CLASS – 10

MATHEMATICS

Chapter – 13

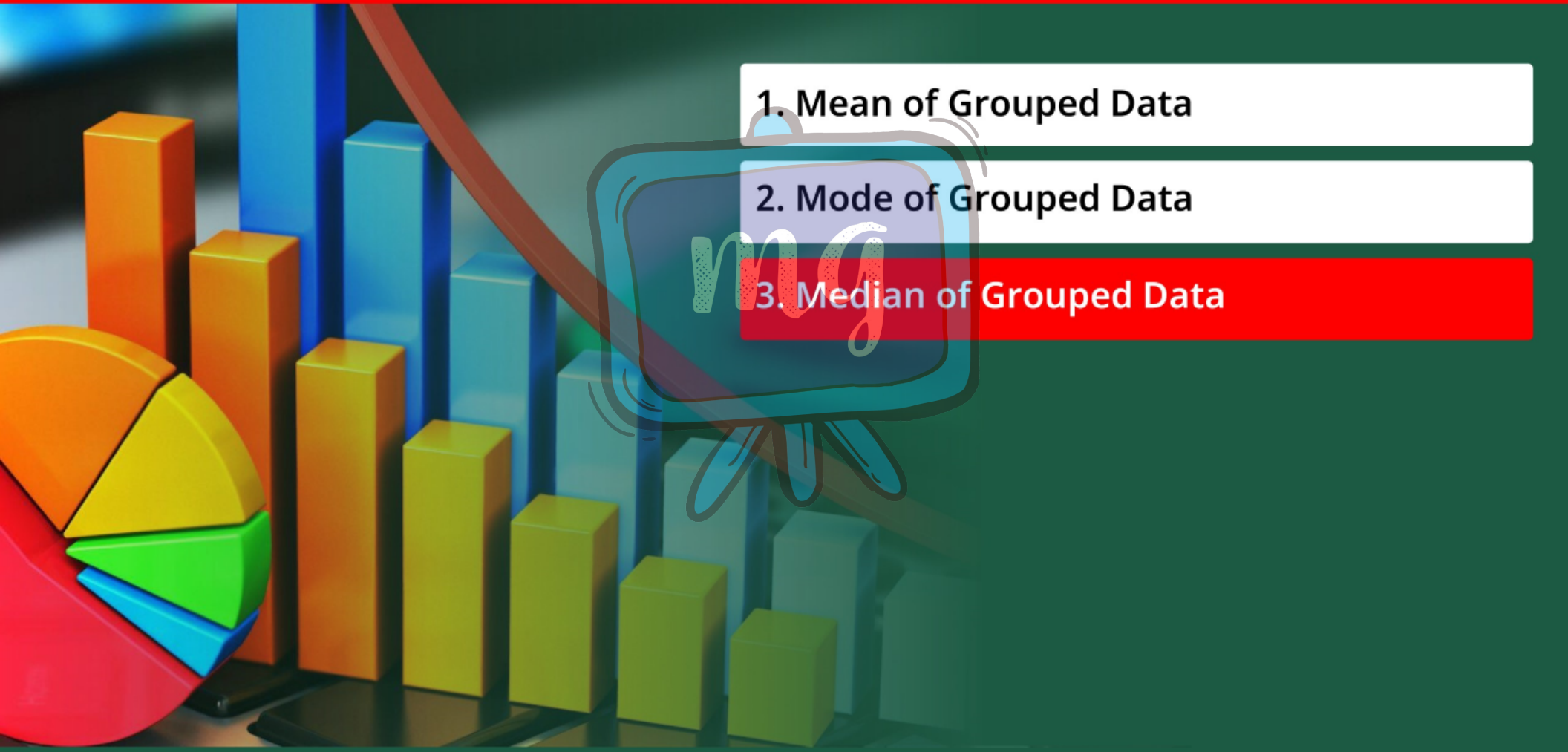
STATISTICS

Part – 8

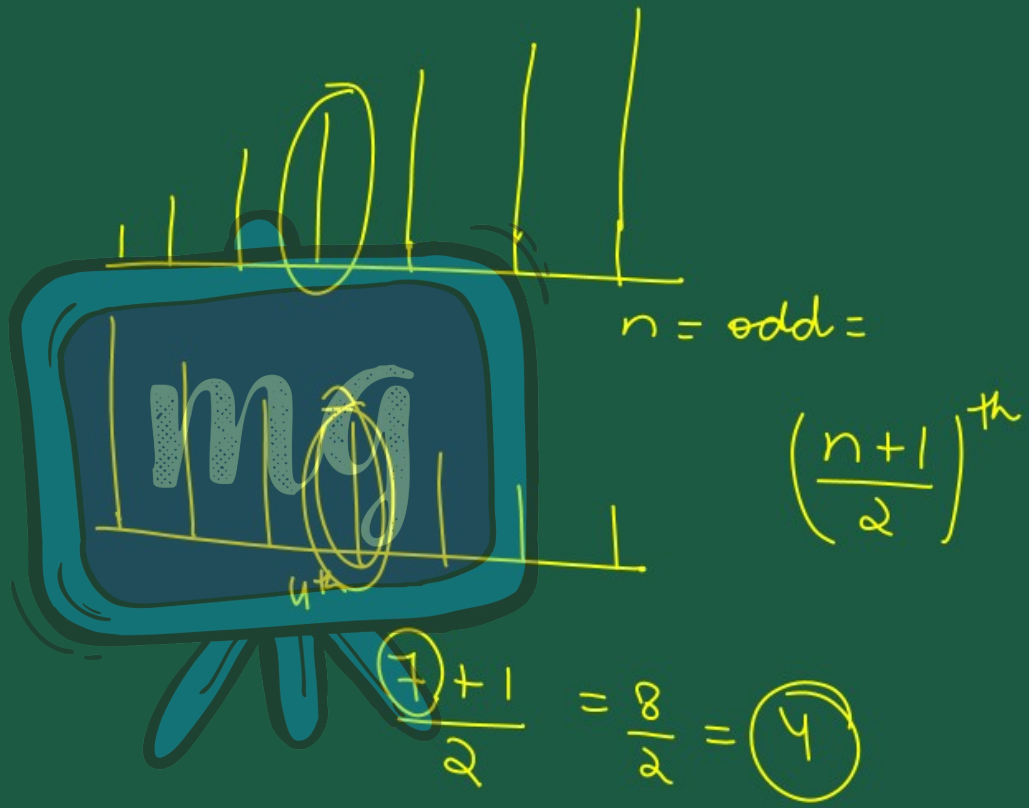
Median of Grouped Data

