

**RD SHARMA**

**Solutions**

**Class 10 Maths**

**Chapter 7**

**Ex 7.3**

1. The following table gives the distribution of total household expenditure (in rupees) of manual workers in a city.

Expenditure (in rupees) (x)	Frequency (f <sub>i</sub> )	Expenditure (in rupees) (x <sub>i</sub> )	Frequency (f <sub>i</sub> )
100 – 150	24	300 – 350	30
150 – 200	40	350 – 400	22
200 – 250	33	400 – 450	16
250 – 300	28	450 – 500	7

Find the average expenditure (in rupees) per household

**Soln:** Let the assumed mean (A) = 275

Class interval	Mid value (x <sub>i</sub> )	d <sub>i</sub> = x <sub>i</sub> – 275	u <sub>i</sub> = (x <sub>i</sub> – 275)/50	Frequency f <sub>i</sub>	f <sub>i</sub> u <sub>i</sub>
100 – 150	125	-150	-3	24	-12
150 – 200	175	-100	-2	40	-80
200 – 250	225	-50	-1	33	-33
250 – 300	275	0	0	28	0
300 – 350	325	50	1	30	30
350 – 400	375	100	2	22	44
400 – 450	425	150	3	16	48

450 – 500	475	200	4	7	28
				N = 200	Sum = -35

We have

$$A = 275, h = 50$$

$$\text{Mean} = A + h * \text{sum}/N = 275 + 50 * -35/200 = 275 - 8.75 = 266.25$$

**2. A survey was conducted by a group of students as a part of their environmental awareness program, in which they collected the following data regarding the number of plants in 200 houses in a locality. Find the mean number of plants per house.**

<b>Number of plants:</b>	<b>0-2</b>	<b>2-4</b>	<b>4-6</b> <b>12</b>	<b>6-8</b> <b>12-14</b>	<b>8-10</b>	<b>10-12</b>
<b>Number of houses:</b>	<b>1</b>	<b>2</b>	<b>1</b> <b>2</b>	<b>5</b> <b>3</b>	<b>6</b>	

**Which method did you use for finding the mean, and why?**

**Soln:**

Let us find class marks  $(x_i) = (\text{upper class limit} + \text{lower class limit})/2$

Now we may compute  $x_i$  and  $f_i x_i$  as following.

Number of plants	Number of house ( $f_i$ )	$x_i$	$F_i x_i$
0 – 2	1	1	1
2 – 4	2	3	6
4 – 6	1	5	5
6 – 8	5	7	35
8 – 10	6	9	54

10 – 12	2	11	22
12 – 14	3	13	39
Total	N = 20		Sum = 162

From the table we may observe that

$$N = 20$$

$$\text{Sum} = 162$$

$$\text{Mean } \bar{X} = \text{Sum}/N$$

$$162/20 = 8.1$$

So mean number of plants per house is 8.1

We have used for the direct method values  $X_i$  and  $f_i$  are very small

### 3. Consider the following distribution of daily wages of workers of a factory

<b>Daily wages (in Rs)</b>	<b>100-120 160</b>	<b>120-140 160-180</b>	<b>140- 180-200</b>
<b>Number of workers:</b>	<b>12 8</b>	<b>16 6</b>	<b>10</b>

Find the mean daily wages of the workers of the factory by using an appropriate method.

**Soln:** Let the assume mean (A) = 150

Class interval	Mid value $x_i$	$d_i = x_i - 150$	$u_i = (x_i - 150)/20$	Frequency $f_i$	$F_i u_i$
100 – 120	110	-40	-2	12	-24
120 – 140	130	-20	-1	14	-14
140 – 160	150	0	0	8	0

160 – 180	170	20	1	6	6
180 – 200	190	40	2	10	20
			N = 50	Sum = -12	

We have

$$N = 50, h = 20$$

$$\text{Mean} = A + h \times \text{sum}/N$$

$$= 150 + 2 \times (-15)/5$$

$$= 150 - 4.8$$

$$= 145.2$$

**4. Thirty women were examined in a hospital by a doctor and the number of heart beats per minute recorded and summarized as follows. Find the mean heart beats per minute for these women, choosing a suitable method.**

