

**RD SHARMA**

**Solutions**

**Class 10 Maths**

**Chapter 7**

**Ex 7.5**

1. Find the mode of the following data:

(i) 3, 5, 7, 4, 5, 3, 5, 6, 8, 9, 5, 3, 5, 3, 6, 9, 7, 4

(ii) 3, 3, 7, 4, 5, 3, 5, 6, 8, 9, 5, 3, 5, 3, 6, 9, 7, 4

(iii) 15, 8, 26, 25, 24, 15, 18, 20, 24, 15, 19, 15

Soln:

(i)

Value (x)	3	4	5	6	7	8	9
Frequency (f)	4	2	5	2	2	1	2

Mode = 5 because it occurs the maximum number of times.

(ii)

Value (x)	3	4	5	6	7	8	9
Frequency (f)	5	2	4	2	2	1	2

Mode = 3 because it occurs maximum number of times.

(iii)

Value (x)	8	15	18	19	20	24	25	26
Frequency (f)	1	4	1	1	1	2	1	1

Mode = 15 because it occurs maximum number of times.

2. The shirt size worn by a group of 200 persons, who bought the shirt from a store, are as follows:

Shirt size:	37	38	39	40
	41	42	43	44

Number of persons:	15	25	39	41
	36	17	15	12

Find the modal shirt size worn by the group.

**Soln:**

Shirt size	37	38	39	40	41	42	43	44
Number of persons	15	25	39	41	36	17	15	12

Model shirt size = 40 because it occurs maximum number of times.

**3. Find the mode of the following distribution.**

(i)

Class interval:	0-10 60	10-20 60-70	20-30 70-80	30-40	40-50	50-60
Frequency:	5 20	8 10	7 10	12	28	

(ii)

Class interval:	10-15 40	15-20	20-25	25-30	30-35	35-40
Frequency:	30	45	75	35	25	15

(iii)

Class interval:	25-30 60	30-35	35-40	40-45	45-50	50-60
Frequency:	25	34	50	42	29	15

**Soln:**

(i)

Class interval	0 – 10	10– 20	20– 30	30– 40	40– 50	50– 60	60– 70	70– 80
Frequency	5	8	7	12	28	20	10	10

Here the maximum frequency is 28 then the corresponding class 40 – 52 is the modal class

$$l = 40, h = 50 - 40 = 10, f = 28, f_1 = 12, f_2 = 20$$

$$\text{Mode} = l + \frac{f - f_1}{2f - f_1 - f_2} \times h$$
$$= 40 + \frac{28 - 12}{2 \times 28 - 12 - 20} \times 10$$

$$= 40 + 160/24$$

$$= 40 + 6.67$$

$$= 46.67$$

(ii)

Class interval	10-15	15– 20	20-25	25-30	30-35	35-40
Frequency	30	45	75	35	25	15

Here the maximum frequency is 75, then the corresponding class 20 – 25 is the modal class

$$l = 20, h = 25 - 20 = 5, f = 75, f_1 = 45, f_2 = 35$$

$$\text{Mode} = l + \frac{f - f_1}{2f - f_1 - f_2} \times h$$
$$= 20 + \frac{75 - 45}{2 \times 75 - 45 - 35} \times 5$$

$$= 20 + 150/70$$

$$= 20 + 2.14$$

$$= 22.14$$

(iii)

Class interval	25-30	30-35	35-40	40-45	45-50	50-60
Frequency	25	34	50	42	38	14

Here the maximum frequency is 50 then the corresponding class 35 – 40 is the modal class

$$l = 35, h = 40 - 35 = 5, f = 50, f_1 = 34, f_2 = 42$$

$$\begin{aligned} \text{Mode} &= l + \frac{f - f_1}{2f - f_1 - f_2} \times h \\ &= 35 + \frac{50 - 34}{2 \times 50 - 34 - 42} \times 5 \\ &= 35 + 80/24 \\ &= 35 + 3.33 \\ &= 38.33 \end{aligned}$$

