STATISTICS
PPT-3

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 14
CHAPTER NAME : STATISTICS

1. **MEAN (AVERAGE):** Mean [Ungrouped Data] – Mean of n observations, $x_1, x_2, x_3 \ldots x_n$, is

$$\overline{X} = \frac{x_1 + x_2 + x_3 + \ldots + x_n}{n} = \frac{1}{n}\sum x \qquad \therefore \qquad \overline{X} = \frac{\sum x}{n}$$

- 2. Frequency of a class is centred at its mid-point called class mark.

LEARNING OUTCOMES

1 Students will be able to know mode.
2. Students will be able to apply the knowledge of mode in solving questions
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Mode

(i) For Ungrouped Data:

The mode is that observation which occurs most frequently, i.e., an observation with maximum frequency.

(ii) For Grouped Data:

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h, \text{ where}$$

l = lower limit of the modal class,

f1 = frequency of the modal class

f 2 = frequency of the class suceeding the modal class,

h = size of the class interval,

f0 = frequency of the class preceeding the modal class.

The class with the maximum frequency is called modal class.

The following data gives the distribution of total monthly household expenditure of 200 families of a village. Find the modal monthly expenditure of the families. Also, find the mean monthly expenditure:

Expenditure (in ₹)	Number of families
1000 – 1500	24
1500 – 2000	40
2000 – 2500	33
2500 – 3000	28
3000 – 3500	30
3500 – 4000	22
4000 – 4500	16
4500 – 5000	7

Here, Maximum frequency = 40

∴ Modal class = 1500 – 2000 and $l = 1500, f_0 = 24, f_1 = 40, f_2 = 33$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 1500 + \left(\frac{40 - 24}{80 - 24 - 33}\right) \times 500$$

$$= 1500 + \frac{16}{23} \times 500 = 1500 + 347.83 = ₹\ 1847.83$$

For Mean

Expenditure (in ₹)	Class mark (x_i)	Number of families (f_i)	$u_i = \dfrac{x_i - 2750}{500}$	$f_i u_i$
1000 – 1500	1250	24	–3	–72
1500 – 2000	1750	40	–2	–80
2000 – 2500	2250	33	–1	–33
2500 – 3000	2750 = a (Let)	28	0	0
3000 – 3500	3250	30	1	30
3500 – 4000	3750	22	2	44
4000 – 4500	4250	16	3	48
4500 – 5000	4750	7	4	28
Total		$\Sigma f_i = 200$		$\Sigma f_i u_i = -35$

Here, $a = 2750, \Sigma f_i = 200, \Sigma f_i u_i = -35, h = 500$

∴

$$\text{Mean} = a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$$

$$= 2750 + \frac{(-35)}{200} \times 500 = 2750 - \frac{175}{2}$$

$$= 2750 - 87.50 = ₹\ 2662.50$$

The given distribution shows the number of runs scored by some top batsmen of the world in one-day international cricket matches.

Runs scored	Number of batsmen
3000 – 4000	4
4000 – 5000	18
5000 – 6000	9
6000 – 7000	7
7000 – 8000	6
8000 – 9000	3
9000 – 10000	1
10000 – 11000	1

Find the mode of the data.

Runs scored	Number of batsmen (f_i)
3000 – 4000	4
4000 – 5000	18
5000 – 6000	9
6000 – 7000	7
7000 – 8000	6
8000 – 9000	3
9000 – 10000	1
10000 – 11000	1

Maximum frequency = 18,

$\therefore$ Modal class = 4000 – 5000; Here, $l = 4000, f_0 = 4, f_1 = 18, f_2 = 9$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 4000 + \left(\frac{18 - 4}{36 - 4 - 9}\right) \times 1000$$

$$= 4000 + \frac{14000}{23} = 4000 + 608.7 = 4608.7 \text{ runs}$$

The following data gives information on the observed lifetimes (in hours) of 225 electrical components:

Life times (in hours)	Frequency
0 – 20	10
20 – 40	35
40 – 60	52
60 – 80	61
80 – 100	38
100 – 120	29

Life times (in hours)	Frequency
0 – 20	10
20 – 40	35
40 – 60	52
60 – 80	61
80 – 100	38
100 – 120	29

Question 2:

The following data gives the information on the observed lifetimes (in hours) of 225 electrical components:

Lifetimes (in hours)	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120
Frequency	10	35	52	61	38	29

Determine the modal lifetimes of the components.

Answer 2:

From the data given above, it can be observed that the maximum class frequency is 61, belonging to class interval 60 – 80.

Therefore, modal class = 60 – 80

Lower class limit (l) of modal class = 60

Frequency (f_1) of modal class = 61

Frequency (f_0) of class preceding the modal class = 52

Frequency (f_2) of class succeeding the modal class = 38

Class size (h) = 20

$$Mode = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 60 + \left(\frac{61 - 52}{2 \times 61 - 52 - 38}\right) \times 20 = 60 + \frac{9}{32} \times 20 = 60 + 5.625 = 65.625$$

Therefore, modal lifetime of electrical components is 65.625 hours.

HOME ASSIGNMENT Ex. 14.2 Q. No 1 to Q5

THANKING YOU
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