Assignment 3

AI1110: Probability and Random Variables

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CBSE Class 9 Statistics

Example 15:
Consider a small unit of a factory where there are 5 employees:a supervisor and four labourers.The labourers draw a salary of ₹5,000 per month each while the supervisor ₹15,000 per month.Calculate the mean,median and mode of the salaries of this unit of the factory.

Solution: For labourers have salary of ₹5000 and supervisor has salary of ₹15000.

(i) Mean

Salary(x_i)	frequency(f_i)
5000	4
15000	1
Total	$\sum_{i=1}^{2} f_i = 5$

TABLE I

Let, X be the column vector of salary (x_i), F be the column vector of frequency (f_i), K be the column matrix of 1's with 2 rows and m be the mean
The formula for finding mean is:

$$\mathbf{m} = \frac{\mathbf{X}^\top \mathbf{F}}{\mathbf{K}^\top \mathbf{F}} \tag{1}$$

Also,

$$\mathbf{X} = \begin{pmatrix} 5000, 15000 \end{pmatrix} \tag{2}$$
$$\mathbf{F} = \begin{pmatrix} 4, 1 \end{pmatrix} \tag{3}$$
$$\mathbf{K} = \begin{pmatrix} 1, 1 \end{pmatrix} \tag{4}$$

Putting the values of (2), (3), (4) in (1),

$$\mathbf{m} = 7000 \tag{5}$$

$\therefore$ the mean of salaries is ₹7000

(ii) Median
To find median, we have to arrange the salaries in ascending order
$\implies 5000, 5000, 5000, 5000, 15000$
Key Concept:
a) For a sorted data if number of observations(N) is odd, then median of the data will be $\left(\frac{N+1}{2}\right)^{th}$ observation.
b) If the number of observations(N) is even, then median will be the mean of $\left(\frac{N}{2}\right)^{th}$ and $\left(\frac{N+2}{2}\right)^{th}$ observations.
As there are odd number of salaries(5),
Median = $\frac{5+1}{2}^{th}$ element = 3^{rd} element

$$\implies median = 5000$$

$\therefore$ the median of salaries is ₹5000.

(iii) Mode
In the data of salaries ,we can see that the salary data element 5000 occurs maximum number of times (frequency = 4).

$$\implies mode = 5000$$

$\therefore$ the mode of salaries is ₹5000.