STATISTICS

MODE

MODE :

It is value of variate which occurs most often.

More precisely mode is that value of variable in the data which has maximum frequency.

It is not necessary that in a series there must be only one mode. A distribution having only one mode is called unimodal, having two, bimodal and more than two multimodal.

Modal class: In a frequency distribution the class having maximum frequency is called modal class.

Example :

(i) The set of numbers 2, 3, 4, 7, 4, 5, 4, 9, 4 has mode 4 as it occurs the maximum number of times.

(ii) The set of numbers 5, 7, 6, 9, 1, 2 has no mode, as no number occurs more number of times than the other numbers.

Mode for grouped Data :

$$Mode = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

l = Lower limit of the modal class interval

f_1 = Frequency of the modal class

f_0 = Frequency of the class preceding the modal class

f_2 = Frequency of the class succeeding the modal class

h = Width of the class Interval

Ex. 1 Find the average height of maximum number of students.

Height (in Cm)	160-162	163-165	166-168	169-171	172-174
No. of Students	15	118	142	127	18

Sol.

Class	Frequrncy
159.5-162.5	15
162.5-165.5	118
165.5-168.5	142
168.5-171.5	127
171.5-174.5	18

We have to find the mode of the data. The given data is an inclusive series. So we convert it to an exclusive form.

The class 165.5 - 168.5 has maximum frequency. So it is the modal class.

$l = 165.5,$ $f_1 = 142,$ $f_0 = 118$ $f_2 = 127,$ & $h = 3$

$$Mode = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$= 165.5 + \left\{3 \times \frac{(142 - 118)}{(2 \times 142 - 181 - 127)}\right\}$$

$$= 165.5 + 1.85 = 167.35$$

Mode = 67.35 Cm.

Hence the average height of maximum number of students is 167.35 Cm.

Ex.2 Find the mode from the following data :

110, 120, 130, 120, 110, 140, 130, 120, 140, 120.

Sol. Arranging the data in the form of a frequency table, we have

Value	Tally bars	Frequency
110	| |	2
120	| | | |	4
130	| |	2
140	| |	2

Since the value 120 occurs maximum number of times i.e. 4. Hence, the modal value is 120.

Ex.3 Find the mode for the following series :

2.5, 2.3, 2.2, 2.2, 2.4, 2.7, 2.7, 2.5, 2.3, 2.2, 2.6, 2.2

Sol. Arranging the data in the form of a frequency table, we have

Value	Tally bars	Frequency
2.2	| | | |	4
2.3	| |	2
2.4	|	1
2.5	| |	2
2.6	|	1
2.7	| |	2

We see that the value 2.2 has the maximum frequency i.e. 4

So 2.2 is the mode for the given series.

Ex.4 Compute mode for the following data

7, 7, 8, 8, 8, 9, 9, 10, 10, 10, 11, 11, 12, 13, 13

Sol. Here, both the scores 8 and 10 occurs thrice (maximum number of times). So, we apply the empirical formula.

Here,

$\text{mean} = \frac{7\times2+8\times3+9\times2+10\times3+11\times2+12+13\times2}{2+3+2+3+2+1+2}$

$= \frac{14+24+18+30+22+12+26}{15} = \frac{146}{15} = 9.73$

No. of scores = 15 (odd)

$\therefore$ Median $= t_{\frac{15+1}{2}} = t_8 = 10$

$\therefore$ Mode = 3 median – 2 mean

$= 3 \times 10 - 2 \times 9.73 = 30 - 19.46 = 10.54$

Relationship among Mean, Median and Mode :

Following are the relations,

Mode = 3 Median – 2 mean

Median = Mode + $\frac{2}{3}$ (Mean – Mode)

Mean = Mode + $\frac{3}{2}$ (Median – Mode)

Note :

1. For a symmetric distribution, Mean = Median = Mode
2. Given any two of the mean, median and mode the third can be calculated.
3. This formula is to be applied in the absence of sufficient data.

Ex.5 Find the mode when median is 12 and mean is 16 of a data.

Sol : Mode $= 3$ Median $- 2$ Mean

$= (3 \times 12) - (2 \times 16) = 36 - 32 = 4$

Ex.6 If mean $= 60$ and median $= 50$, find mode.

Sol. We have,

Mean $= 60$, Median $= 50$

Mode $= 3$ Median $- 2$ Mean

$= 3\ (50) - 2\ (60) = 30$

Ex.7 If mode $= 70$ and mean $= 100$, find median.

Sol. We have, Mode $= 70$, Mean $= 100$

$$\text{Median} = \text{Mode} + \frac{2}{3}\ (\text{Mean} - \text{Mode})$$

$$= 70 + \frac{2}{3}\ (100 - 70)$$

$$= 70 + 20$$

$$= 90$$