Chapter 28

Measures of Central Tendency

POINTS TO REMEMBER

1. **Average of a Data**

For a given data, a single value of the variable representing the entire data,which describes the characteristics of the data, is called an average of the data.

An average tends to lie centrally with the values of the variable arranged in ascending order of magnitude. So, we call an average a measure of central tendency of the data.

Mainly, we are interested in three types of averages :

(*i*) Mean (*ii*) Median (*iii*) Mode.

2. **Arithmetic Mean**

The average of numbers in arithmetic is known as the Arithmetic Mean of these numbers in statistics.

Mean of An Ungrouped Data

The Arithmetic Mean or simply the Mean of n observations $x_1, x_2, x_3, \ldots\ldots, x_n$ is given by the formula :

$$\text{Mean} = \frac{(x_1 + x_2 + x_3 + \ldots\ldots + x_n)}{n} = \frac{\Sigma x_i}{n}$$

where the symbol Σ, called sigma stands for the summation of the terms.

3. **Some Useful Results**

Let the mean of $x_1, x_2, x_3, \ldots\ldots, x_n$ be A. Then

(*i*) Mean of $(x_1 + k), (x_2 + k), (x_3 + k) \ldots\ldots\ldots\ldots, (x_n + k)$ is $(A + k)$;

(*ii*) Mean of $(x_1 - k), (x_2 - k), (x_3 - k) \ldots\ldots\ldots, (x_n - k)$ is $(A - k)$;

(*iii*) Mean of $kx_1, kx_2, kx_3 \ldots\ldots\ldots\ldots, kx_n$ is kA, where $k \neq 0$.

4. **Mean of grouped data :**

(A) Direct method. When the variates $x_1, x_2, x_3 \ldots\ldots\ldots\ldots x_n$ have frequencies $f_1, f_2, f_3 \ldots\ldots\ldots f_n$ respectively, then the mean is given by the formula :

$$\text{Mean} = \frac{f_1x_1 + f_2x_2 + f_3x_3 \ldots\ldots\ldots + f_xx_n}{f_1 + f_2 + f_3 + \ldots\ldots\ldots + f_x} = \frac{\Sigma f_1 x_1}{f_1}$$

(B) Shortcut Method. Using this method larger quantities get converted into smaller ones, making the process of multiplication and division easier.

Method. From the given data, we suitable choose a term, usually the middle term and call it the assumed mean, to be denoted by A. We find the deviations, $d_1 = (x_i - A)$ for each term : then

$$\text{Mean} = A + \frac{\Sigma f_i d_i}{\Sigma f_i}$$

5. Mean of grouped data in the form of classes :

(A) Direct Method : Step 1. For each class, find the class mark x_i by using the relation, $x = \frac{1}{2}$ (lower limit + upper limit).

Step 2. Use the formula, Mean $= \frac{\Sigma f_i x_i}{\Sigma f_i}$.

(B) Short Cut Method or Deviation Method :

Step 1. For each class, find the class mark x_i.

Step 2. Let A be the assumed mean.

Step 3. Find $d_i = (x_i - A)$.

Step 4. Use the formula, Mean $= \left(A + \frac{\Sigma f_i d_i}{\Sigma f_i}\right)$.

(C) Step-Deviation Method :

Step 1. For each class, find the class mark x_1.

Step 2. Let A be the assumed mean.

Step 3. Calculate, $u_i = \frac{(x_i - A)}{c}$, where c is the class size.

Step 4. Use the formula, Mean $= \left(A + c.\frac{\Sigma f_i u_i}{\Sigma f_i}\right)$

EXERCISE 28

Q.1. Find the mean of each of the following sets of numbers :

(*i*) 10, 4, 6, 9, 12 (*ii*) 14, 11, 23,7, 18, 14, 5, 8 (*iii*) 5·8, 6·3, 7·1, 9·4, 4·9 (*iv*) 0·2, 0·02, 2, 2·02

Sol. (*i*) Sum of variates = 10 + 4 + 6 + 9 + 12 = 41 and number of variates = 5

$$\therefore \text{Mean} = \frac{\Sigma x_i}{n} = \frac{41}{5} = 8{\cdot}2$$

(*ii*) Sum of variates = 14 + 11 + 23 + 7 + 18 + 14 + 5 + 8 = 100

Number of variates = 8

$$\therefore \text{Mean} = \frac{\Sigma x_i}{n} = \frac{100}{8} = 12{\cdot}5$$

(*iii*) Sum of variates = 5·8 + 6·3 + 7·1 + 9·4 + 4·9 = 33·5

Number of variates = 5

$$\therefore \text{Mean} = \frac{\Sigma x_i}{n} = \frac{33{\cdot}5}{5} = 6{\cdot}7$$