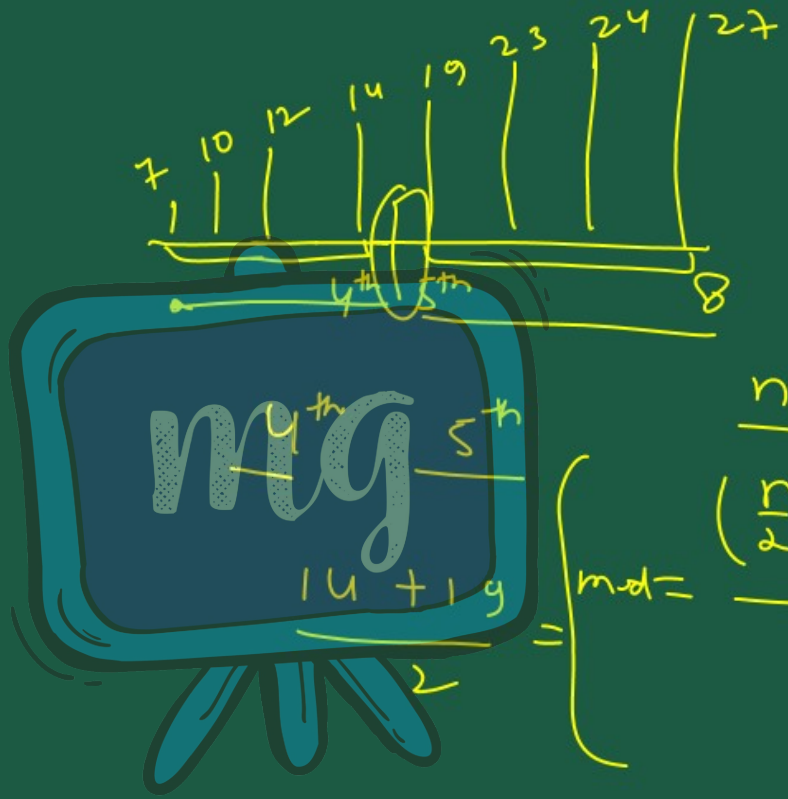
Shubham Tiwari

OVERVIEW

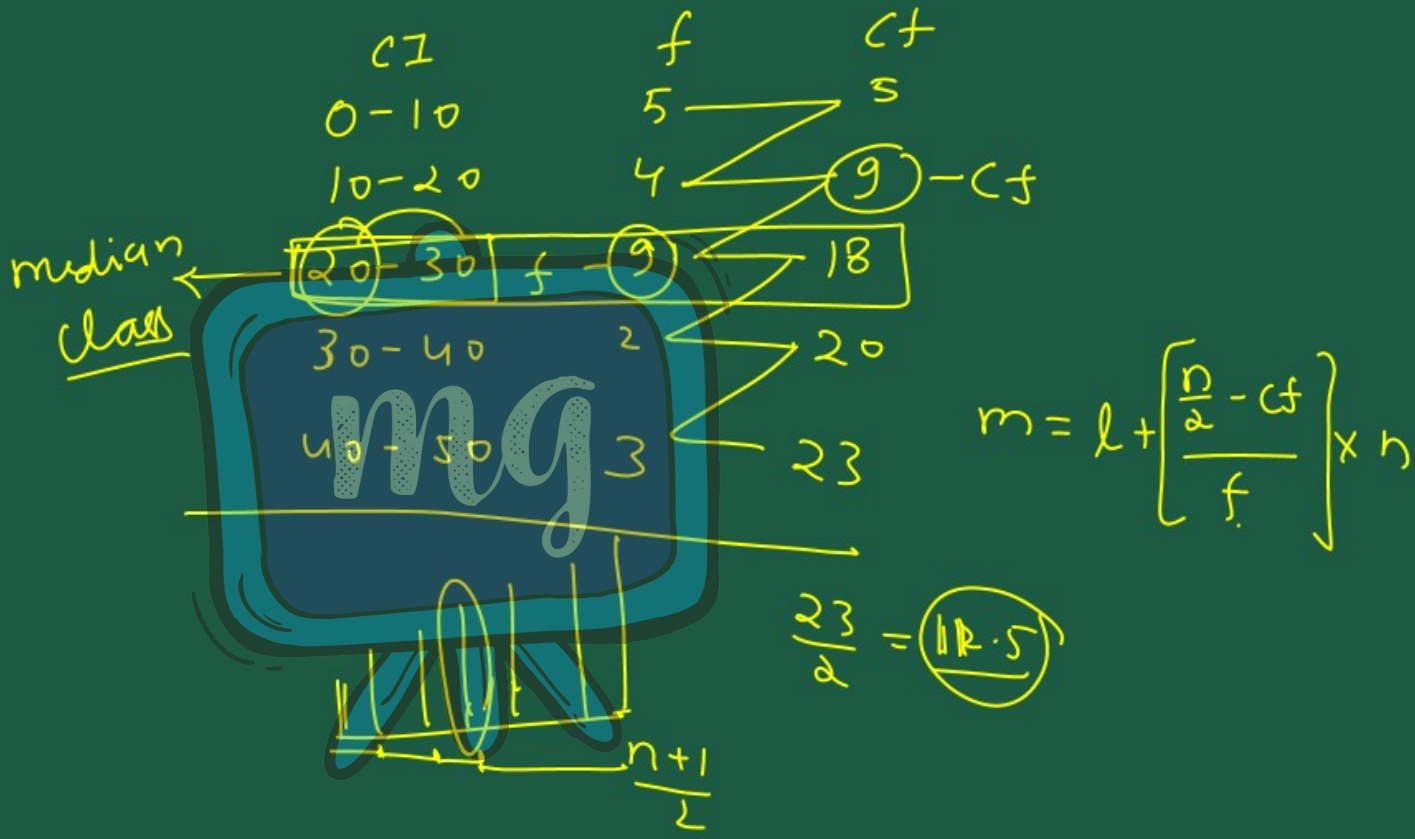


1. Mean of Grouped Data
2. Mode of Grouped Data
3. Median of Grouped Data





$$\text{median} = \begin{cases} \dfrac{\left(\frac{n}{2}\right)^{th} + \left(\frac{n}{2}+1\right)^{th}}{2} & n = \text{even} \end{cases}$$



