

# CLASS – 10 MATHEMATICS

Chapter – 13

STATISTICS

Part – 8

Median of Grouped Data

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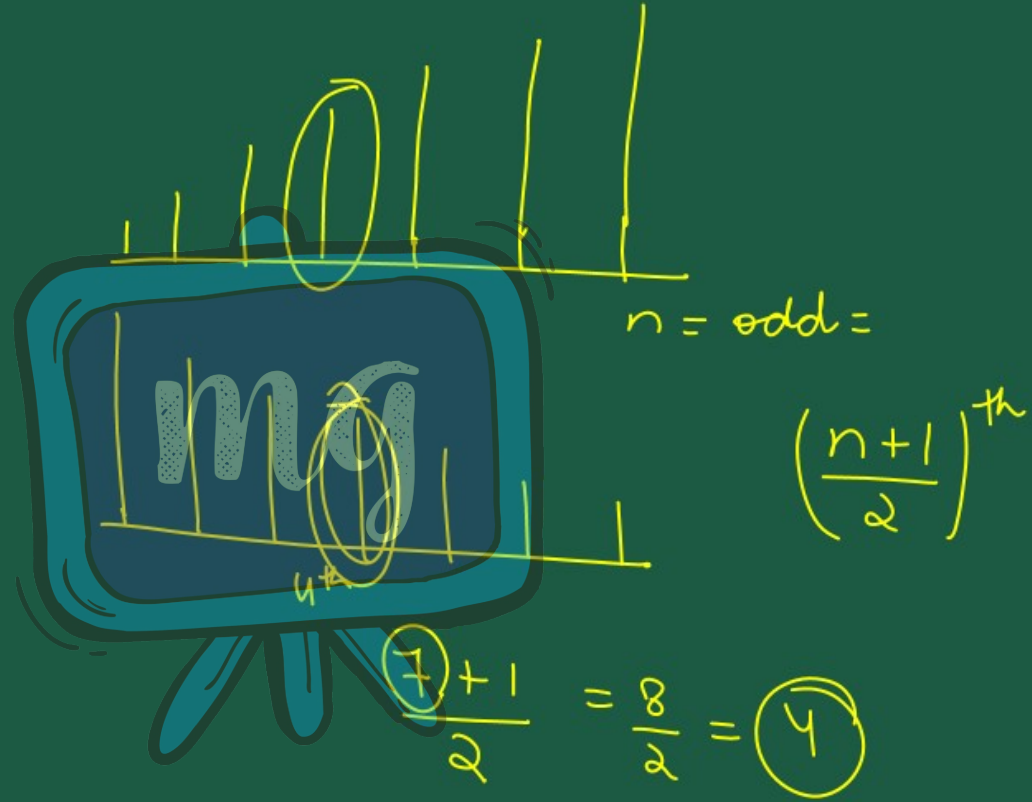
# OVERVIEW

