

## Chapter 24: Measures of Central Tendency

### Exercise 24(B)

1. The following table gives the ages of 50 students of a class. Find the arithmetic mean of their ages.

Age - Years	16 - 18	18 - 20	20 - 22	22- 24	24-26
No. of Students	2	7	21	17	3

**Solution:**

Age in years C.I.	$x_i$	Number of students ( $f_i$ )	$x_i f_i$
16 - 18	17	2	34
18 - 20	19	7	133
20 - 22	21	21	441
22 - 24	23	17	391
24 - 26	25	3	75
Total		50	1074

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i} = 1074/50 = 21.48$$

2. The following table gives the weekly wages of workers in a factory.

Weekly Wages (Rs)	No. of Workers
50-55	5
55-60	20
60-65	10
65-70	10
70-75	9
75-80	6
80-85	12
85-90	8

Calculate the mean by using:

(i) Direct Method

(ii) Short - Cut Method

**Solution:**

(i) Direct Method

Weekly Wages (Rs)	Mid-Value $x_i$	No. of Workers ( $f_i$ )	$f_i x_i$
50-55	52.5	5	262.5
55-60	57.5	20	1150.0
60-65	62.5	10	625.0
65-70	67.5	10	675.0
70-75	72.5	9	652.5
75-80	77.5	6	465.0
80-85	82.5	12	990.0

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85-90	87.5	8	700.0
Total		80	5520.00

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i} = \frac{5520}{80} = 69$$

(ii) Short - cut method

Weekly wages (Rs)	No. of workers ( $f_i$ )	Mid-value $x_i$	$A = 72.5$ $d_i = x - A$	$f_i d_i$
50-55	5	52.5	-20	-100
55-60	20	57.5	-15	-300
60-65	10	62.5	-10	-100
65-70	10	67.5	-5	-50
70-75	9	$A = 72.5$	0	0
75-80	6	77.5	5	30
80-85	12	82.5	10	120
85-90	8	87.5	15	120
Total	80			-280

Here,  $A = 72.5$

$$\bar{x} = A + \frac{\sum f_i d_i}{\sum f_i} = 72.5 + \left( \frac{-280}{80} \right) = 72.5 - 3.5 = 69$$

3. The following are the marks obtained by 70 boys in a class test:

Marks	No. of boys
30 - 40	10
40 - 50	12
50 - 60	14
60 - 70	12
70 - 80	9
80 - 90	7
90 - 100	6

Calculate the mean by:

(i) Short - cut method

(ii) Step - deviation method

**Solution:**

(i) Short - cut method

Marks	No. of boys ( $f_i$ )	Mid-value $x_i$	$A = 65$ $d_i = x - A$	$f_i d_i$
30 - 40	10	35	-30	-300
40 - 50	12	45	-20	-240
50 - 60	14	55	-10	-140
60 - 70	12	$A = 65$	0	0
70 - 80	9	75	10	90
80 - 90	7	85	20	140

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90 - 100	6	95	30	180
Total	70			-270

Here,  $A = 65$

$$\bar{x} = A + \frac{\sum fd_i}{\sum f_i} = 65 + \left( \frac{-270}{70} \right) = 65 - 3.86 = 61.14$$

(ii) Step - deviation method

Marks	No. of boys ( $f_i$ )	Mid-value $x_i$	$A = 65$ $u_i = (x_i - A)/h$	$f_i u_i$
30 - 40	10	35	-3	-30
40 - 50	12	45	-2	-24
50 - 60	14	55	-1	-14
60 - 70	12	$A = 65$	0	0
70 - 80	9	75	1	9
80 - 90	7	85	2	14
90 - 100	6	95	3	18
Total	70			-27

Here,  $A = 65$  and  $h = 10$

$$\bar{x} = A + h \times \frac{\sum f_i u_i}{\sum f_i} = 65 + 10 \times \left( \frac{-27}{70} \right) = 65 - 3.86 = 61.14$$

**4. Find mean by step - deviation method:**

C. I.	63-70	70-77	77-84	84-91	91-98	98-105	105-112
Freq	9	13	27	38	32	16	15

**Solution:**

C. I.	Frequency ( $f_i$ )	Mid-value $x_i$	$A = 87.50$ $u_i = (x_i - A)/h$	$f_i u_i$
63 - 70	9	66.50	-3	-27
70 - 77	13	73.50	-2	-26
77 - 84	27	80.50	-1	-27
84 - 91	38	$A = 87.50$	0	0
91 - 98	32	94.50	1	32
98 - 105	16	101.50	2	32
105 - 112	15	108.50	3	45
Total	150			29

Here,  $A = 87.50$  and  $h = 7$

$$\bar{x} = A + h \times \frac{\sum f_i u_i}{\sum f_i} = 87.5 + 7 \times \frac{29}{150} = 87.5 + 1.35 = 88.85$$

**5. The mean of the following frequency distribution is  $21\frac{1}{7}$ . Find the value of 'f'.**

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C. I.	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
freq	8	22	31	f	2

**Solution:**

Given,

$$\bar{x} = 21\frac{1}{7} = \frac{148}{7}$$

C. I.	frequency	Mid-value ( $x_i$ )	$f_i x_i$
0-10	8	5	40
10-20	22	15	330
20-30	31	25	775
30-40	f	35	35f
40-50	2	45	90
Total	63 + f		1235 + 35f

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{1235 + 35f}{63 + f}$$

$$\Rightarrow \frac{148}{7} = \frac{1235 + 35f}{63 + f}$$

$$9324 + 148f = 8645 + 245f$$

$$245f - 148f = 9324 - 8645$$

$$f = 679/97$$

Thus,  $f = 7$

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