**Number of heart**

<b>Beats Per minute:</b>	<b>65 – 68</b>	<b>68 – 71</b>	<b>71 – 74</b>	<b>74 – 77</b>	<b>77 – 80</b>	<b>80 – 83</b>	<b>83 – 86</b>
<b>Number of women:</b>	<b>2</b>	<b>4</b>	<b>3</b>	<b>8</b>	<b>7</b>		
			<b>4</b>	<b>2</b>			

**Soln:** we may find marks of each interval ( $x_i$ ) by using the relation

$$(x_i) = (\text{upper class limit} + \text{lower class limit})/2$$

Class size of this data = 3

Now taking 75.5 as assumed mean (a)

We may calculate  $d_i$ ,  $u_i$ ,  $f_i u_i$  as following

Number of heart beats per minute	Number of women ( $x_i$ )	$x_i$	$d_i = x_i - 75.5$	$u_i = (x_i - 75.5)/h$	$f_i u_i$
65-68	2	66.5	-9	-3	-6

68-71	9	69.5	-6	-2	-8
71-74	3	72.5	-3	-1	-3
74-77	8	75.5	0	0	0
77-80	7	78.5	3	1	7
80-83	4	81.5	6	2	8
83-86	2	84.5	9	3	6
	N = 30				Sum = 4

Now we may observe from table that  $N = 30$ ,  $\text{sum} = 4$

$$\text{Mean } \bar{X} = 75.5 + (4/30) \times 3$$

$$= 75.5 + 0.4$$

$$= 75.9$$

So mean heart beats per minute for those women are 75.9 beats per minute

**5. Find the mean of each of the following frequency distributions: (5 – 14)**

<b>Class interval:</b>	<b>0-6</b>	<b>6-12</b>	<b>12-18</b>	<b>18-24</b>	<b>24-30</b>
<b>Frequency:</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>9</b>	<b>7</b>

**Soln:**

Let us assume mean be 15

Class interval	Mid – value	$d_i = x_i - 15$	$u_i = (x_i - 15)/6$	$f_i$	$f_i u_i$
0 – 6	3	-12	-2	6	-12
6 – 12	9	-6	-1	8	-8
12 – 18	15	0	0	10	0
18 – 24	21	6	1	9	9
24 – 30	27	18	2	7	14
				N = 40	Sum = 3

$$A = 15, h = 6$$

$$\text{Mean} = A + h(\text{sum}/A)$$

$$= 15 + 6(3/40)$$

$$= 15 + 0.45$$

$$= 15.45$$

6.

<b>Class interval:</b>	<b>50-70</b>	<b>70-90</b>	<b>90-110</b>	<b>110-130</b>	<b>130-150</b>
	<b>150-170</b>				
<b>Frequency:</b>	<b>18</b>	<b>12</b>	<b>13</b>	<b>27</b>	
	<b>8</b>	<b>22</b>			

**Soln:** Let us assumed mean be 100

Class interval	Mid-value $x_i$	$d_i = x_i - 100$	$u_i = (x_i - 100)/20$	$f_i$	$f_i u_i$
50 – 70	60	-40	-2	18	-36
70 – 90	80	-20	-1	12	-12
90 – 110	100	0	0	13	0
110 – 130	120	20	1	27	27
130 – 150	140	40	2	8	16
150 – 170	160	60	3	22	66
					61

$$A = 100, h = 20$$

$$\text{Mean} = 100 + 20 (61/100)$$

$$= 100 + 12.2$$

$$= 112.2$$

7.

