# **Statistics**

By

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## MEASURES OF CENTRAL TENDENCY

An average value or a central value of a distribution is the value of variable which is representative of the entire distribution, this representative value are called the measures of central tendency.





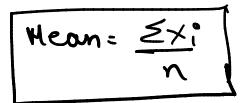
Mean Median Mode





(i) For ungrouped dist. : If  $x_1, x_2, \dots x_n$  are <u>n</u> values of variate  $x_i$  then their A.M.  $\overline{x}$  is defined as

$$\begin{bmatrix} \overline{x} = \frac{x_1 + x_2 + \dots + x_n}{n} \\ \Sigma x_i = n \overline{x} \end{bmatrix} = \underbrace{\frac{\sum_{i=1}^{n} x_i}{n}}_{i}$$



(ii) For ungrouped and grouped freq. dist. : If  $x_1, x_2, \dots x_n$  are values of variate with corresponding frequencies  $f_1, f_2, \dots f_n$  then their A.M. is given by

$$\overline{x} = \frac{f_1x_1 + f_2x_2 + \dots + f_nx_n}{f_1 + f_2 + \dots + f_n} = \frac{\sum_{i=1}^n f_ix_i}{N}, \text{ where } N = \sum_{i=1}^n f_i$$

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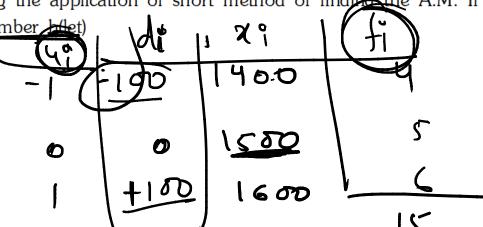
(iii by short method: If the value of  $x_i$  are large, then the calculation of A.M. by using previous formula is quite tedious and time consuming. In such case we take deviation of variate from an arbitrary point of  $d_i = x_i - a$ 

 $\overline{x} = a + \frac{\Sigma f_i d_i}{N}, \text{ where a is assumed mean}$  23 144 232 1932

By step deviation method: Sometime during the application of short method of finding the A.M. If each deviation degree divisible by a common number below.

Let .

$$\overline{x} = a + \left(\frac{\sum f_i u_i}{N}\right)$$



If for some  $x \in R$ , the frequency distribution of the marks obtained by 20 students in a test is

| Marks     | 2         | 3    | 5          | 7 |
|-----------|-----------|------|------------|---|
| Frequency | $(x+1)^2$ | 2x-5 | $x^2 - 3x$ | x |

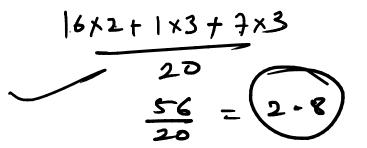
Then, the mean of the marks is

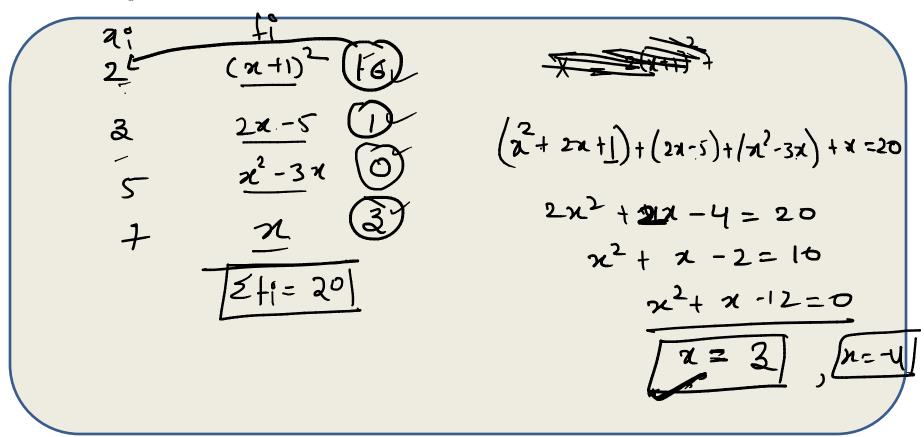
(2019 Main, 10 April I)



(c) 2.5

(d) 3.2





# Properties

$$(D \cap A.M. \text{ of } (x_i + \lambda) = \overline{x} + \lambda$$

A.M. of 
$$(\lambda x_i) = \lambda \overline{x}$$

If 
$$\overline{x}$$
 is the mean of variate  $(x_i)$  then  $(x_i) = \overline{x} + \lambda$ 

A.M. of  $(x_i) = \overline{x} + \lambda$ 

A.M. of  $(ax_i) = \lambda \overline{x}$ 

A.M. of  $(ax_i) = a\overline{x} + b$ 

(where  $\lambda$ , a, b are constant)