(*iv*) Sum of variates = 0·2 + 0·02 + 2 + 2·02 = 4·24

Number of variates (n) = 4

$$\therefore \text{Mean} = \frac{\Sigma x_i}{n} = \frac{4 \cdot 24}{4} = 1 \cdot 06 \textbf{ Ans.}$$

Q.2. Find the arithmetic mean of :

(*i*) first eight natural numbers ;

(*ii*) first five prime numbers ;

(*iii*) first six positive even integers ;

(*iv*) first five positive integral multiples of 3 ;

(*v*) all factors of 20.

Sol. (*i*) First eight natural numbers are 1, 2, 3, 4, 5, 6, 7, 8

∴ Sum = 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 = 36

$$\therefore \text{Mean} = \frac{\Sigma x_i}{n} = \frac{36}{8} = 4 \cdot 5$$

(*ii*) First 5 prime numbers are 2, 3, 5, 7, 11

∴ Sum = 2 + 3 + 5 + 7 + 11 = 28

$$\text{Mean} = \frac{\Sigma x_i}{n} = \frac{28}{5} = 5 \cdot 6$$

(*iii*) First 6 positive even integers are 2, 4, 6, 8, 10, 12

∴ Sum = 2 + 4 + 6 + 8 + 10 + 12 = 42

$$\text{Mean} = \frac{\Sigma x_i}{n} = \frac{42}{6} = 7$$

(*iv*) First 5 positive integral multiples of 3 are 3, 6, 9, 12, 15

∴ Sum = 3 + 6 + 9 + 12 + 15 = 45

$$\therefore \text{Mean} = \frac{\Sigma x_i}{n} = \frac{45}{5} = 9$$

(*v*) All factors of 20 are 1, 2, 4, 5, 10, 20

∴ Sum = 1 + 2 + 4 + 5 + 10 + 20 = 42

$$\therefore \text{Mean} = \frac{\Sigma x_i}{n} = \frac{42}{6} = 7 \textbf{ Ans.}$$

Q.3. The daily minimum temperature recorded (in degrees F) at a place during a week was as under:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
35·5	30·8	28·3	31·1	23·8	29·9	32·7

Find the mean temperature of the week.

Sol. Total temperature during 7 days

= 35·5 + 30·8 + 28·3 + 31·1 + 23·8 + 29·9 + 32·7 = 212·1 F°

$$\therefore \text{Mean temperature} = \frac{\Sigma x_i}{n} = \frac{212 \cdot 1}{7} = 30 \cdot 3 \text{ F°}$$

Q.4. The marks obtained by 10 students in a class-test were as follows :

38, 41, 36, 31, 45, 38, 27, 32, 29, 39

Find (*i*) the mean of their marks ;

(*ii*) the mean of their marks, when the marks of each student are increased by 2;

(*iii*) the mean of their marks, when 1 mark is deducted from the marks of each student ;

(*iv*) the mean of their marks, when the marks of each student are halved.

Sol. Marks obtained by 10 students are 38, 41, 36, 31, 45, 38, 27, 32, 29, 39

$\therefore$ Sum of their marks $= 38 + 41 + 36 + 31 + 45 + 38 + 27 + 32 + 29 + 39 = 356$

(*i*) Mean $= \dfrac{\Sigma x_i}{n} = \dfrac{356}{10} = 35{\cdot}6$

(*ii*) Mean when marks of each students is increased by 2 marks

$= 35{\cdot}6 + 2 = 37{\cdot}6$

(*iii*) Mean when marks of each student is deducted by 1 mark

$= 35{\cdot}6 - 1{\cdot}0 = 34{\cdot}6$

(*iv*) Mean when marks of each student is halved

$= 35{\cdot}6 \div 2 = 17{\cdot}8$ **Ans.**

Q.5. If the mean of 7, 10, 4, 12, x, 3 is 7·5, find the value of x.

