)
- (ii) Even number of observations. (arithmetic mean of two middle terms after the values has been arranged in ascending or descending order of magnitude)

Ex: Find the median of the values 25, 20, 15, 35, 18.

Ex: Find the median of the values 8, 20, 50, 25, 15, 30.

For Grouped data:

(i) Discrete Frequency distribution:

1. Find $\frac{N+1}{2}$, where N –Total Frequency $= \sum_{i=1}^n f_i$.
2. See the cumulative frequency (c.f.) just greater than $\frac{N+1}{2}$.
3. The corresponding value of x is median.

Example:

x	1	2	3	4	5	6	7	8	9
f	8	10	11	16	20	25	15	9	6

Calculate the Median of the distribution.

Ans:

x	f	$c.f.$
1	8	8
2	10	18
3	11	29
4	16	45
5	20	65
6	25	90
7	15	105
8	9	114
9	6	120
	$N = 120$	

$$\frac{N + 1}{2} = 60.5$$

The cumulative frequency (c.f.) just greater than $\frac{N+1}{2}$ is 65 and value corresponding to 65 is 5.

\therefore **Median is 5.**

(ii) Continuous Frequency distribution:

In case of continuous frequency distribution, the class corresponding to the c.f. just greater than $N/2$ is called the median class and the value of median is obtained by the following formula:

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

Where,

l -is the lower limit of the median class,

f -is the frequency of the median class,

h -is the magnitude of the median class,

c -is the c.f. of the class preceding the median class

Note: The median formula can only be used only for continuous classes without any gaps, i.e., for exclusive type classifications.

Example: Find the median of the following data:

Wages (in Rs.)	2000-3000	3000-4000	4000-5000	5000-6000	6000-7000
No. of workers	3	5	20	10	5

Ans:

<i>Wages (in Rs.)</i>	<i>No. of Employees</i>	<i>c.f.</i>
2000-3000	3	3
3000-4000	5	8
4000-5000	20	28
5000-6000	10	38
6000-7000	5	43
	N = 43	

$$\frac{N}{2} = \frac{43}{2} = 21.5$$

Cumulative frequency just greater than 21.5 is 28 and the corresponding class is 4000-5000. Thus the median class is 4000-5000.

$$l = 4000; h = 1000; f = 20; c = 8$$

$$\text{Median} = 4000 + \frac{1000}{20} (21.5 - 8)$$

$$\therefore \text{Median} = 4675.$$

Example: Find the value of the median from the following data:

No. of days for which absent (less than)	5	10	15	20	25	30	35	40	45
No. of students	29	224	465	582	634	644	650	653	655

Ans: The given cumulative frequency will be converted into ordinary frequency as follows:

<i>Class-Interval</i>	<i>Cumulative frequency</i>	<i>Ordinary frequency</i>
0–5	29	$29 = 29$
5–10	224	$224 - 29 = 195$
10–15	465	$465 - 224 = 241$
15–20	582	$582 - 465 = 117$
20–25	634	$634 - 582 = 52$
25–30	644	$644 - 634 = 10$
30–35	650	$650 - 644 = 6$
35–40	653	$653 - 650 = 3$
40–45	655	$655 - 653 = 2$

Median

$$\begin{aligned} &= 10 + \frac{\frac{655}{2} - 224}{241} \times 5 \\ &= 10 + \frac{103.5 \times 5}{241} = 10 + 2.15 \\ &= 12.15 \end{aligned}$$