#### 4. Compare the modal ages of two groups of students appearing for an entrance test:

Age (in years):	16–18	18–20	20–22	22–24	24–26
Group A:	50	78	46	28	23
Group B:	54	89	40	25	17

**Soln:**

Age in years	16-18	18-20	20-22	22-24	24-26
Group A	50	78	46	28	23
Group B	54	89	40	25	17

For Group A

Here the maximum frequency is 78, then the corresponding class 18 – 20 is model class

$$l = 18, h = 20 - 18 = 2, f = 78, f_1 = 50, f_2 = 46$$

$$\begin{aligned} \text{Mode} &= l + \frac{f - f_1}{2f - f_1 - f_2} \times h \\ &= 18 + \frac{78 - 50}{2 \times 78 - 50 - 46} \times 2 \\ &= 18 + 56/60 \end{aligned}$$

$$= 18 + 0.93$$

$$= 18.93 \text{ years}$$

For group B

Here the maximum frequency is 89, then the corresponding class 18 – 20 is the modal class

$$l = 18, h = 20 - 18 = 2, f = 89, f_1 = 54, f_2 = 40$$

$$\text{Mode} = l + \frac{f - f_1}{2f - f_1 - f_2} \times h$$

$$= 18 + \frac{89 - 54}{2 \times 89 - 54 - 40} \times 2$$

$$= 18 + 70/84$$

$$= 18 + 0.83$$

$$= 18.83 \text{ years}$$

Hence the modal age for the Group A is higher than that for Group B

**5. The marks in science of 80 students of class X are given below. Find the mode of the marks obtained by the students in science.**

<b>Marks:</b>	<b>0-10</b>	<b>10-20</b>	<b>20-30</b>	<b>30-40</b>	<b>40-50</b>	<b>50-60</b>
	<b>60-70</b>	<b>70-80</b>	<b>80-90</b>	<b>90-100</b>		
<b>Frequency:</b>	<b>3</b>	<b>5</b>	<b>16</b>	<b>12</b>	<b>13</b>	
	<b>20</b>	<b>5</b>	<b>4</b>	<b>1</b>	<b>1</b>	

**Soln:**

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	5	16	12	13	20	5	4	1	1

Here the maximum frequency is 20, then the corresponding class 50 – 60 is the modal class

$$l = 50, h = 60 - 50 = 10, f = 20, f_1 = 13, f_2 = 5$$

$$\text{Mode} = l + \frac{f - f_1}{2f - f_1 - f_2} \times h$$

$$= 50 + \frac{20-13}{2 \times 20-13-5} \times 10$$

$$= 50 + 70/22$$

$$= 50 + 3.18$$

$$= 53.18$$

6. The following is the distribution of height of students of a certain class in a city:

Height (in cm):	160-162 168	163-165 169-171	166- 172-174
No of students:	15 142	118 127	18

Find the average height of maximum number of students.

Soln:

Heights(exclusive)	160- 162	163- 165	166- 168	169- 171	172- 174
Heights (inclusive)	159.5- 162.5	162.5- 165.5	165.5- 168.5	168.5- 171.5	171.5- 174.5
No of students	15	118	142	127	18

Here the maximum frequency is 142, then the corresponding class 165.5 – 168.5 is the modal class

$$l = 165.5, h = 168.5 - 165.5 = 3, f = 142, f_1 = 118, f_2 = 127$$

$$\text{Mode} = l + \frac{f-f_1}{2f-f_1-f_2} \times h$$

$$= 165.5 + \frac{142-118}{2 \times 142-118-127} \times 3$$

$$= 165.5 + 72/39$$

$$= 165.5 + 1.85$$

$$= 167.35 \text{ cm}$$

7. The following table shows the ages of the patients admitted in a hospital during a year:

<b>Ages (in years):</b>	<b>5-15</b>	<b>15-25</b>	<b>25-35</b>	<b>35-45</b>	<b>45-55</b>	<b>55-65</b>
<b>No of students:</b>	<b>6</b>	<b>11</b>	<b>21</b>	<b>23</b>	<b>14</b>	<b>5</b>

**Find the mode and the mean of the data given above. Compare and interpret the two measures of central tendency.**

**Soln:** We may compute class marks ( $x_i$ ) as per the relation

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

Now taking 30 as assumed mean ( $a$ ) we may calculate  $d_i$  and  $f_i d_i$  as follows.

