

CLASS X: CHAPTER - 14
STATISTICS
NCERT NICHOD

In many real-life situations, it is helpful to describe data by a single number that is most representative of the entire collection of numbers. Such a number is called a **measure of central tendency**. The most commonly used measures are as follows.

1. The **mean**, or **average**, of 'n' numbers is the sum of the numbers divided by n.
2. The **median** of 'n' numbers is the middle number when the numbers are written in order. If n is even, the median is the average of the two middle numbers.
3. The **mode** of 'n' numbers is the number that occurs most frequently. If two numbers tie for most frequent occurrence, the collection has two modes and is called **bimodal**.

MEAN OF GROUPED DATA

Direct method

$$\text{Mean, } \bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$

Assume mean method or Short-cut method

$$\text{Mean, } \bar{x} = A + \frac{\sum f_i d_i}{\sum f_i} \text{ where } d_i = x_i - A$$

Step Deviation method

$$\text{Mean, } \bar{x} = A + \frac{\sum f_i u_i}{\sum f_i} \times h \text{ where } u = \frac{x_i - A}{h}$$

MODE OF GROUPED DATA

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

where l = lower limit of the modal class,

h = size of the class interval (assuming all class sizes to be equal),

f_1 = frequency of the modal class,

f_0 = frequency of the class preceding the modal class,

f_2 = frequency of the class succeeding the modal class.

- **Cumulative Frequency:** The cumulative frequency of a class is the frequency obtained by adding the frequencies of all the classes preceding the given class.

MEDIAN OF GROUPED DATA

$$\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f} \right) \times h$$

where l = lower limit of median class,

n = number of observations,

cf = cumulative frequency of class preceding the median class,

f = frequency of median class,

h = class size (assuming class size to be equal).

EMPIRICAL FORMULA

$$3\text{Median} = \text{Mode} + 2\text{Mean}$$

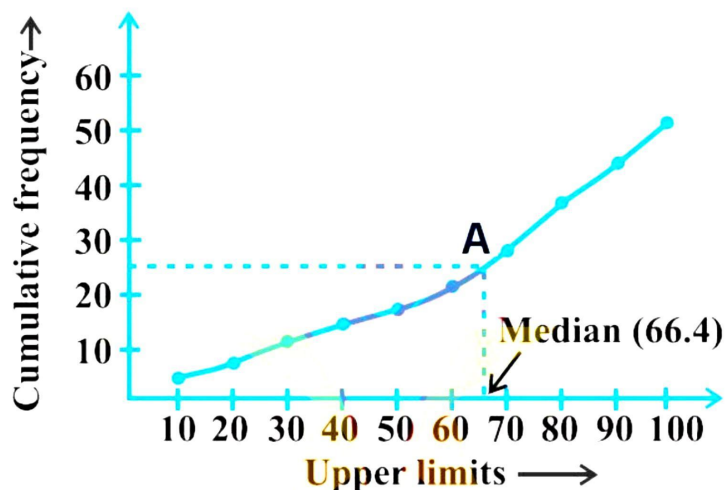
❖ Cumulative frequency curve is also known as 'Ogive'.

There are three methods of drawing ogive:

1. LESS THAN METHOD

Steps involved in calculating median using less than Ogive approach-

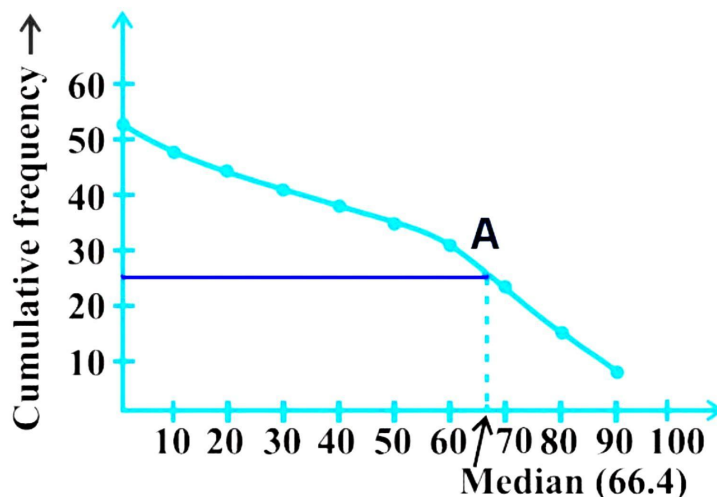
- Convert the series into a 'less than' cumulative frequency distribution.
- Let N be the total number of students whose data is given. N will also be the cumulative frequency of the last interval. Find the $(N/2)^{\text{th}}$ item and mark it on the y-axis.
- Draw a perpendicular from that point to the right to cut the Ogive curve at point A.
- From point A where the Ogive curve is cut, draw a perpendicular on the x-axis. The point at which it touches the x-axis will be the median value of the series as shown in the graph.



2. MORE THAN METHOD

Steps involved in calculating median using more than Ogive approach-

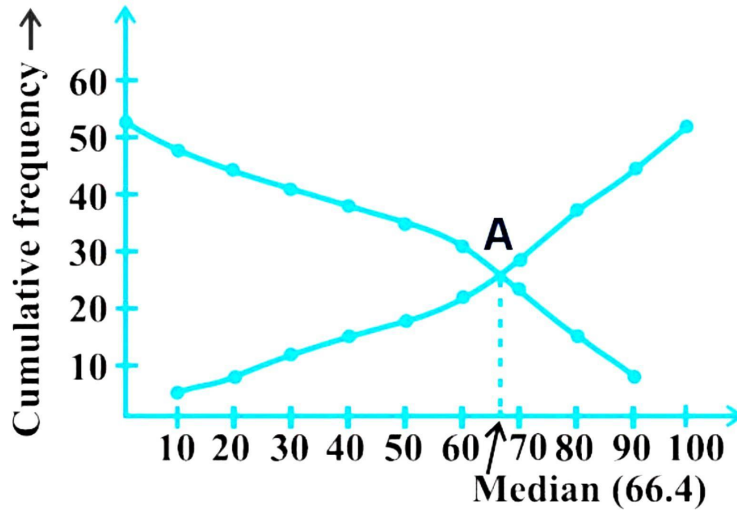
- Convert the series into a 'more than' cumulative frequency distribution.
- Let N be the total number of students whose data is given. N will also be the cumulative frequency of the last interval. Find the $(N/2)^{\text{th}}$ item and mark it on the y-axis.
- Draw a perpendicular from that point to the right to cut the Ogive curve at point A.
- From point A where the Ogive curve is cut, draw a perpendicular on the x-axis. The point at which it touches the x-axis will be the median value of the series as shown in the graph.



3. LESS THAN AND MORE THAN OGIVE METHOD

Another way of graphical determination of median is through simultaneous graphic presentation of both the less than and more than Ogives.

- Mark the point A where the Ogive curves cut each other.
- Draw a perpendicular from A on the x-axis. The corresponding value on the x-axis would be the median value.



- ❖ The median of grouped data can be obtained graphically as the x-coordinate of the point of intersection of the two ogives for this data.