

# Class 10 Maths

## Chapter 13: Statistics

---

### KEY CONCEPTS

Three measures of central tendencies are:

a) Mean                      b) Median                      c) Mode

### 1. Mean of Grouped Data

The mean (average) of grouped data can be calculated using three methods based on the size of the numerical values.

Mean of grouped data is computed by the following methods:

#### A. Direct Method

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$

Where:

- $f_i$  = frequency of the  $i$ th class
- $x_i$  = (Upper Class Limit + Lower Class Limit) / 2

#### B. Assumed Mean Method

$$\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$$

Where:

- $a$  = assumed mean (usually the middle value of  $x_i$ )
- $d_i = x_i - a$  (deviation from the assumed mean)

### C. Step-Deviation Method

$$\bar{x} = a + \frac{\sum f_i u_i}{\sum f_i} \times h$$

Where:

- $h$  = class size (Upper limit - Lower limit)
- $u_i = (x_i - a) / h$

## 2. Mode of Grouped Data

The mode is the value among the observations which occurs most often. For grouped data, we first locate the Modal Class (the class with the maximum frequency).

Mode of grouped data can be calculated using the formula

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

Where:

- $l$  = lower limit of the modal class
- $h$  = size of the class interval (assuming all class sizes are 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

## 3. Median of Grouped Data

The median is a measure of central tendency which gives the value of the middle-most observation in the data. First, we find the cumulative frequency (cf) and then locate the Median Class (the class whose cumulative frequency is greater than and nearest to  $n/2$ ).

Median for grouped data can be calculated using the formula,

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

Where:

- $l$  = lower limit of median class
- $n$  = number of observations ( $\sum f_i$ )
- $cf$  = cumulative frequency of the class preceding the median class
- $f$  = frequency of median class
- $h$  = class size (assuming class size to be equal)

#### 4. Empirical Relationship between the Three Measures

There is an empirical relationship between the three measures of central tendency (Mean, Median, and Mode) which is very important for solving 1-mark or 2-mark questions:

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