Age (in years)	Number of patients $f_i$	Class marks $x_i$	$d_i = x_i - 275$	$f_i d_i$
5 – 15	6	10	-20	-120
15 – 25	11	20	-10	-110
25 – 35	21	30	0	0
35 – 45	23	40	10	230
45 – 55	14	50	20	280
55 – 65	5	60	30	150
Total	80			430

From the table we may observe that

$$\sum f_i = 80$$

$$\sum f_i d_i = 430$$

$$\text{Mean } \bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$$

$$30 + 430 / 80$$

$$30 + 5.375$$

$$35.375$$

$$\approx 35.38$$



Clearly, mean of this data is 35.38. It represents that on an average the age of a patients admitted to hospital was 35.38 years.

As we may observe that maximum class frequency is 23 belonging to class interval 35 – 45

So, modal class = 35 – 45

Lower limit (l) of modal class = 35

Frequency (f) of modal class = 23

Class size (h) = 10

Frequency (f<sub>1</sub>) of class preceding the modal class = 21

Frequency (f<sub>2</sub>) of class succeeding the modal class = 14

$$\begin{aligned} \text{Mode} &= l + \frac{f - f_1}{2f - f_1 - f_2} \times h \\ &= 35 + \frac{23 - 21}{2 \times 23 - 21 - 14} \times 10 \\ &= 35 + \frac{2}{46 - 35} \times 10 \\ &= 35 + 1.81 \\ &= 36.8 \end{aligned}$$

Clearly mode is 36.8. It represents that maximum number of patients admitted in hospital were of 36.8 years.

**8. The following data gives the information on the observed lifetimes (in hours) of 225 electrical components:**

Lifetimes (in hours):	0-20	20-40	40-60	60-80	80-100
No of components:	10	35	52	61	
	38	29			

**Determine the modal lifetimes of the components.**

**Soln:** From the data given as above we may observe that maximum class frequency is 61 belonging to class interval 60 – 80

So, modal class limit (l) of modal class = 60

Frequency (f) of modal class = 61

Frequency (f<sub>1</sub>) of class preceding the modal class = 52

Frequency ( $f_2$ ) of class succeeding the modal class = 38

Class size ( $h$ ) = 20

$$\begin{aligned}\text{Mode} &= l + \frac{f - f_1}{2f - f_1 - f_2} \times h \\ &= 60 + \frac{61 - 52}{2 \times 61 - 52 - 38} \times 20 \\ &= 60 + \frac{9}{122 - 90} \times 20 \\ &= 60 + \frac{9 \times 20}{32} \\ &= 60 + 90/16 \\ &= 60 + 5.625 \\ &= 65.625\end{aligned}$$

So, modal lifetime of electrical components is 65.625 hours

**9. The following table gives the daily income of 50 workers of a factory:**

<b>Daily income</b>	<b>100 – 120</b>	<b>120 – 140</b>	<b>140 – 160</b>	<b>160 – 180</b>	<b>180 – 200</b>
<b>Number of workers</b>	<b>12</b>	<b>14</b>	<b>8</b>	<b>6</b>	<b>10</b>

**Find the mean, mode and median of the above data.**

**Soln:**

Class interval	Mid value ( $x$ )	Frequency ( $f$ )	$fx$	Cumulative frequency
100 – 120	110	12	1320	12
120 – 140	130	14	1820	26
140 – 160	150	8	1200	34
160 – 180	170	6	1000	40

