

Branch - Electrical. mech. Csc

Sub - Engg math.

Topic - Statistics

Mean of Grouped data.

(A.) Direct method: In this type of distribution; data is given by classes using intervals.

We consider the Centre value of class-intervals and calculate mean.

The Centre value.

$$x_i = \frac{\text{Upper boundary} + \text{Lower boundary of the given class.}}{2}$$

$$\bar{x} = \frac{\sum f_i x_i}{N}$$

Where f_i = corresponding class frequency

$N = \sum f_i$ = total No. of observation.

Ex: From the following data calculate arithmetic mean by direct method.

marks	0-10	10-20	20-30	30-40	40-50
No. of Student	6	15	25	20	4

Soln. $x_i = \frac{\text{Upper boundary} + \text{Lower boundary}}{2}$ for each class.

marks	mid-point (x_i)	No. of Student (f_i)	$f_i x_i$
0-10	5	6	30
10-20	15	15	225
20-30	25	25	625
30-40	35	20	700
40-50	45	4	180

$\sum x_i = 70$

$\sum f_i x_i = 1760$

Maharaja

$$\bar{x} = \frac{\sum f_i x_i}{N} = \frac{1760}{70} = 25.14 \approx 25$$

Step-deviation method:

$$\bar{x} = A + \frac{\sum f_i d_i}{N} \times C$$

Where A = assumed mean of the given data.

f_i = corresponding frequency.

x_i = mid-value of class-interval

$N = \sum f_i$ = Total number of observations.

C = Equal width of class interval.

= upper boundary - lower boundary

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

Ex: Calculate the A.M of marks from the following table, using step deviation method.

marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of student	12	18	17	20	17	6

Soln. Formula used for calculation of arithmetic mean by using step-deviation method

$$\bar{x} = A + \frac{\sum f_i d_i}{N} \times C$$

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

let,

assumed mean $A = 25$

Marks	mid-value x_i	No. of Students f_i	$d_i = \frac{x_i - A}{c}$	$f_i d_i$
			$d_i = \frac{x_i - 25}{10}$	
			(A = 25, c = 10)	
0-10	5	12	-2	-24
10-20	15	18	-1	-18
20-30	25	17	0	0
30-40	35	20	1	20
40-50	45	17	2	34
50-60	55	6	3	18
		$\Sigma f_i = 90 = N$		$\Sigma f_i d_i = 30$

$$c = 10$$

$$N = \Sigma f_i = 90$$

$$\bar{x} = A + \frac{\Sigma f_i d_i}{N} \times c$$

$$\bar{x} = 25 + \frac{30}{90} \times 10$$

$$= 28.33$$

mean of Combined Distribution.

Let A and B be two sets of observations

Let $N_1 =$ Total number of observations in set A

$\bar{x}_1 =$ mean of set A

$N_2 =$ Total number of observations in set B.

$\bar{x}_2 =$ mean of set B.

Then the combined mean of A and B is,

$$\bar{x} = \frac{N_1 \bar{x}_1 + N_2 \bar{x}_2}{N_1 + N_2}$$

Ex. The mean of 20 observations is 25 and mean of 10 observations is 15.

find the mean of these combined observations.

Soln. let $N_1 = 20$ $\bar{x}_1 = 25$
 $N_2 = 10$ $\bar{x}_2 = 15$

$$\text{Combined mean} = \frac{N_1 \bar{x}_1 + N_2 \bar{x}_2}{N_1 + N_2}$$

$$= \frac{20 \times 25 + 10 \times 15}{20 + 10}$$

$$= \frac{500 + 150}{30} = \frac{650}{30}$$

\therefore Combined mean $\bar{x} = 21.66$