$$\overline{X} = \frac{X_1 + X_2 + X_3 - Y_1}{N}$$

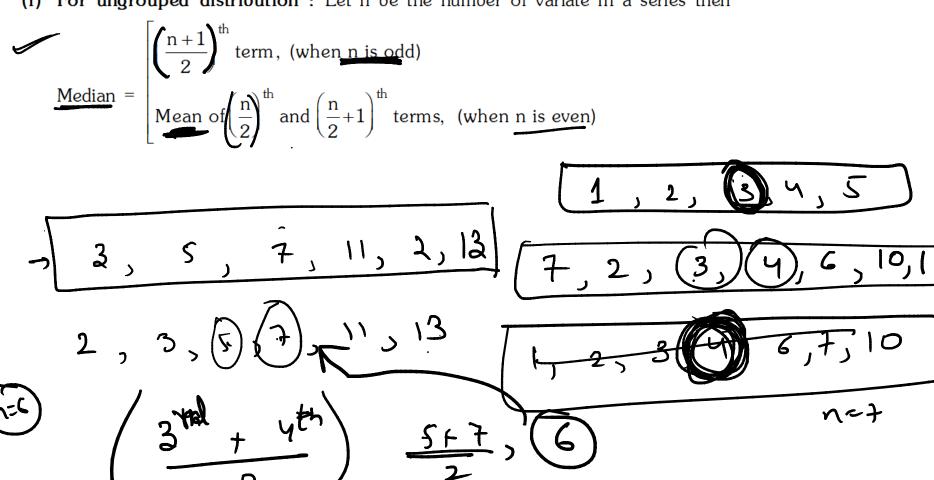
$$X = \frac{x_1 + x_2 + \dots + x_n + x_n}{x_1 + x_2 + x_2 + x_3} + A$$

#### MEDIAN:

The median of a series is the value of middle term of the series when the values are written in ascending order. Therefore median, divided an arranged series into two equal parts.

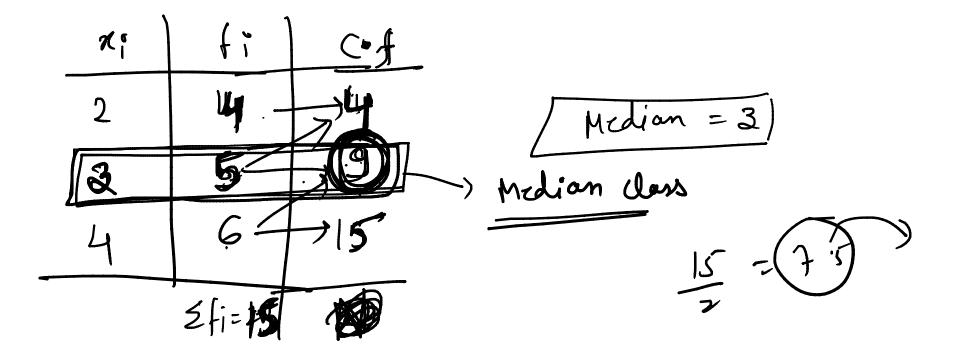
### Formulae of median :

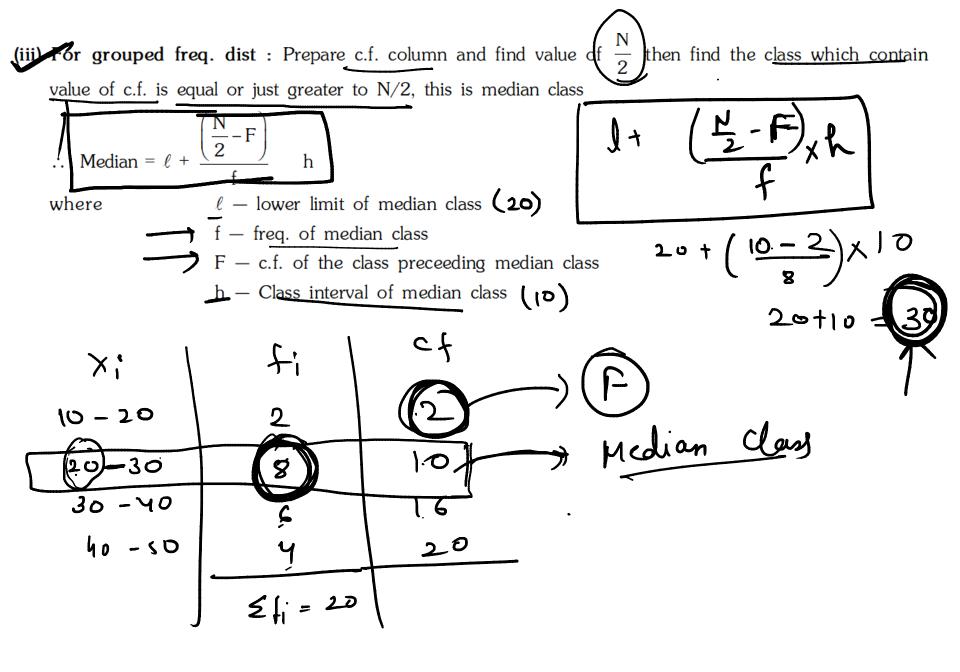
(i) For ungrouped distribution: Let n be the number of variate in a series then



For ungrouped freq. dist. : First we prepare the cumulative frequency (c.f.) column and Find value of

Median = 
$$\begin{bmatrix} \left(\frac{N+1}{2}\right)^{th} & \text{term, (when N is odd)} \\ Mean & \text{of } \left(\frac{N}{2}\right)^{th} & \text{and } \left(\frac{N}{2}+1\right)^{th} & \text{terms, (when N is even)} \end{bmatrix}$$







The mean and the median of the following ten numbers in increasing order 10, 22, 26, 29, 34, x, 42,

 $\sqrt{0}$ , y are 42 and 35 respectively, then  $\frac{y}{}$  is equal to

(2019 Main, 9 April II)

(a) 
$$\frac{7}{3}$$

- 126 42 7 36 12 2

$$\begin{cases} 42 = \frac{294 + 4}{10} \\ y = 126 \end{cases}$$

$$\frac{2}{35} = \frac{344}{2}$$

$$\chi = 36$$