180 – 200	190	10	1900	50
		N = 50	$\Sigma fx = 7260$	

$$\text{Mean} = \frac{\Sigma fx}{N} = \frac{7260}{50} = 145.2$$

We have,

$$N = 50$$

$$\text{Then, } N/2 = 50/2 = 25$$

The cumulative frequency just greater than  $N/2$  is 26, then the median class is 120 – 140 such that

$$l = 120, h = 140 - 120 = 20, f = 14, F = 12$$

$$\text{Median} = l + \frac{N/2 - F}{f} \times h$$

$$= 120 + \frac{25 - 12}{14} \times 20$$

$$= 120 + 260/14$$

$$= 120 + 18.57$$

$$= 138.57$$

Here the maximum frequency is 14, then the corresponding class 120 – 140 is the modal class

$$l = 120, h = 140 - 120 = 20, f = 14, f_1 = 12, f_2 = 8$$

$$\text{Mode} = l + \frac{f - f_1}{2f - f_1 - f_2} \times h$$

$$= 120 + \frac{14 - 12}{2 \times 14 - 12 - 8} \times 20$$

$$= 120 + 40/8$$

$$= 120 + 5$$

$$= 125$$

10. The following distribution gives the state-wise teachers-students ratio in higher secondary schools of India. Find the mode and mean of this data. Interpret the two measures:

Number of students per teacher	Number of states/ U.T	Number of students per teacher	Number of states/ U.T
15 – 20	3	35 – 40	3
20 – 25	8	40 – 45	0
25 – 30	9	45 – 50	0
30 – 35	10	50 – 55	2

**Soln:** WE may observe from the given data that maximum class frequency is 10 belonging to class interval 30 – 35.

So, modal class = 30 – 35

Class size (h) = 5

Lower limit (l) of modal class = 30

Frequency (f) of modal class = 10

Frequency ( $f_1$ ) of class preceding modal class = 9

Frequency ( $f_2$ ) of class succeeding modal class = 3

$$\text{Mode} = l + \frac{f - f_1}{2f - f_1 - f_2} \times h$$

$$= 30 + \frac{10 - 9}{2 \times 10 - 9 - 3} \times 5$$

$$= 30 + \frac{1}{20 - 12} \times 5$$

$$= 30 + 5/8$$

$$= 30.625$$

$$\text{Mode} = 30.6$$

It represents that most of states/ U.T have a teacher- student ratio as 30.6

Now we may find class marks by using the relation

$$\text{Class mark} = \frac{\text{upperclasslimit} + \text{lowerclasslimit}}{2}$$

Now taking 32.5 as assumed mean (a) we may calculate  $d_i$ ,  $u_i$ , and  $f_i u_i$  as following

Number of students per teacher	Number of states/ U.T ( $f_i$ )	$x_i$	$d_i = x_i - 32.5$	$U_i$	$f_i u_i$
15 – 20	3	17.5	-15	-3	-9
20 – 25	8	22.5	-10	-2	-16
25 – 30	9	27.5	-5	-1	-9
30 – 35	10	32.5	0	0	0
35 – 40	3	37.5	5	1	3
40 – 45	0	42.5	10	2	0
45 – 50	0	47.5	15	3	0
50 – 55	2	52.5	20	4	8
Total	35				-23

Now Mean  $\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i} \times h$

$$= 32.5 + \frac{-23}{35} \times 5$$

$$= 32.5 - 23/7$$

$$= 32.5 - 3.28$$

$$= 29.22$$

So mean of data is 29.2

It represents that on an average teacher-student ratio was 29.2

**11. Find the mean, median and mode of the following data:**

<b>Classes:</b>	0 – 50	50 – 100	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350
<b>Frequency:</b>	2	3	5	6	5	3	1