Sol. Sum of given 6 numbers $= 7 + 10 + 4 + 12 + x + 3$

$= 36 + x$

Mean $= \dfrac{36 + x}{6}$ (here, $n = 6$)

But, mean is given $= 7{\cdot}5$

$\therefore \dfrac{36 + x}{6} = 7{\cdot}5$

$\Rightarrow 36 + x = 7{\cdot}5 \times 6$

$\Rightarrow x = 7{\cdot}5 \times 6 - 36 = 45 - 36 = 9$

$\therefore x = 9$ **Ans.**

Q.6. The mean weight of 60 students of a class is 52·75 kg. If the mean weight of 25 of them is 51 kg, find the mean weight of the remaining students.

Sol. Mean weight of 60 students = 52·75 kg

$\therefore$ Total weight of 60 students $= 52{\cdot}75 \times 60$

$= 3165$ kg

Mean weight of 25 of them = 51 kg

$\therefore$ Then total weight $= 51 \times 25 = 1275$ kg

Total weight of remaining $60 - 25 = 35$ students

$= 3165 - 1275 = 1890$ kg

$\therefore$ Mean weight $= 1890 \div 35 = 54$ kg. **Ans.**

Q.7. Find the mean of 25 numbers, it being given that the mean of 15 of them is 18 and the mean of remaining ones is 13.

Sol. Mean of 15 numbers = 18

$\therefore$ Total = 18 × 15 = 270

Mean of remaining (25 – 15) = 10 = 13

$\therefore$ Total = 10 × 13 = 130

Now, total of 25 = 270 + 130 = 400

Hence mean = 400 ÷ 25 = 16 **Ans.**

Q.8. The mean of five numbers is 18. On excluding one number, the mean becomes 16. Find the excluded number.

Sol. Mean of 5 numbers = 18

$\therefore$ Total = 18 × 5 = 90

Mean of 4 excluding one = 16

$\therefore$ Total = 16 × 4 = 64

Hence, the excluded number = 90 – 64 = 26 **Ans.**

Q.9. The ages of 40 students of a group are given below :

Age (in years)	12	13	14	15	16	17
Number of students	6	8	5	7	9	5

Find the mean age of the group.

Sol.

x_i	f_i	$f_i x_i$
12	6	72
13	8	104
14	5	70
15	7	105
16	9	144
17	5	85
Total	$\Sigma f_i = 40$	$\Sigma f_i x_i = 580$

$\therefore$ Mean $= \dfrac{\Sigma f_i x_i}{\Sigma f_i} = \dfrac{580}{40} = 14{\cdot}5$ years. **Ans.**

Q.10. Find the mean of the following frequency distribution :

Variate	5	6	7	8	9
Frequency	7	8	14	11	10

Sol.

Variate x_i	frequency f_i	$f_i x_i$
5	7	35
6	8	48
7	14	98
8	11	88
9	10	90
Total	$\Sigma f_i = 50$	$\Sigma f_i x_i = 359$

$\therefore$ Mean $= \dfrac{\Sigma f_i x_i}{\Sigma f_i} = \dfrac{359}{50} = 7{\cdot}18$ **Ans.**

Q.11. In a book of 300 pages, the distribution of misprints is shown below :

Number of misprints per page	0	1	2	3	4	5
Number of pages	154	95	36	7	6	2

Find the average number of misprints per page.

Sol.

No. of misprints per page x_i	No. of pages f_i	$f_i x_i$
0	154	0
1	95	95
2	36	72
3	7	21
4	6	24
5	2	10
Total	$\Sigma f_i = 300$	$\Sigma f_i x_i = 222$

$\therefore$ Mean misprints $= \dfrac{\Sigma f_i x_i}{\Sigma f_i} = \dfrac{222}{300} = 0{\cdot}74$ **Ans.**

Q. 12. The following table gives the wages of different categories of workers in a factory :

Category	A	B	C	D	E	F	G
Wages in Rs/day	50	60	70	80	90	100	110
Number of workers	2	4	8	12	10	6	8

(*i*) Calculate the mean wage, correct to the nearest rupee.

(*ii*) If the number of workers in each category is doubled, what would be the new mean wage ?

(1995)

Sol.

