DAY 4

MODE

Mode is that value of variable which has **highest frequency** or that value which repeats maximum times in the series. It is also known as **NORM**.

In 9th class, we have discussed about Mode in Individual Series. In this section, we shall discuss Mode in **Discrete series** and **Continuous Series.**

Discrete Series:

In Discrete Series, Mode is calculated by observation, Which value has highest frequency that is Mode.

1. Find the mode of the distribution :

Size of garments	**28**	**29**	**30**	**31**	**32**	**33**
No. of persons	**5**	**14**	**26**	**50**	**23**	**10**

Sol:- We notice that 50 is the maximum frequency and 31 has it.

$\therefore$ 31 is the mode of the distribution.

2. Find the mode of the distribution :

Marks	**10**	**12**	**14**	**16**	**18**	**20**
No. of Students	**6**	**14**	**9**	**10**	**5**	**7**

Sol:- We notice that 14 is the maximum frequency and 12 has it.

$\therefore$ 12 is the mode of the distribution.

MODE OF A GROUPED DISTRIBUTION

- While computing mode of continuous series, we have to find the class which has the **maximum frequency**. This class is known as **Modal Class.**
- Give name f_1 **to maximum frequency,** f_0 **to frequency of upper class and** f_2 **to frequency to lower class.**
- Replace these values in the following formula:

$$\textbf{Mode} = \mathbf{L} + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

$\mathbf{L}$ = Lower limit of the modal class; f_1 = frequency of modal class

f_0 = Frequency of class preceding the modal class

f_2 = Frequency of class succeeding the modal class

i = Width of the modal class

1. Find the mode for the following distribution:-

Class Interval	**1-3**	**3-5**	**5-7**	**7-9**	**9-11**
No. of students	**7**	**8**	**8**	**2**	**1**

Sol:-

Class Interval	No. of Students
1-3	7 f_0
3-5	8 f_1
5-7	2 f_2
7-9	2
9-11	1

Here Highest frequency is $f_1 = 8$ and its modal class interval is $\mathbf{3-5}$
and its lower limit $\mathbf{L = 3}$ and **class size**$(\boldsymbol{i}) = \mathbf{2}, f_0 = 7, f_2 = 2,$

$$\therefore \text{Mode} = \text{L} + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times i$$
$$= 3 + \left(\frac{8-7}{2\times 8 - 7 - 2}\right) \times 2$$
$$= 3 + \left(\frac{1}{16-9}\right) \times 2 = 3 + \frac{2}{7} = 3 + 0.286 = 3.286$$

Hence modal value is 3.286

2. Find the mode for the following distribution:-

Age	**0-15**	**15-30**	**30-45**	**45-60**	**60-75**	**75-90**
No. of patients	**6**	**9**	**12**	**18**	**15**	**10**

Sol:-

Age	No. of Patients
0-15	6
15-30	9
30-45	12 f_0
45-60	**18 f_1**
60-75	15 f_2
75-90	10

Here Highest frequency is $f_1 = 18$ and its modal class interval is $\mathbf{45-60}$
and its lower limit $\mathbf{L = 45}$ and **class size**$(\boldsymbol{i}) = \mathbf{15}, f_0 = 12, f_2 = 15,$

$$\therefore \text{Mode} = \text{L} + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times i$$
$$= 45 + \left(\frac{18-12}{2\times 18 - 12 - 15}\right) \times 15$$
$$= 45 + \left(\frac{6}{36-27}\right) \times 15 = 45 + \frac{6}{9} \times 15 = 45 + 10 = 55$$

Hence modal value is 55

3. Find the Arithmetic Mean and Mode for the following distribution:-

Class Interval	**0-20**	**20-40**	**40-60**	**60-80**	**80-100**	**100-120**
Frequency	**15**	**14**	**13**	**10**	**21**	**12**

Sol:-

Class Interval	Frequency(f)	Mid Value (x)	fx
0-20	15	10	150
20-40	14	30	420
40-60	13	50	650
60-80	10 f_0	70	700
80-100	21 f_1	90	1890
100-120	12 f_2	110	1320
Total	$\Sigma f = 85$		$\Sigma fx = 5130$

Arithmetic Mean: $\bar{X} = \frac{\Sigma fx}{\Sigma f} = \frac{5130}{85} = 60.39$ (app)

Mode: Here Highest frequency is $f_1 = 21$ and its modal class interval is $\mathbf{80 - 100}$ and its lower limit $\mathbf{L = 80}$ and **class size**$(\boldsymbol{i}) = \mathbf{20}, f_0 = 10, f_2 = 12$

$$\therefore \text{Mode} = \text{L} + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times i$$

$$= 80 + \left(\frac{21-10}{2\times21-10-12}\right) \times 20$$

$$= 80 + \left(\frac{11}{42-22}\right) \times 20 = 80 + \frac{11}{20} \times 20 = 80 + 11 = 91$$

Hence modal value is 91

4. Find the Mode for the following distribution:-

Class Interval	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**
Frequency	**8**	**10**	**2**	**5**	**3**	**4**

Sol:-

Class Interval	Frequency(f)
15-20	8 f_0
20-25	10 f_1
25-30	2 f_2
30-35	5
35-40	3
40-45	4

Here Highest frequency is $f_1 = 10$ and its modal class interval is $\mathbf{20 - 25}$ and its lower limit $\mathbf{L = 20}$ and **class size**$(\boldsymbol{i}) = \mathbf{5}, f_0 = 8, f_2 = 2$

$$\therefore \text{Mode} = \text{L} + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times i$$

$$= 20 + \left(\frac{10-8}{2\times10-8-2}\right) \times 5$$

$$= 20 + \left(\frac{2}{20-10}\right) \times 5 = 20 + \frac{2}{10} \times 5 = 20 + 1 = 21$$

Hence modal value is 21

EXERCISE

1. Ex 14.2