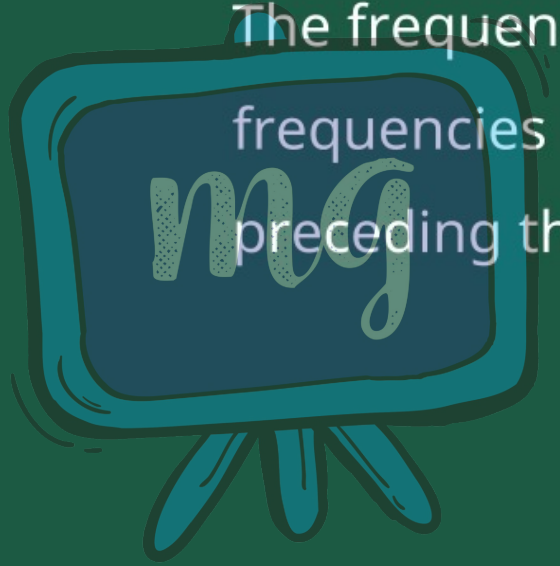
MEDIAN

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.

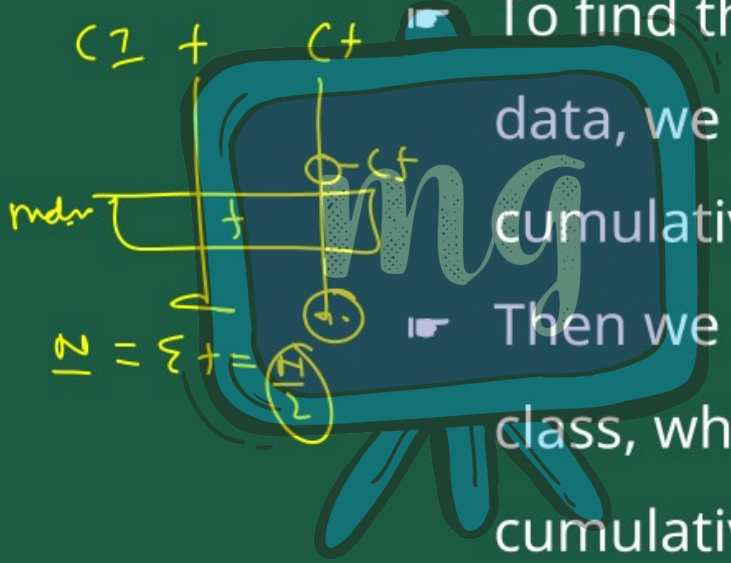
Median is also called a positional average.

CUMULATIVE FREQUENCY

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

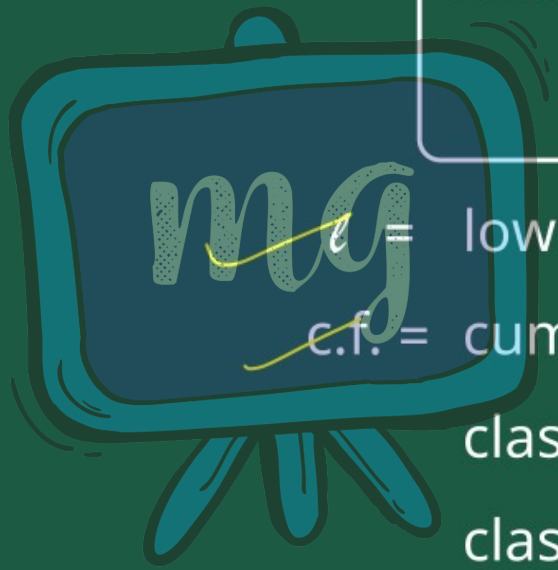


MEDIAN OF GROUPED DATA



- 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.