Category	Wages in Rs/day (x)	No. of workers (f)	fx
A	50	2	100
B	60	4	240
C	70	8	560
D	80	12	960
E	90	10	900
F	100	6	600
G	110	8	880
		50	4240

(*i*) $\therefore$ Mean $= \frac{\Sigma fx}{\Sigma f} = \frac{4240}{50} = 84{\cdot}8$ = Rs. 85 (Correct to the nearest rupee) **Ans.**

(*ii*) If no. of workers is doubled, then

total number of workers = 50 × 2 = 100

then, their wages will also be doubled

$\therefore$ New wages = 4240 × 2 = Rs. 8480

Now, mean $= \frac{8480}{100}$ = Rs. 84·80 = Rs. 85 (Nearest rupee) **Ans.**

Q.13. Using **short cut method,** compute the mean height from the following frequency distribution

Height (in cm)	58	60	62	65	66	68
Number of plants	15	14	20	18	8	5

Sol. Let A = 65, then

Height (in cm) x_i	**No. of plants** f_i	$d_i = x_i - A$	$f_i d_i$
58	15	−7	−105
60	14	−5	−70
62	20	−3	−60
65=A	18	0	0
66	8	1	8
68	5	3	15
Total	$\Sigma f_i = 80$		$\Sigma f_i d_i = -212$

$$\therefore \text{Mean} = A + \frac{\Sigma f_i d_i}{\Sigma f_i}$$

$$= 65 + \frac{-212}{80} = 65 - \frac{212}{80} = 65 - 2{\cdot}65 = 62{\cdot}35 \text{ cm}$$ **Ans.**

Q.14. The number of match sticks contained in 50 match boxes is given below :

Number of Match sticks	40	42	43	44	45	48
Number of boxes	6	7	12	9	10	6

(*i*) Using **short cut method,** find the mean number of match sticks per box.

(*ii*) How many extra match sticks are to be added to all the contents of 50 match boxes to bring the mean exactly equal to 45 match sticks per box ?

Sol. Here, A = 44, then

No. of match sticks x_i	Number of boxes f_i	$d_i = x_i - A$	$f_i d_i$
40	6	–4	–24
42	7	–2	–14
43	12	–1	–12
44 = A	9	0	0
45	10	1	10
48	6	4	24
Total	$\Sigma f_i = 50$		$\Sigma f_i d_i = -16$

(*i*) $\therefore$ Mean $= A + \frac{\Sigma f_i d_i}{\Sigma f_1} = 44 + \frac{-16}{50} = 44 - 0{\cdot}32 = 43{\cdot}68$

(*ii*) Extra match sticks needed to have all the contents of 50 match boxes = (45 – 43·68) × 50 = 1·32 × 50 = 66 **Ans.**

Q.15. Using **short cut method,** find the mean from the following data :

Variate (x_i)	18	19	20	21	22	23	24
Frequency (f_i)	184	212	327	376	614	372	415

Sol. Here, A = 21, then

Variate (x_i)	Frequency (f_i)	$d_i = x_i - A$	$f_i d_i$
18	184	–3	–552
19	212	–2	–424
20	327	–1	–327
21 = A	376	0	0
22	614	1	614
23	372	2	744
24	415	3	1245
Total	$\Sigma f_i = 2500$		$\Sigma f_i d_i = 1300$

$\therefore$ Mean = $A + \frac{\Sigma f_i d_i}{\Sigma f_i} = 21 + \frac{1300}{2500} = 21 + 0 \cdot 52 = 21 \cdot 52$ **Ans.**

Q. 16. If the mean of the following distribution is 7.5, find the missing frequency 'f'. **(2005)**

Variable	5	6	7	8	9	10	11	12
Frequency	20	17	f	10	8	6	7	6

Sol.

Variable (x)	Frequency (f)	fx
5	20	100
6	17	102
7	f	$7f$
8	10	80
9	8	72
10	6	60
11	7	77
12	6	72
Total	$\Sigma f = 74 + f$	$563 + 7f$

$\because M = \frac{\Sigma fx}{\Sigma f}$

$\therefore 7.5 = \frac{563 + 7f}{74 + f} \Rightarrow 555 + 7.5f = 563 + 7f \Rightarrow 0.5f = 8 \Rightarrow f = \frac{8 \times 10}{5} \Rightarrow f = 16$

$\therefore$ missing frequency (f) = 16 **Ans.**

Q.17. If the mean of the following observations is 16·6, find the numerical value of p.

Variate (x_i)	8	12	15	18	20	25	30
Frequency (f_i)	12	16	20	p	16	8	4

Sol.