1. Mean of Grouped Data

2. Mode of Grouped Data

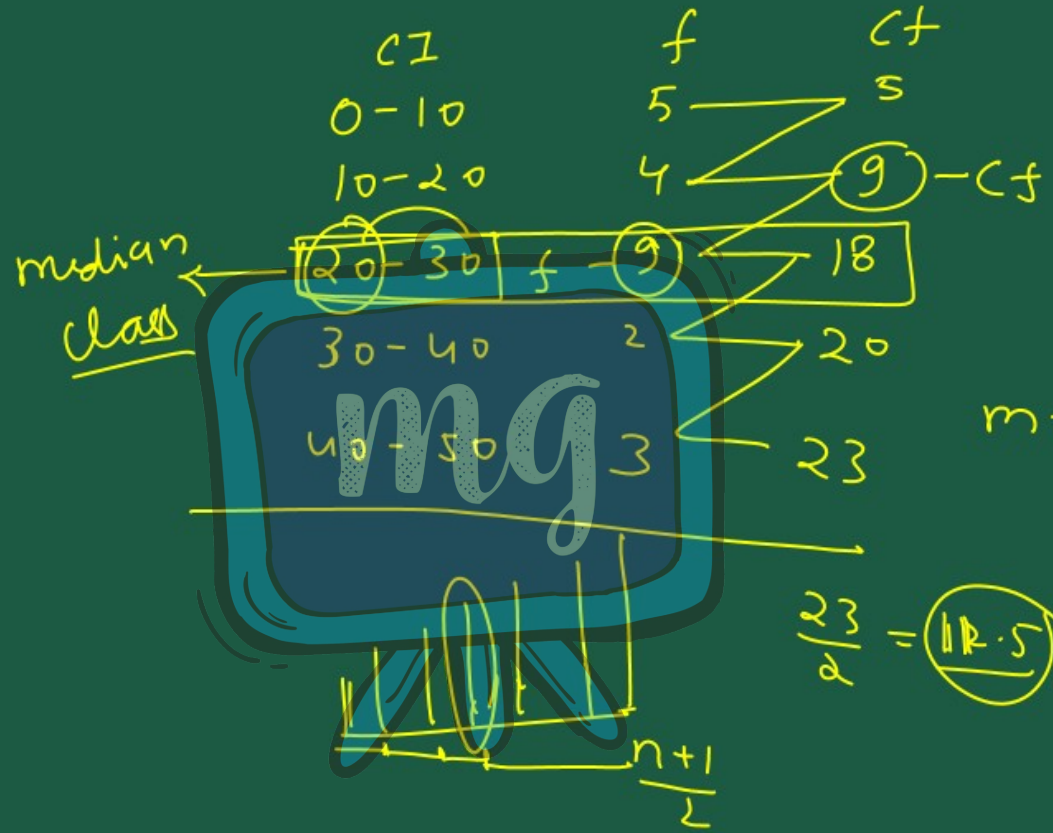
3. Median of Grouped Data





The diagram illustrates the derivation of the formula for the sum of an arithmetic progression (AP). At the top, a bar chart shows terms of an AP: 7, 10, 12, 14, 19, 23, 24, 27. A horizontal line is drawn below the bars, with a double-headed arrow underneath labeled '4<sup>th</sup>' and '5<sup>th</sup>', indicating the number of terms. A circled '8' is written below the line. Below the chart is a blue chalkboard with the 'mg' logo. The logo has '4<sup>th</sup>' and '5<sup>th</sup>' written above it, and '14 + 19' written below it. A double-headed arrow is drawn below the logo, with a '2' written below it. To the right of the chalkboard, the formula for the sum of an AP is written:

$$n = \text{even}$$
$$S_n = \frac{\left(\frac{n}{2}\right)^{\text{th}} + \left(\frac{n}{2} + 1\right)^{\text{th}}}{2}$$



$$m = l + \left[ \frac{\frac{n}{2} - Cf}{f} \right] \times h$$

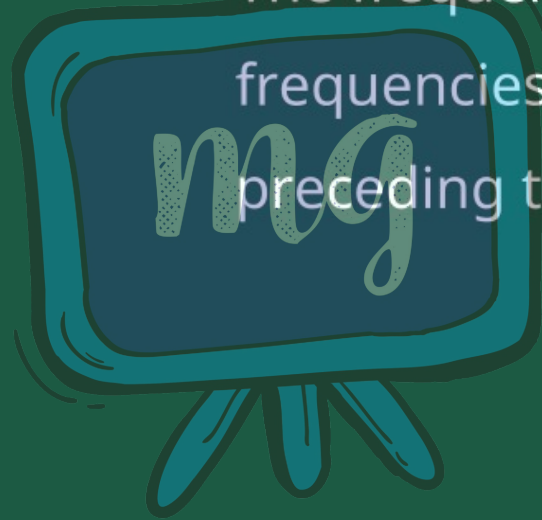
# MEDIAN

The middle most value of the given data set when it is arranged in either ascending order or descending order of magnitude is called median.

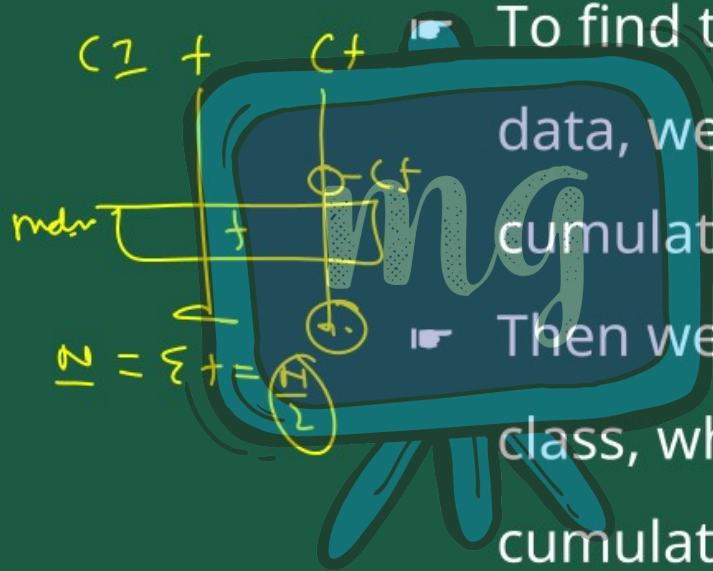
Median is also called a positional average.

# CUMULATIVE FREQUENCY

The frequency obtained by adding the frequencies of all the classes preceding the given class.