<b>Class interval:</b>	<b>0-8</b>	<b>8-16</b>	<b>16-24</b>	<b>24-32</b>	<b>32-40</b>
<b>Frequency:</b>	<b>6</b>	<b>7</b>	<b>10</b>	<b>8</b>	<b>9</b>

**Soln:** Let the assumed mean (A) = 20

Class interval	Mid-value	$d_i = x_i - 20$	$u_i = (x_i - 20)/8$	$f_i$	$f_i u_i$
0-8	4	-16	-2	6	-12
8-16	12	-8	-1	7	-7
16-24	20	0	0	10	0
24-32	28	8	1	8	8
32-40	36	16	2	9	18
				N = 40	Sum = 7

We have A = 20, h = 8

Mean = A + h (sum/N)

$$= 20 + 8 (7/40)$$

$$= 20 + 1.4$$

$$= 21.4$$

**8.**

<b>Class interval:</b>	<b>0 – 6</b>	<b>6 – 12</b>	<b>12 –</b>
	<b>18</b>	<b>18 – 24</b>	<b>24 – 30</b>
<b>Frequency:</b>	<b>7</b>	<b>5</b>	
	<b>10</b>	<b>12</b>	<b>6</b>

**Soln:** Let the assumed mean be (A) = 15

Class interval	Mid – value	$d_i = x_i - 15$	$u_i = (x_i - 15)/6$	Frequency $f_i$	$f_i u_i$
0 – 6	3	-12	-2	7	-14
6 – 12	9	-6	-1	5	-5



12 – 18	15	0	0	10	0
18 – 24	21	6	1	12	12
24 – 30	27	12	2	6	12
				N = 40	Sum = 5

We have

$$A = 15, h = 6$$

$$\text{Mean} = A + h(\text{sum}/N)$$

$$= 15 + 6 (5/40)$$

$$= 15 + 0.75$$

$$= 15.75$$

9.

<b>Class interval:</b>	<b>0 – 10</b> 30	<b>10 – 20</b> 30 – 40	<b>20 –</b> 40 – 50
<b>Frequency:</b>	<b>9</b> 15	<b>12</b> 10	<b>14</b>

**Soln:** Let the assumed mean (A) = 25

Class interval	Mid – value	$d_i = x_i - 25$	$u_i = (x_i - 25)/10$	Frequency $f_i$	$f_i u_i$
0 – 10	5	-20	-2	9	-18
10 – 20	15	-10	-1	10	-12
20 – 30	25	0	0	15	0
30 – 40	35	10	1	10	10
40 – 50	45	20	2	14	28
				N = 60	Sum = 8

We have A = 25, h = 10

$$\text{Mean} = A + h(\text{sum}/N)$$

$$= 25 + 19 (8/60)$$

$$= 25 + (4/3)$$

$$= 26.333$$

10.

<b>Class interval:</b>	<b>0-8</b>	<b>8-16</b>	<b>16-24</b>	<b>24-32</b>	<b>32-40</b>
<b>Frequency:</b>	<b>5</b>	<b>9</b>	<b>10</b>	<b>8</b>	<b>8</b>

**Soln:** Let the assumed mean (A) = 20

Class interval	Mid value $x_i$	$d_i = x_i - 20$	$u_i = (x_i - 20)/8$	Frequency $f_i$	$f_i u_i$
0-8	4	-16	-2	5	-10
8-16	12	-8	-1	9	-9
16-24	20	0	0	10	0
24-32	28	8	1	8	8
32-40	36	16	2	8	16
				N = 40	Sum = 5

We have,

$$A = 20, h = 8$$

$$\text{Mean} = A + h (\text{sum}/N)$$

$$= 20 + 8 (5/40)$$

$$= 20 + 1$$

$$= 21$$

11.