Variate (x_i)	Frequency (f_i)	$f_i x_i$
8	12	96
12	16	192
15	20	300
18	p	$18p$
20	16	320
25	8	200
30	4	120
Total	$\Sigma f_i = 76 + p$	$\Sigma f_i x_i = 1228 + 18p$

$\therefore$ Mean $= \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{1228 + 18p}{76 + p}$

But, mean = 16·6

$\therefore \frac{1228 + 18p}{76 + p} = \frac{16 \cdot 6}{1}$

$\Rightarrow 1228 + 18p = 16 \cdot 6 \times (76 + p)$

$\Rightarrow 1228 + 18p = 1261 \cdot 6 + 16 \cdot 6p$

$\Rightarrow 18p - 16 \cdot 6p = 1261 \cdot 6 - 1228$

$\Rightarrow \quad 1 \cdot 4p = 33 \cdot 6 \Rightarrow p = \frac{33 \cdot 6}{1 \cdot 4} = 24$

$\therefore p = 24$ **Ans.**

Q.18. Find the numerical value of x, if the mean of the following frequency distribution is 12·58.

Variate	5	8	10	12	x	20	25
Frequency	2	5	8	22	7	4	2

Sol.

Variate (x_i)	Frequency (f_i)	$f_i x_i$
5	2	10
8	5	40
10	8	80
12	22	264
x	7	$7x$
20	4	80
25	2	50
Total	$\Sigma f_i = 50$	$\Sigma f_i x_i = 524 + 7x$

$\therefore$ Mean $= \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{524 + 7x}{50}$

But, mean = 12·58

$\therefore \frac{524 + 7x}{50} = 12 \cdot 58$

$\Rightarrow 524 + 7x = 50 \times 12 \cdot 58 \qquad \Rightarrow 524 + 7x = 629$

$\Rightarrow \quad 7x = 629 - 524 = 105 \quad \Rightarrow \quad x = \frac{105}{7} = 15$

Hence, $x = 15$ **Ans.**

Q.19. Given below are the daily wages of 200 workers in a factory :

Daily Wages (in Rs.)	80–100	100–120	120–140	140–160	160–180
Number of Workers	20	30	20	40	90

Calculate the mean daily wages of the workers. (1998)

Sol.

Daily wages (in Rs.)	No. of workers (f_i)	Class mark (x_i)	$f_i x_i$
80–100	20	90	1800
100–120	30	110	3300
120–140	20	130	2600
140–160	40	150	6000
160–180	90	170	15300
Total	$\Sigma f_i = 200$		$\Sigma f_i x_i = 29000$

Mean $= \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{29000}{200} = 145$ rupees **Ans.**

Q.20. Find the mean of the following frequency distribution.

Class-Interval	0–50	50–100	100–150	150–200	200–250	250–300
Frequency	4	8	16	13	6	3

Sol.

Class interval (x_i)	Class mark (f_i)	Frequency	$f_i x_i$
0–50	25	4	100
50–100	75	8	600
100–150	125	16	2000
150–200	175	13	2275
200–250	225	6	1350
250–300	275	3	825
Total		$\Sigma f_i = 50$	$\Sigma f_i x_i = 7150$

Mean $= \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{7150}{50} = 143$ **Ans.**

Q.21. The following table the wages of workers in a factory :

Wages (in Rs.)	45-50	50-55	55-60	60-65	65-70	70-75	75-80
No. of workers	5	8	30	25	14	12	6

Calculate the mean by the short cut method. (2009)

Sol. Let assumed mean (A) = 62.5

Wages in (B)	Mid value (x)	No. of workers (f)	$d = (x - A)$	$f_i \times d_i$
45 – 50	47.5	5	–15	–75
50 – 55	52.5	8	–10	–80
55 – 60	57-5	30	–5	–150
60 – 65	A = 62.5	25	0	0
65 – 70	67.5	14	5	70

70 – 75	72.5	12	10	120
75 – 80	77.5	6	15	90
Total		100		–25

$\therefore$ Mean $= A + \frac{\Sigma f_i d_i}{\Sigma f_i} = 62.5 + \frac{-25}{100} = 62.5 - 0.25 = 62.25$

Q.22. Use **step deviation method** and calculate the mean of the following frequency distribution :

Class-Interval	50–60	60–70	70–80	80–90	90–100	100–110	110–120
Frequency	9	11	10	14	8	12	11

Sol. Let A = 85 and c = 10, then

Class Interval	**Class Mark** x_i	**Frequency** f_i	$u_i = \frac{x_i - A}{c}$	$f_i u_i$
50–60	55	9	–3	–27
60–70	65	11	–2	–22
70–80	75	10	–1	–10
80–90	85 = A	14	0	0
90–100	95	8	1	8
100–110	105	12	2	24
110–120	115	11	3	33
Total		$\Sigma f_i = 75$		$\Sigma f_i u_i = 6$