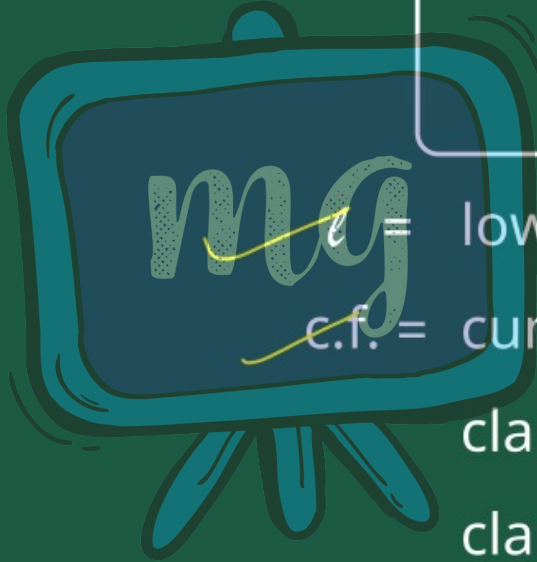
# MEDIAN OF GROUPED DATA



To find the median of a grouped data, we need to find the cumulative frequency and  $n/2$ .

Then we have to find the median class, which is the class of the cumulative frequency near or greater than the value of  $n/2$ .

$$\text{Median} = \ell + \left[ \frac{\frac{n}{2} - \text{c.f.}}{f} \right] \times h$$



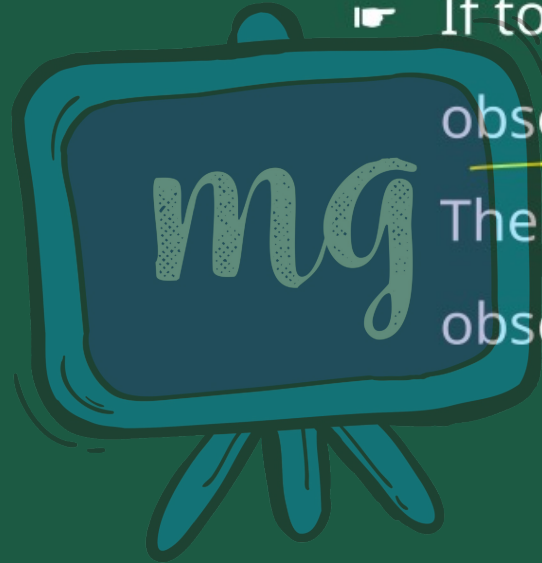
$\ell$  = lower limit of median class  
 $\text{c.f.}$  = cumulative frequency of the class preceding to the median class

$f$  = frequency of the median class  
 $h$  = size of class



**Note**

- ▮ If total number of observations is odd, say  $n$ .  
Then, Median is the  $\left(\frac{n+1}{2}\right)$ th observation.



- If total number of observations is even, say  $n$ . Then,

$$\text{Median} = \frac{\text{Value of } \left(\frac{n}{2}\right) \text{ term} + \text{Value of } \left(\frac{n}{2} + 1\right) \text{ term}}{2}$$

## EMPIRICAL RELATIONSHIP BETWEEN MEAN, MEDIAN & MODE

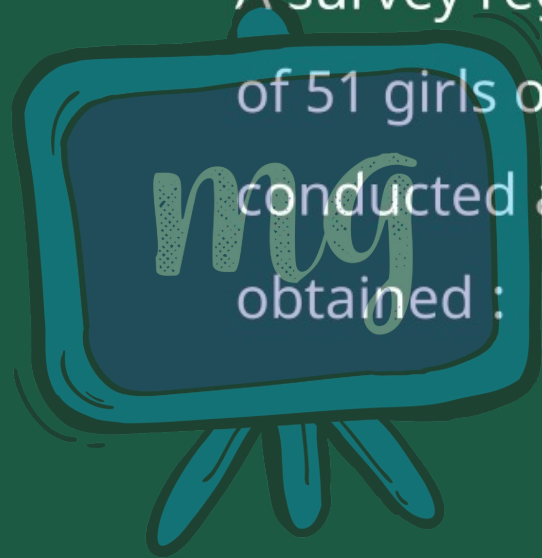
There is an empirical relationship  
between the three measures of central  
tendency :

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

$$\underline{3 \text{ med} - 2 \text{ Mean} = \text{mode}}$$

## Example : 7

A survey regarding the heights (in cm) of 51 girls of Class X of a school was conducted and the following data was obtained :



Height (in cm)	Number of Girls
Less than 140	4
Less than 145	11
Less than 150	29
Less than 155	40
Less than 160	46
Less than 165	51



Find the median height.



Solution :

median  
class

Height (in cm)	Number of Girls	Cumulative Frequency (C.F.)
Below 140	4	4
140 - 145	7	11 Cf
145 - 150	18 - f	29
150 - 155	11	40
155 - 160	6	46
160 - 165	5	51

$$N = \Sigma f = 51$$

$$\frac{H}{2} = \frac{51}{2} = \underline{25.5}$$

$$\text{median} = l + \left[ \frac{\frac{H}{2} - (F)}{f} \right] \times h$$

$$= 145 + \left[ \frac{25.5 - 11}{18} \right] \times 5$$

$$= 145 + \left[ \frac{14.5}{18} \right] \times 5$$

$$= 145 + \left[ \frac{72.5}{180} \right]$$

$$\Rightarrow 145 + 40.2$$

$$145 + 4.02$$

$$\Rightarrow \underline{149.02}$$