<b>Class interval:</b>	<b>0-8</b>	<b>8-16</b>	<b>16-24</b>	<b>24-32</b>	<b>32-40</b>
<b>Frequency:</b>	<b>5</b>	<b>6</b>	<b>4</b>	<b>3</b>	<b>2</b>

**Soln:** Let the assumed mean (A) = 20

Class interval	Mid value $x_i$	$d_i = x_i - 20$	$u_i = (x_i - 20)/8$	Frequency $f_i$	$f_i u_i$
0-8	4	-16	-2	-2	-10
8-16	12	-8	-1	-1	-6
16-24	20	0	0	0	0
24-32	28	8	1	1	3
32-40	36	16	2	2	4
				N = 20	Sum = -9

We have,

$$A = 20, h = 8$$

$$\text{Mean} = A + h (\text{sum}/N)$$

$$= 20 + 8 (-9/20)$$

$$= 20 - (72/20)$$

$$= 20 - 3.6$$

$$= 16.4$$

12.

Class interval:	10-30	30-50	50-70	70-90	90-110	110-130
Frequency:	5	8	12	20	3	
	2					

**Soln:** Let the assumed mean (A) = 60

Class interval	Mid value $x_i$	$d_i = x_i - 60$	$u_i = (x_i - 60)/20$	Frequency $f_i$	$f_i u_i$
10 - 30	20	-40	-2	5	-10
30 - 50	40	-20	-1	8	-8
50 - 70	60	0	0	12	0

70 – 90	80	20	1	20	20
90 – 110	100	40	2	3	6
110 – 130	120	60	3	2	6
				N = 50	Sum = 14

We have

$$A = 60, h = 20$$

$$\text{Mean} = A + h (\text{sum}/N)$$

$$= 60 + 20 (14/ 5)$$

$$= 60 + 5.6$$

$$= 65.6$$

13.

<b>Class interval:</b>	<b>25-35</b>	<b>35-45</b>	<b>45-55</b>	<b>55-65</b>
	<b>65</b>	<b>65-75</b>		
<b>Frequency:</b>	<b>6</b>	<b>10</b>	<b>8</b>	
	<b>10</b>	<b>4</b>		

**Soln:** Let the assumed mean (A) = 50

Class interval	Mid value $x_i$	$d_i = x_i - 50$	$u_i = (x_i - 50)/ 10$	Frequency $f_i$	$f_i u_i$
25 – 35	30	-20	-2	6	-12
35 – 45	40	-10	-1	10	-10
45 – 55	50	0	0	8	0
55 – 65	60	10	1	12	12
65 – 75	70	20	2	4	8
				N = 40	Sum = -2

We have

$$A = 50, h = 10$$

$$\text{Mean} = A + h (\text{sum}/N)$$

$$= 50 + 10 (-2/40)$$

$$= 50 - 0.5$$

$$= 49.5$$

14.

<b>Class interval:</b>	<b>25-29</b> <b>54</b>	<b>30-34</b> <b>55-59</b>	<b>35-39</b>	<b>40-44</b>	<b>45-49</b>	<b>50-</b>
<b>Frequency:</b>	<b>14</b> <b>3</b>	<b>22</b> <b>4</b>	<b>16</b>	<b>6</b>	<b>5</b>	

**Soln:** Let the assumed mean (A) = 42

Class interval	Mid value $x_i$	$d_i = x_i - 42$	$u_i = (x_i - 42)/5$	Frequency $f_i$	$f_i u_i$
25 – 29	27	-15	-3	14	-42
30 – 34	32	-10	-2	22	-44
35 – 39	37	-5	-1	16	-16
40 – 44	42	0	0	6	0
45 – 49	47	5	1	5	5
50 – 54	52	10	2	3	6
55 – 59	57	15	3	4	12
				N = 70	Sum = -79

