

Median

(1)

What is it?

If we have a set of values and we have arranged the values either in ascending or descending order, then the values in the middle position is known as Median. That is why Median is called average of position.

Example

What is the median of
5, 9, 3, 15, 20, 12, 30.

Solution

We arrange the values first
3, 5, 9, 12, 15, 20, 30 [in ascending order]

Here we have 7 values, so,

$$\begin{aligned}\text{Median (Me)} &= \text{Value in the middle position} \\ &= \text{Value in } 4^{\text{th}} \text{ position.} \\ &\text{or, Value in } \left(\frac{n+1}{2}\right)^{\text{th}} \text{ position.}\end{aligned}$$

if $n = \text{even}$ (in the above, there are odd number of values)
Then $M_e = \frac{\text{Value in } \frac{n}{2}^{\text{th}} \text{ place} + \text{next value}}{2}$

As for example 3, 5, 12, 9, 15, 20.

Here $n = 6$ (even)

So, after arranging 3, 5, 9, 12, 15, 20.

$$M_e = \frac{\text{Value in } 3^{\text{rd}} \text{ place } \left(\frac{6}{2}\right) + \text{Value in the next place}}{2}$$

$$= \frac{9 + 12}{2} = \frac{21}{2} = 10.5$$

But 10.5 is not among the values. Still Median is 10.5.

For ungrouped frequency distribution, we search median in $\frac{N+1}{2}^{\text{th}}$ place in the cumulative frequency column.

But for grouped frequency distribution, we search Median in $\frac{N}{2}^{\text{th}}$ place in the cumulative frequency column.

Example Find Median from the following

data:

x :	2	3	4	5	6	7
f :	7	12	17	19	21	24

Soln:

x	f	c.f
2	7	7
3	12	19
4	17	36
5	19	55
6	21	76
7	24	100 (=N)

Median = Value of $\frac{N+1}{2}^{\text{th}}$ item

= Value of $\frac{100+1}{2} = 50.5^{\text{th}}$ item

= In the c.f column it is found that 50.5 is greater 36 but less than 55. So corresponding value is $x=4$

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where There are 19 values.

So $\boxed{M_e = 4 \text{ Ans.}}$

From Grouped Frequency distribution

Here we will use formula

$$M_e = l + \frac{\frac{N}{2} - c}{f} \times i \quad \text{where } l = \text{lower limit of median class}$$

c = cumulative frequency of the class preceding the median class

i = width of the median class

For grouped frequency distribution, the class intervals must be in continuous form, if it is in ~~discrete~~ ^{discontinuous} form, we have to make them continuous.

like
0 - 10
10 - 20
20 - 30
.....

But for open end class intervals, Median is the best Average.

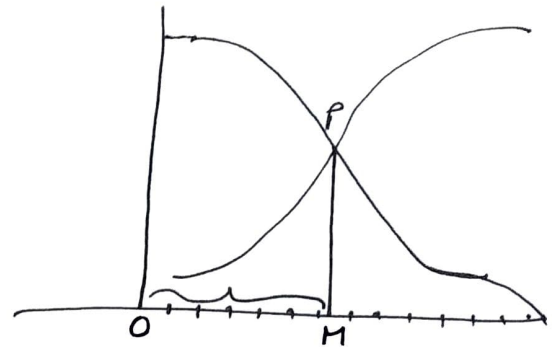
And Median can be found out graphically from Ogive. For that we need to draw less than and greater than ogives. The two graphs cut at a point. From that point,

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we draw a perpendicular on X axis.

The length from origin (O) to the foot of the perpendicular along X axis is The Median.

Like



$\overline{OM} = \text{Median}$

Q. Find The median of The distribution

Wages (hundred Rupees):	5-10	10-15	15-20	20-25	25-30	30-35
Workers :	4	7	10	12	8	3

Solution: First we have to make cumulative frequency table

C.I	frequency	Cumulative frequency (C.f.)
5-10	4	4
10-15	7	11
15-20	10	21
20-25	12	33
25-30	8	41
30-35	3	44 [= N]

Here, for group frequency distribution, we see median class, where $\frac{N}{2}$ falls.

$N = 44$, So, $\frac{N}{2} = 22$, In the C.f. column, 22 is greater than 21, but less

than 33, so, we will take corresponding class interval of 33 as median class, i.e.

20-25. So, $\frac{N}{2} = 22$, $l = 20$, $c = 21$, $f = 12$
 $i = 5$.

Hence

$$\begin{aligned} M_e &= l + \frac{\frac{N}{2} - c}{f} \times i \\ &= 20 + \frac{(22 - 21)}{12} \times 5 \\ &= 20 + \frac{5}{12} \\ &= 20 + .415 \\ &= 20.42 \text{ (app.)} \end{aligned}$$

Ans : $\bar{x}$ 2042 Ans

 $\left[\begin{array}{l} 20.42 \times 100 \\ = 2042.00 \end{array} \right]$

Note 1. Have you seen I ~~have~~ took $\frac{N+1}{2}^{\text{th}}$ item in c.f. column in case of discrete frequency distribution, but in case of continuous frequency distribution, ~~we~~ $\frac{N}{2}^{\text{th}}$ item in c.f. column. It is an important point to be remembered.

Note 2: Median has been considered as best measure among the averages.

Note 3: ~~Even~~ In case of unequal class intervals, the same procedure have to be followed to find Median.

Mode

In any frequency distribution, Mode is that value which comes repeatedly.

Say 2, 5, 9, 7, 5, 15

Here, 5 comes twice, but other numbers come only once.

So, Mode is 5