

## 25

## MEASURES OF CENTRAL TENDENCY

- **Central Tendency:** A Single quantity which enables us to know the average characteristics of the data under consideration. Use of central tendency is a technique to analyse the data.

- **Various Measures of central tendency :**

The arithmetic mean/the mean/Average

The median

The mode

Mean: It is the ratio of the sum of all values of the variable and the number of observations and denoted by  $\bar{X}$ .

Mean for raw data  $\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$

$x_1, x_2, x_3, \dots, x_n$  are  $n$  observations, symbol  $\Sigma$  stand for 'sum of'

Mean for ungrouped frequency distribution:

$$\bar{x} = \frac{\sum_{i=1}^n f_i \times x_i}{\sum_{i=1}^n f_i}$$

$x_1, x_2, x_3, \dots, x_n$  are  $n$  observations with their respective frequencies  $f_1, f_2, f_3, \dots, f_n$ .

Mean for grouped frequency distribution:

$$\bar{x} = \frac{\sum_{i=1}^n f_i \times x_i}{\sum_{i=1}^n f_i}$$

$x_1, x_2, x_3, \dots, x_n$  are class marks of different classes with their respective frequencies  $f_1, f_2, f_3, \dots, f_n$ .

Mean by short cut Method:

$$\bar{X} = A + \frac{\sum_{i=1}^n f_i d_i}{\sum_{i=1}^n f_i} \times C$$

A = assumed mean

$$d_i = \frac{x_i - A}{C}$$

C = class size

- **Median :** It is the middle most value of arrayed data. It divides the arrayed data into two equal parts.

Median, when number of observations is odd:

Median = value of  $\left(\frac{n+1}{2}\right)^{\text{th}}$  observation in the

array,  $n$  is number of observations in arrayed form Median, when number of observations is even:

$$\text{Median} = \frac{\text{value of } \left(\frac{n}{2}\right)^{\text{th}} \text{ observation} + \text{value of } \left(\frac{n}{2} + 1\right)^{\text{th}} \text{ observation}}{2}$$

- **Mode:** It is the most frequently occurring value amongst the given values of the variate in the data and denoted by Mo.

or

It is an observation with the maximum frequency in the given data.

**CHECK YOUR PROGRESS:**

1. The mean of the distribution in which variates are 1, 2, 3 ..... $n$  and the frequency of each being 1, is :

(A)  $\frac{n(n+1)}{2}$       (B)  $\frac{n}{2}$       (C)  $\frac{(n+1)}{2}$       (D)  $n(n+1)$

2. Which of the following cannot be determined graphically?:

(A) Mean      (B) Median      (C) Mode      (D) None of these

3. The mean of 7 observations is 15. If each observation is increased by 2, then the new mean is:  
 (A) 15                      5(B) 9                      (C) 17                      (D) 7
4. If the mean of the following distribution is 2.6, then the value of y is:  
 Variable(x):            1            2            3            4            5  
 Frequency:            4            5            y            1            2  
 (A) 3                      (B) 8                      (C) 13                      (D) 24
5. The median of the first 10 prime numbers is:  
 (A) 11                      (B) 12                      (C) 13                      (D) 14
6. If the mean of 6, 7, x, 8, y, 14, is 9, then  
 (A)  $x + y = 21$       (B)  $x + y = 19$       (C)  $x - y = 19$                       (D)  $x - y = 21$
7. What is the mode of 2, 7, 6, 7, 21, 5, 5, 10, 13, 7?
8. What is the median of 4, 8, 9, 11, 13, 17, 18, 19?
9. Find the mean of the following :
- |           |        |         |         |         |         |
|-----------|--------|---------|---------|---------|---------|
| Class     | 0 - 10 | 10 - 20 | 20 - 30 | 30 - 40 | 40 - 50 |
| Frequency | 5      | 18      | 15      | 16      | 6       |
10. A group of 10 items has arithmetic mean 6. If the arithmetic mean of 4 of these items is 7.5, then find the mean of the remaining items.

### STRETCH YOURSELF

1. If the mean of the following frequency distribution is 62.8 and sum of all the frequencies is 50, then find the missing frequencies  $F_1$  and  $F_2$ .
- |           |        |         |         |         |          |           |
|-----------|--------|---------|---------|---------|----------|-----------|
| Class     | 0 - 20 | 20 - 40 | 40 - 60 | 60 - 80 | 80 - 100 | 100 - 120 |
| Frequency | 5      | $F_1$   | 10      | $F_2$   | 7        | 8         |
2. The mean of n observations is  $\bar{X}$ . If the first item is increased by 1, second by 2 and so on, then find the new mean.

### ANSWERS

#### CHECK YOUR PROGRESS :

1. C    2. A            3. C            4. B            5. B            6. B            7. 7            8. 12  
 9. 27    10. 15

#### STRETCH YOURSELF :

1.  $F_1 = 8, F_2 = 12$                       2.  $\bar{X} + \frac{n+1}{2}$