$\therefore$ Mean $= A + c \times \frac{\Sigma f_i u_i}{\Sigma f_i} = 85 + 10 \times \frac{6}{75} = 85 + \frac{4}{5} = 85 + 0{\cdot}8 = 85{\cdot}8$ **Ans.**

Q.23. Use **step-deviation method** and calculate the mean of the following frequency distribution :

Class-Interval	10–15	15–20	20–25	25–30	30–35	35–40
Frequency	5	6	8	12	6	3

Sol. Let A = 22·5 and c = 5, then

Class Interval	**Class Mark** (x_i)	**Frequency** (f_i)	$u_i = \frac{x_i - A}{c}$	$f_i u_i$
10–15	12·5	5	–2	–10
15–20	17·5	6	–1	–6
20–25	22·5 = A	8	0	0
25–30	27·5	12	1	12
30–35	32·5	6	2	12
35–40	37·5	3	3	9
Total		$\Sigma f_i = 40$		$\Sigma f_i u_i = 17$

$$\text{Mean} = A + c \times \frac{\Sigma f_i u_i}{\Sigma f_i} = 22{\cdot}5 + 5 \times \frac{17}{40} = 22{\cdot}5 + 2{\cdot}125 = 24{\cdot}625 \text{ Ans.}$$

24. The weights of 50 apples were recorded as given below. Calculate the mean weight, to the nearest gram, by the Step Deviation Method.

Weight in grams	80 – 85	85 – 90	90 – 95	95 – 100	100 – 105	105 – 110	110 – 115
No. of apples	5	8	10	12	8	4	3

Sol. Let assumed mean (A) = 97.5 and $i = 5$

Weight in grams	No. of apples (f)	Class marks x	A = 97.5 $d' = \frac{x - A}{2}$	$f \times d'$
80 – 85	5	82.5	$\frac{82.5 - 97.5}{5} = -3$	–15
85 – 90	8	87.5	–2	–16
90 – 95	10	92.5	–1	–10
95 – 100	12	97.5	0	0
100 – 105	8	102.5	1	8
105 – 110	4	107.5	2	8
110 – 115	3	112.5	3	9
Total	50			–16

$$\therefore \quad \text{Mean} = A + \frac{\Sigma f \times d'}{\Sigma f_1} \times i = 97.5 + \frac{-16}{50} \times 5 = 97.5 - \frac{-16}{10} = 97.5 - 1.6 = 95.9$$

Q. 25. Weights of 60 eggs were recorded as given below :

Weights (in gms)	75–79	80–84	85–89	90–94	95–99	100–104	105–109
Number of eggs	4	9	13	17	12	3	2

Calculate their mean weight to the nearest gm.

Sol. Writing in exclusive form :

Weight (in gms)	Class marks (x_i)	Frequency (f_i)	$f_i x_i$
74·5—79·5	77	4	308
79·5—84·5	82	9	738
84·5—89·5	87	13	1131
89·5—94·5	92	17	1564
94·5—99·5	97	12	1164
99·5—104·5	102	3	306
104·5—109·5	107	2	214
Total		$\Sigma f_i = 60$	$\Sigma f_i x_i = 5425$

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{5425}{60} = 90{\cdot}42 \text{ gm.}$$

∴ Mean weight in (gm) = 90 gm. **Ans.**

Q. 26. The following table gives marks scored by students in an examination :

Marks	Less than 5	Less than 10	Less than 15	Less than 20	Less than 25	Less than 30	Less than 35	Less than 40
Number of students	3	10	25	49	65	73	78	80

Calculate the mean marks correct to 2 decimal places.

Sol. We shall use step – deviation method. Construct the table as under, taking assumed mean A = 17·5. Here, c (Width of each class) = 5.

Class Interval	Class mark x_i	$u_i = \frac{x_i - A}{c}$	frequency f_i	$f_i u_i$
0–5	2·5	– 3	3	– 9
5–10	7·5	– 2	10	– 20
10–15	12·5	– 1	25	– 25
15–20	17·5	0	49	0
20–25	22·5	1	65	65
25–30	27·5	2	73	146
30–35	32·5	3	78	234
35–40	37·5	4	80	320
				711

$$\therefore \text{Mean} = A + c \times \frac{\Sigma f_i u_i}{\Sigma f_i} = 17{\cdot}5 + 5 \times \frac{711}{383} = 17{\cdot}5 + 9{\cdot}28 = 26{\cdot}78 \textbf{ Ans.}$$