We have

$$A = 42, h = 5$$

$$\text{Mean} = A + h (\text{sum}/N)$$

$$= 42 + 5 (-79/70)$$

$$= 42 - 79/14$$

$$= 36.357$$

15. For the following distribution, calculate mean using all suitable methods:

Size of item:	1 – 4	4 – 9	9 – 16	16 – 20
Frequency:	6	12	26	20

**Soln:** By direct method

Class interval	Mid value $x_i$	Frequency $f_i$	$f_i x_i$
1 – 4	2.5	6	15
4 – 9	6.5	12	18
9 – 16	12.5	26	325
16 – 27	21.5	20	430
		N = 64	Sum = 848

$$\text{Mean} = (\text{sum}/N) + A$$

$$= 848/64$$

$$= 13.25$$

By assuming mean method

Let the assumed mean (A) = 65

Class interval	Mid value $x_i$	$u_i = (x_i - A) = x_i - 65$	Frequency $f_i$	$f_i u_i$
1 – 4	2.5	-4	6	-25
4 – 9	6.5	0	12	0
9 – 16	12.5	6	26	196
16 – 27	21.5	15	20	300
			N = 64	Sum = 432

$$\text{Mean} = A + \text{sum}/N$$

$$= 6.5 + 6.75$$

$$= 13.25$$

**16.** The weekly observation on cost of living index in a certain city for the year 2004 – 2005 are given below. Compute the weekly cost of living index.

Cost of living index	Number of students	Cost of living index	Number of students
1400 – 1500	5	1700 – 1800	9
1500 – 1600	10	1800 – 1900	6
1600 – 1700	20	1900 – 2000	2

**Soln:** Let the assumed mean (A) = 1650

Class interval	Mid value $x_i$	$d_i = x_i - A$ $= x_i - 1650$	$u_i = \frac{(x_i - 1650)}{100}$	Frequency $f_i$	$f_i u_i$
1400 – 1500	1450	-200	-2	5	-10
1500 – 1600	1550	-100	-1	10	-10
1600 – 1700	1650	0	0	20	0
1700 – 1800	1750	100	1	9	9
1800 – 1900	1850	200	2	6	12
1900 – 2000	1950	300	3	2	6
				N = 52	Sum = 7

We have

$$A = 16, h = 100$$

$$\text{Mean} = A + h (\text{sum}/N)$$

$$= 1650 + 100 (7/52)$$

$$= 1650 + (175/13)$$

$$= 21625/13$$

$$= 1663.46$$

**17. The following table shows the marks scored by 140 students in an examination of a certain paper:**

<b>Marks:</b>	<b>0-10</b>	<b>10-20</b>	<b>20-30</b>	<b>30-40</b>	<b>40-50</b>
<b>Number of students:</b>	<b>20</b>	<b>24</b>	<b>40</b>	<b>36</b>	<b>20</b>

**Calculate the average marks by using all the three methods: direct method, assumed mean deviation and shortcut method.**

**Soln:** (i) Direct method:

Class interval	Mid value $x_i$	Frequency $f_i$	$f_i x_i$
0 – 10	5	20	100
10 – 20	15	24	360
20 – 30	25	40	1000
30 – 40	35	36	1260
40 – 50	45	20	900
		<b>N = 140</b>	<b>Sum = 3620</b>

$$\text{Mean} = \text{sum} / N$$

$$= 3620 / 140$$

$$= 25.857$$

(ii) Assumed mean method:

Let the assumed mean = 25

$$\text{Mean} = A + (\text{sum} / N)$$

Class interval	Mid value $x_i$	$u_i = (x_i - A)$	Frequency $f_i$	$f_i u_i$



0 – 10	5	-20	20	-400
10 – 20	15	-10	24	-240
20 – 30	25	0	40	0
30 – 40	35	10	36	360
40 – 50	45	20	20	400
			N = 140	Sum = 120

$$\text{Mean} = A + (\text{sum} / N)$$

$$= 25 + (120 / 140)$$

$$= 25 + 0.857$$

$$= 25.857$$

(iii) Step deviation method:

Let the assumed mean (A) = 25

Class interval	Mid value $x_i$	$d_i = x_i - A = x_i - 25$	$u_i = \frac{x_i - 25}{10}$	Frequency $f_i$	$f_i u_i$
0 – 10	5	-20	-2	20	-40
10 – 20	15	-10	-1	24	-24
20 – 30	25	0	0	40	0
30 – 40	35	10	1	36	36
40 – 50	45	20	2	20	40
				N = 140	Sum = 12

$$\text{Mean} = A + h(\text{sum} / N)$$

$$= 25 + 10(12 / 140)$$

$$= 25 + 0.857$$

$$= 25.857$$

18. The mean of the following frequency distribution is 62.8 and the sum of all the frequencies is 50. Compute the missing frequency  $f_1$  and  $f_2$ .