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



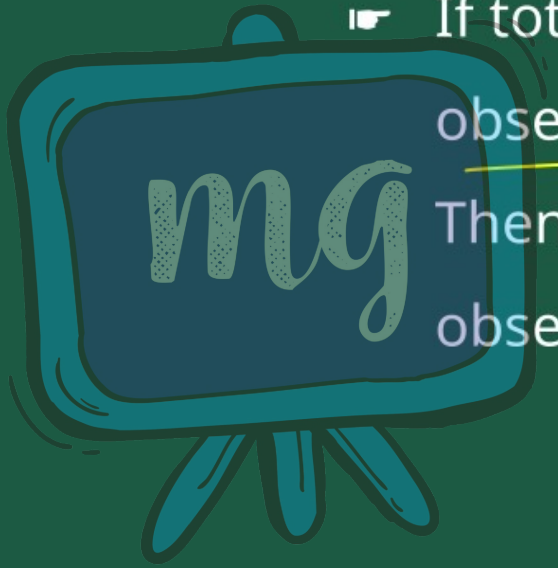
ℓ = lower limit of median class

c.f. = cumulative frequency of the class preceding to the median class

f = frequency of the median class

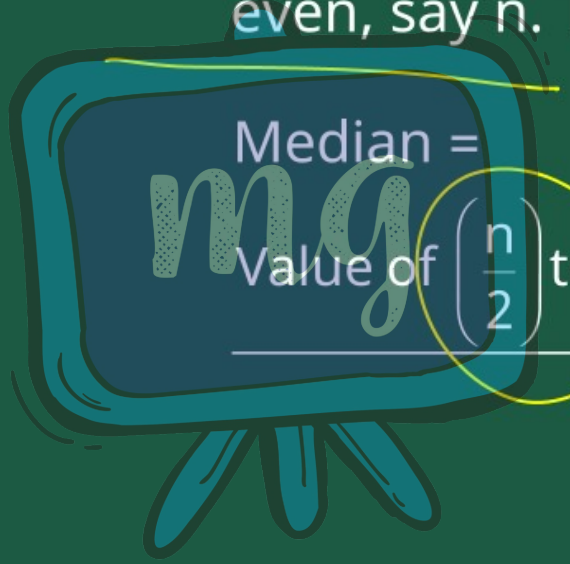
h = size of class

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

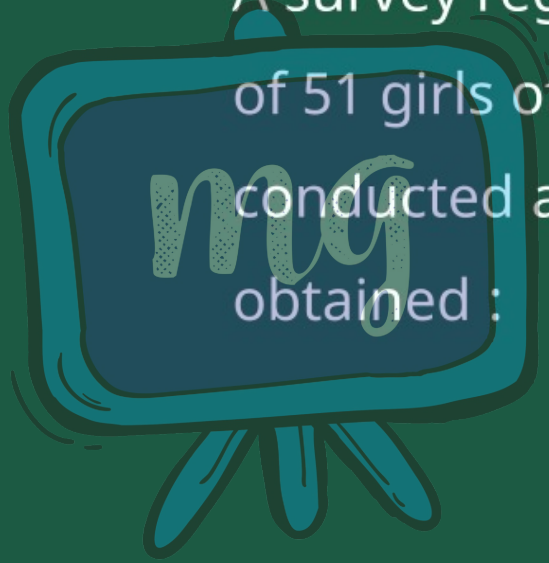
There is a empirical relationship between the three measures of central tendency :

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

$3\,\text{Med} - 2\,\text{Mean} = \text{Mode}$

Example : 7

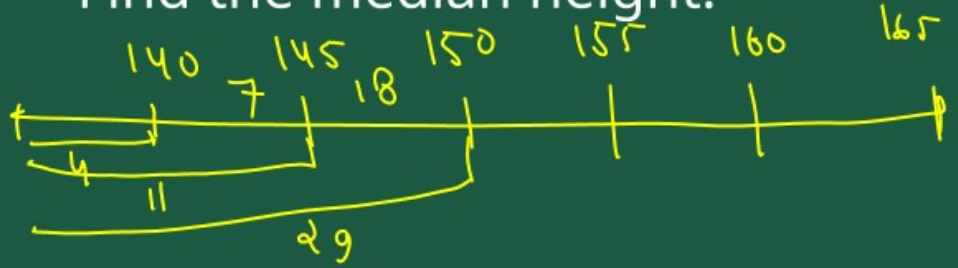
A survey regarding the heights (in cm) of 51 girls of Class X of a school was conducted and the following data was obtained :



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

7
18
11
6
5

Find the median height.



Solution :

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

median class

$N = \Sigma f = 51$

$$\frac{N}{2} = \frac{51}{2} = 25.5$$

$$\text{median} = l + \left[\frac{\frac{N}{2} - cf}{f}\right] \times h$$

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

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

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

$$\Rightarrow 145 + 40.2$$

$$145 + 4.02$$

$$\Rightarrow 149.02$$