**Soln:**

Class interval	Mid value (x)	Frequency (f)	fx	Cumulative frequency
0 – 50	35	2	50	2
50 – 100	75	3	225	5
100 – 150	125	5	625	10
150 – 200	175	6	1050	16
200 – 250	225	5	1127	21
250 – 300	275	3	825	24
300 – 350	325	1	325	25
		N = 25	$\Sigma fx = 4225$	

$$\text{Mean} = \frac{\Sigma fx}{N} = \frac{4225}{25} = 169$$

We have,

$$N = 25$$

$$\text{Then, } N/2 = 25/2 = 12.5$$

The cumulative frequency just greater than  $N/2$  is 16, then the median class is 150 – 200 such that

$$l = 150, h = 200 - 150 = 50, f = 6, F = 10$$

$$\text{Median} = l + \frac{\frac{N}{2} - F}{f} \times h$$

$$= 150 + \frac{12.5 - 10}{6} \times 50$$

$$= 150 + 125/6$$

$$= 150 + 20.83$$

$$= 170.83$$

Here the maximum frequency is 6, then the corresponding class 150 – 200 is the modal class

$$l = 150, h = 200 - 150 = 50, f = 6, f_1 = 5, f_2 = 5$$

$$\begin{aligned} \text{Mode} &= l + \frac{f - f_1}{2f - f_1 - f_2} \times h \\ &= 150 + \frac{6 - 5}{2 \times 6 - 5 - 5} \times 50 \\ &= 150 + 50/2 \\ &= 150 + 25 \\ &= 175 \end{aligned}$$

**12. A student noted the number of cars pass through a spot on a road for 100 periods each of 3 minutes and summarized it in the table given below. Find the mode of the data.**

**Soln:** From the given data we may observe that maximum class frequency is 20 belonging to 40 – 50 class intervals.

So, modal class = 40 – 50

Lower limit (l) of modal class = 40

Frequency (f) of modal class = 20

Frequency (f<sub>1</sub>) of class preceding modal class = 12

Frequency (f<sub>2</sub>) of class succeeding modal class = 11

Class size = 10

$$\begin{aligned} \text{Mode} &= l + \frac{f - f_1}{2f - f_1 - f_2} \times h \\ &= 40 + \frac{20 - 12}{2(20) - 12 - 11} \times 10 \\ &= 40 + \frac{80}{40 - 23} \\ &= 40 + 80/17 \\ &= 40 + 4.7 \\ &= 44.7 \end{aligned}$$

So mode of this data is 44.7 cars

13. The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality. Find the median, mean and mode of the data and compare them.

<b>Monthly consumption:</b>	<b>65-85</b> <b>145-165</b>	<b>85-105</b> <b>165-185</b>	<b>105-125</b> <b>8</b>	<b>125-145</b> <b>185-205</b>
<b>No of consumers:</b>	<b>4</b> <b>20</b>	<b>5</b> <b>14</b>	<b>13</b> <b>8</b>	<b>4</b>

**Soln:**

Class interval	Mid value $x_i$	Frequency $f_i$	$Fx$	Cumulative frequency
65 – 85	75	4	300	4
85 – 105	95	5	475	9
105 – 125	115	13	1495	22
125 – 145	135	20	2700	42
145 – 165	155	14	2170	56
165 – 185	175	8	1400	64
185 – 205	195	4	780	68
		$N = 68$		$\Sigma fx \Sigma fx = 9320$

$$\text{Mean} = \frac{\Sigma fx}{N} = \frac{9320}{68} = 137.05$$

We have,  $N = 68$

$$N/2 = 68/2 = 34$$

The cumulative frequency just greater than  $N/2$  is 42 then the median class is 125 – 145 such that

$$l = 125, h = 145 - 125 = 20, f = 20, F = 22$$



$$\begin{aligned} \text{Median} &= l + \frac{N_2 - F}{f} \times h \\ &= 125 + \frac{34 - 22}{20} \times 20 \\ &= 125 + 12 \\ &= 137 \end{aligned}$$