Class:	0-20	20-40	40-60	60-80	80-100	100-120
Frequency:	5	$f_1$	10	$f_2$	7	8

**Soln:**

Class interval	Mid value $x_i$	Frequency $f_i$	$f_i x_i$
0 – 20	10	5	50
20 – 40	30	$f_1$	$30f_1$
40 – 60	50	10	500
60 – 80	70	$f_2$	$70f_2$
80 – 100	90	7	630
100 – 120	110	8	880
		$N = 50$	Sum = $30f_1 + 70f_2 +$ 2060

Given,

sum of frequency = 50

$$5 + f_1 + 10 + f_2 + 7 + 8 = 50$$

$$f_1 + f_2 = 20$$

$$3f_1 + 3f_2 = 60 \text{ — (1) [multiply both side by 3]}$$

And mean = 62.8

$$\text{Sum} / N = 62.8$$

$$(30f_1 + 70f_2 + 2060) / 50 = 62.8$$

$$30f_1 + 70f_2 = 3140 - 2060$$

$$30f_1 + 70f_2 = 1080$$

$$3f_1 + 7f_2 = 108 \text{ — (2) [divide it by 10]}$$

subtract equation (1) from equation (2)

$$3f_1 + 7f_2 - 3f_1 - 3f_2 = 108 - 60$$

$$4f_2 = 48$$

$$f_2 = 12$$

Put value of  $f_2$  in equation (1)

$$3f_1 + 3(12) = 60$$

$$f_1 = 24/3 = 8$$

$$f_1 = 8, f_2 = 12$$

**19.**The following distribution shows the daily pocket allowance given to the children of a multistory building. The average pocket allowance is Rs 18.00. Find out the missing frequency.

<b>Class interval:</b>	<b>11-13 23</b>	<b>13-15 23-25</b>	<b>15-17</b>	<b>17-19</b>	<b>19-21</b>	<b>21- 23</b>
<b>Frequency:</b>	<b>7 5</b>	<b>6 4</b>	<b>9</b>	<b>13</b>	<b>-</b>	

**Soln:** Given mean = 18,

Let the missing frequency be  $v$

Class interval	Mid value $x_i$	Frequency $f_i$	$f_i x_i$
11 – 13	12	7	84
13 – 15	14	6	88
15 – 17	16	9	144
17 – 19	18	13	234
19 – 21	20	$x$	$20x$
21 – 23	22	5	110
23 – 25	14	4	56
		$N = 44 + x$	Sum = $752 + 20x$

Mean = sum/ N

$$18 = \frac{752+20x}{44+x}$$

$$792 + 18x = 752 + 20x$$

$$2x = 40$$

$$x = 20$$

20.If the mean of the following distribution is 27. Find the value of p.

<b>Class:</b>	<b>0-10</b>	<b>10-20</b>	<b>20-30</b>	<b>30-40</b>	<b>40-50</b>
<b>Frequency:</b>	<b>8</b>	<b>p</b>	<b>12</b>	<b>13</b>	<b>10</b>

**Soln:**

Class interval	Mid value $x_i$	Frequency $f_i$	$f_i x_i$
0 – 10	5	8	40
10 – 20	15	P	152
20 – 30	25	12	300
30 – 40	35	13	455
40 – 50	45	16	450
		$N = 43 + P$	Sum = 1245 + 15p

Given mean =27

Mean = sum/ N

$$1245+15p \over 43+p = 27$$

$$1245 + 15p = 1161 + 27p$$

$$12p = 84$$

$$P = 7$$

21.In a retail market, fruit vendors were selling mangoes kept in packing boxes. These boxes contain varying number of mangoes. The following was the distribution of mangoes according to the number of boxes.

<b>Number of mangoes:</b>	<b>50-52</b>	<b>53-55</b>	<b>56-58</b>	<b>59-61</b>	<b>62-64</b>

Number of boxes:	15	110	135	115	25
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Find the mean number of mangoes kept in packing box. Which method of finding the mean did you choose?

Soln:

Number of mangoes	Number of boxes ( $f_i$ )
50 – 52	15
53 – 55	110
56 – 58	135
59 – 61	115
62 – 64	25

We may observe that class internals are not continuous

There is a gap between two class intervals. So we have to add  $\frac{1}{2}$  from lower class limit of each interval and class mark ( $x_i$ ) may be obtained by using the relation

$$x_i = \frac{\text{upperlimit} + \text{lowerclasslimit}}{2}$$

Class size (h) of this data = 3

Now taking 57 as assumed mean (a) we may calculated  $d_i, u_i, f_i u_i$  as follows

Class interval	Frequency $f_i$	Mid value $x_i$	$d_i = x_i - A = x_i - 25$	$u_i = \frac{x_i - 25}{h} = \frac{x_i - 25}{3}$	$f_i u_i$
49.5 – 52.5	15	51	-6	-2	-30
52.5 – 55.5	110	54	-3	-1	-110
55.5 – 58.5	135	57	0	0	0
58.5 – 61.5	115	60	3	1	115
61.5 – 64.5	25	63	6	2	50

Total	N = 400				Sum = 25
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Now we have N = 400

Sum = 25

Mean = A + h (sum/ N)

= 57 + 3 (45/400)

= 57 + 3/ 16

= 57+ 0.1875

= 57.19

Clearly mean number of mangoes kept in packing box is 57.19

**22.The table below shows the daily expenditure on food of 25 households in a locality**

Daily expenditure (in Rs):	100-150 250	150-200 250-300	200-300-350
Number of households:	4 12	5 2	2

**Find the mean daily expenditure on food by a suitable method.**

**Soln:** we may calculate class mark ( $x_i$ ) for each interval by using the relation

$$x_i = \frac{\text{upperlimit} + \text{lowerclasslimit}}{2}$$

Class size = 50

Now, taking 225 as assumed mean ( $x_i$ ) we may calculate  $d_i, u_i, f_i u_i$  as follows

Daily expenditure	Frequency $f_i$	Mid value $x_i$	$d_i = x_i - 225$	$u_i = \frac{x_i - 225}{50}$	$f_i u_i$
100 – 150	4	125	-100	-2	-8
150 – 200	5	175	-50	-1	-5
200 – 250	12	225	0	0	0

250 – 300	2	275	50	1	2
300 – 350	2	325	100	2	4
	N = 25				Sum = -7

Now we may observe that

$$N = 25$$

$$\text{Sum} = -7$$

$$\text{Mean } \bar{x} = a + \left(\frac{\text{sum}}{N}\right) \times h$$

$$225 + 50 \left(-7/25\right)$$

$$225 - 14 = 211$$

So, mean daily expenditure on food is Rs 211

**23. To find out the concentration of SO<sub>2</sub> in the air (in parts per million i.e ppm) the data was collected for localities for 30 localities in a certain city and is presented below:**

Concentration of SO <sub>2</sub> (in ppm)	Frequency
0.00 – 0.04	4
0.04 – 0.08	9
0.08 – 0.12	9
0.12 – 0.16	2
0.16 – 0.20	4
0.20 – 0.24	2