Here the maximum frequency is 20, then the corresponding class 125 – 145 is the modal class

$$l = 125, h = 145 - 125 = 20, f = 20, f_1 = 13, f_2 = 14$$

$$\begin{aligned} \text{Mode} &= l + \frac{f - f_1}{2f - f_1 - f_2} \times h \\ &= 125 + \frac{20 - 13}{2(20) - 13 - 14} \times 20 \\ &= 125 + 140/13 \\ &= 135.77 \end{aligned}$$

**14.100 surnames were randomly picked up from a local telephone directly and the frequency distribution of the number of letter English alphabets in the surnames was obtained as follows:**

<b>Number of letters:</b>	<b>1-4</b>	<b>4-7</b>	<b>7-10</b>	<b>10-13</b>	<b>13-16</b>
<b>Number surnames:</b>	<b>6</b>	<b>30</b>	<b>40</b>	<b>16</b>	

**Determine the median number of letters in the surnames. Find the mean number of letters in the surnames. Also, find the modal size of the surnames.**

**Soln:**

Class interval	Mid value (x)	Frequency (f)	fx	Cumulative frequency
1 – 4	2.5	6	15	6
4 – 7	5.5	30	165	36
7 – 10	8.5	40	340	76
10 – 13	11.5	16	184	92
13 – 16	14.5	4	58	96

16 – 19	17.5	4	70	100
		N = 100	$\Sigma fx \Sigma fx = 832$	

$$\text{Mean} = \frac{\Sigma fx}{N} = \frac{832}{100} = 8.32$$

We have,

$$N = 100$$

$$N/2 = 100/2 = 50$$

The cumulative frequency just greater than  $N/2$  is 76, then the median class is 7 – 10 such that

$$l = 7, h = 10 - 7 = 3, f = 40, F = 36$$

$$\text{Median} = l + \frac{N/2 - F}{f} \times h$$

$$= 7 + \frac{50 - 36}{40} \times 3$$

$$= 7 + 52/40$$

$$= 7 + 1.05$$

$$= 8.05$$

Here the maximum frequency is 40, then the corresponding class 7 – 10 is the modal class

$$l = 7, h = 10 - 7 = 3, f = 40, f_1 = 30, f_2 = 16$$

$$\text{Mode} = l + \frac{f - f_1}{2f - f_1 - f_2} \times h$$

$$= 7 + \frac{40 - 30}{2 \times 40 - 30 - 16} \times 3$$

$$= 7 + 30/34$$

$$= 7 + 0.88$$

$$= 7.88$$

**15. Find the mean, median and mode of the following data:**

Class	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120	120 – 140
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Frequency	6	8	10	12	6	5	3
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**Soln:**

Class interval	Mid value (x)	Frequency (f)	fx	Cumulative frequency
0 – 20	10	6	60	6
20 – 40	30	8	240	17
40 – 60	50	10	500	24
60 – 80	70	12	840	36
80 – 100	90	6	540	42
100 – 120	110	5	550	47
120 – 140	130	3	390	50
		N = 50	$\Sigma fx = \Sigma fx = 3120$	

$$\text{Mean} = \frac{\Sigma fx}{N} = \frac{3120}{50} = 62.4$$

We have,

$$N = 50$$

$$\text{Then, } N/2 = 50/2 = 25$$

The cumulative frequency just greater than  $N/2$  is 36, then the median class is 60 – 80 such that

$$l = 60, h = 80 - 60 = 20, f = 12, F = 24$$

$$\text{Median} = l + \frac{\frac{N}{2} - F}{f} \times h$$

$$= 60 + \frac{25 - 24}{12} \times 20$$

$$= 60 + 20/12$$

$$= 60 + 1.67$$

$$= 61.67$$

Here the maximum frequency is 12, then the corresponding class 60 – 80 is the modal class

$$l = 60, h = 80 - 60 = 20, f = 12, f_1 = 10, f_2 = 6$$

$$\begin{aligned} \text{Mode} &= l + \frac{f - f_1}{2f - f_1 - f_2} \times h \\ &= 60 + \frac{12 - 10}{2 \times 12 - 10 - 6} \times 20 \\ &= 60 + 40/8 \\ &= 65 \end{aligned}$$

**16. The following data gives the distribution of total monthly household expenditure of 200 families of a village. Find the modal monthly expenditure of the families. Also, find the mean monthly expenditure:**

Expenditure	Frequency	Expenditure	Frequency
1000-1500	24	3000-3500	30
1500-2000	40	3500-4000	22
2000-2500	33	4000-4500	16
2500-3000	28	4500-5000	7

**Soln:** We may observe from the given data that maximum class frequency is 40 belonging to 1500 -200 intervals

So, modal class = 1500 -2000

Lower limit (l) of modal class = 1500

Frequency (f) of modal class = 40

Frequency ( $f_1$ ) of class preceding modal class = 24

Frequency ( $f_2$ ) of class succeeding modal class = 33

Class size (h) = 500

$$\text{Mode} = l + \frac{f - f_1}{2f - f_1 - f_2} \times h$$

$$= 1500 + 40 - 242 \times 40 - 24 - 33 \times 500 + \frac{40 - 24}{2 \times 40 - 24 - 33} \times 500$$

$$= 1500 + 1680 - 57 \times 500 + \frac{16}{80 - 57} \times 500$$

$$= 1500 + 347.826$$

$$= 1847.826 \approx 1847.83$$

So modal monthly expenditure was Rs. 1847.83

Now we may find class mark as

$$\text{Class mark} = \frac{\text{upperclasslimit} + \text{lowerclasslimit}}{2}$$

Class size (h) of given data = 500

Now taking 2750 as assumed mean (a) we may calculate  $d_i$   $u_i$  as follows:

Expenditure (in Rs)	Number of families $f_i$	$x_i$	$d_i = x_i - 2750$	$U_i$	$f_i u_i$
1000-1500	24	1250	-1500	-3	-72
1500-2000	40	1750	-1000	-2	-80
2000-2500	33	2250	-500	-1	-33
2500-3000	28	2750	0	0	0
3000-3500	30	3250	500	1	30
3500-4000	22	3750	1000	2	44
4000-4500	16	4250	1500	3	48
4500-5000	7	4750	2000	4	28
Total	200				-35

Now from table may observe that

$$\sum f_i = 200$$

$$\sum f_i d_i = -35$$

$$\text{Mean } \bar{x} = a + \frac{\sum f_i d_i}{\sum f_i} \times h$$

$$\bar{x} = 2750 + \frac{-35}{200} \times 500$$

$$\bar{x} = 2750 - 87.5$$

$$\bar{x} = 2662.5$$

So mean monthly expenditure was Rs. 2662.5

**17. The given distribution shows the number of runs scored by some top batsmen of the world in one day international cricket matches.**

Runs scored	No of batsmen	Runs scored	No of batsmen
3000 – 4000	4	7000 – 8000	6
4000 – 5000	18	8000 – 9000	3
5000 – 6000	9	9000 – 10000	1
6000 – 7000	7	10000 – 11000	1

**Find the mode of the data.**

**Soln:** From the given data we may observe that maximum class frequency is 18 belonging to class interval 4000 – 5000.

So, modal class = 4000 – 5000

Lower limit (l) of modal class = 4000

Frequency (f) of modal class = 18

Frequency ( $f_1$ ) of class preceding modal class = 4

Frequency ( $f_2$ ) of class succeeding modal class = 9

Class size (h) = 1000

$$\begin{aligned} \text{Now mode} &= l + \frac{f - f_1}{2f - f_1 - f_2} \times h \\ &= 4000 + \frac{18 - 4}{2(18) - 4 - 9} \times 1000 \\ &= 4000 + (14000 / 23) \\ &= 4000 + 608.695 \\ &= 4608.695 \end{aligned}$$

So mode of given data is 4608.7 runs