**Find the mean concentration of SO<sub>2</sub> in the air**

**Soln:** we may find class marks for each interval by using the relation

$$X = \frac{\text{upperlimit} + \text{lowerclasslimit}}{2}$$

Class size of this data = 0.04

Now taking 0.04 assumed mean ( $x_i$ ) we may calculate  $d_i, u_i, f_i u_i$  as follows

Concentration	Frequency	Class	$d_i =$	$u_i$	$f_i u_i$
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of SO <sub>2</sub>	f <sub>i</sub>	interval x <sub>i</sub>	x <sub>i</sub> - 0.14		
0.00 – 0.04	4	0.02	-0.12	-3	-12
0.04 – 0.08	9	0.06	-0.08	-2	-18
0.08 – 0.12	9	0.10	-0.04	-1	-9
0.12 – 0.16	2	0.14	0	0	0
0.16 – 0.20	4	0.18	0.04	1	4
0.20 – 0.24	2	0.22	0.08	2	4
Total	N = 30				Sum = -31

From the table we may observe that

$$N = 30$$

$$\text{Sum} = -31$$

$$\text{Mean } \bar{x} = a + \left(\frac{\text{sum}}{N}\right) \times h$$

$$= 0.14 + (0.04)(-31/30)$$

$$= 0.099 \text{ ppm}$$

So mean concentration of SO<sub>2</sub> in the air is 0.099 ppm

**24.A class teacher has the following absentee record of 40 students of a class for the whole term. Find the mean number of days a student was absent.**

Number of days:	0-6 28-38	6-10 38-40	10-14	14-20	20-28
Number of students:	11 4	10 3	7 1	4	

**Soln:** We may find class mark of each interval by using the relation

$$X = \frac{\text{upperlimit} + \text{lowerclasslimit}}{2}$$

Now, taking 16 as assumed mean (a) we may

Calculate d<sub>i</sub> and f<sub>i</sub>d<sub>i</sub> as follows



Number of days	Number of students $f_i$	$X_i$	$d = x_i + 10$	$f_i d_i$
0 – 6	11	3	-13	-143
6 – 10	10	8	-8	-280
10 – 14	7	12	-4	-28
14 – 20	7	16	0	0
20 – 28	8	24	8	32
28 – 36	3	33	17	51
30 – 40	1	39	23	23
Total	$N = 40$			Sum = -145

Now we may observe that

$$N = 40$$

$$\text{Sum} = -145$$

$$\text{Mean } \bar{x} = a + \left( \frac{\text{sum}}{N} \right) \bar{x} = a + \left( \frac{\text{sum}}{N} \right)$$

$$= 16 + (-145/40)$$

$$= 16 - 3.625$$

$$= 12.38$$

So mean number of days is 12.38 days, for which student was absent

**25.** The following table gives the literacy rate (in percentage) of 35 cities. Find the mean literacy rate.

Literacy rate (in %):	45-55	55-65	65-75	75-85	85-95
Number of cities:	3	10	11	8	3

**Soln:** We may find class marks by using the relation

$$X = \frac{\text{upperlimit} + \text{lowerclasslimit}}{2}$$

Class size (h) for this data = 10

Now taking 70 as assumed mean (a) wrong

Calculate  $d_i, u_i, f_i u_i$  as follows

Literacy rate (in %)	Number of cities ( $f_i$ )	Mid value $x_i$	$d_i = x_i - 70$	$u_i = \frac{d_i}{50}$	$f_i u_i$
45 – 55	3	50	-20	-2	-6
55 – 65	10	60	-10	-1	-10
65 – 75	11	70	0	0	0
75 – 85	8	80	10	1	8
85 – 95	3	90	20	2	6
Total	N = 35				Sum = -2

Now we may observe that

$$N = 35$$

$$\text{Sum} = -2$$

$$\text{Mean } \bar{x} = a + \left(\frac{\text{sum}}{N}\right) \times h$$

$$= 70 + (-2/35)$$

$$= 70 - 4/7$$

$$= 70 - 0.57$$

$$= 69.43$$

So, mean literacy rate is 69.43 %