CHAPTER : 13

OPEN STUDENT FOUNDATION
STD 10 : MATHS
IMPORTANT QUESTION DAY 11

Date : 27/02/24

Section A

● **Write the answer of the following questions. [Each carries 3 Marks]** **[18]**

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

Age (in years)	5 – 15	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65
Number of patients	6	11	21	23	14	5

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

2. 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	100 – 120
Frequency	10	35	52	61	38	29

Determine the modal lifetimes of the components.

3. 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 (in ₹)	Number of families
1000 – 1500	24
1500 – 2000	40
2000 – 2500	33
2500 – 3000	28
3000 – 3500	30
3500 – 4000	22
4000 – 4500	16
4500 – 5000	7

4. The following distribution gives the state-wise teacher-student 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.
15 – 20	3
20 – 25	8
25 – 30	9
30 – 35	10
35 – 40	3
40 – 45	0
45 – 50	0
50 – 55	2

5. A student noted the number of cars passing through a spot on a road for 100 periods each of 3 minutes and summarised it in the table given below. Find the mode of the data :

Number of cars	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Frequency	7	14	13	12	20	11	15	8

6. 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

Section B

● **Write the answer of the following questions. [Each carries 4 Marks]** **[40]**

7. A survey was conducted by a group of students as a part of their environment awareness programme, in which they collected the following data regarding the number of plants in 20 houses in a locality. Find the mean number of plants per house.

Number of plants	0 – 2	2 – 4	4 – 6	6 – 8	8 – 10	10 – 12	12 – 14
Number of houses	1	2	1	5	6	2	3

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

8. The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is ₹ 18. Find the missing frequency f.

Daily pocket allowance (in ₹)	11 – 13	13 – 15	15 – 17	17 – 19	19 – 21	21 – 23	23 – 25
Number of children	7	6	9	13	f	5	4

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

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

Find the mean number of mangoes kept in a packing box. Which method of finding the mean did you choose ?

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

Daily expenditure (in ₹)	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350
Number of households	4	5	12	2	2

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

11. 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	6 – 10	10 – 14	14 – 20	20 – 28	28 – 38	38 – 40
Number of students	11	10	7	4	4	3	1

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

Runs scored	Number of batsmen
3000 – 4000	4
4000 – 5000	18
5000 – 6000	9
6000 – 7000	7
7000 – 8000	6
8000 – 9000	3
9000 –10000	1
10000 –11000	1

Find mode of the data.

13. If the median of the distribution given below is 28.5. Find the values of x and y.

Class interval	Frequency
0 – 10	5
10 – 20	x
20 – 30	20
30 – 40	15
40 – 50	y
50 – 60	5
Total	60

14. A life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are given only to persons having age 18 years onwards but less than 60 year.

Age (in years)	Number of policy holders
Below 20	2
Below 25	6
Below 30	24
Below 35	45
Below 40	78
Below 45	89
Below 50	92
Below 55	98
Below 60	100

15. The following table gives the distribution of the life time of 400 neon lamps :

Life time (in hours)	Number of lamps
1500 – 2000	14
2000 – 2500	56
2500 – 3000	60
3000 – 3500	86
3500 – 4000	74
4000 – 4500	62
4500 – 5000	48

Find the median life time of a lamp.

16. The distribution below gives the weights of 30 students of a class. Find the median weight of the students.

Weight (in kg)	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65	65 – 70	70 – 75
Number of students	2	3	8	6	6	3	2

Section A

● **Write the answer of the following questions. [Each carries 3 Marks]** **[18]**

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

Age (in years)	5 – 15	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65
Number of patients	6	11	21	23	14	5

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

➤ Mode : The maximum frequency is 23 of the class 35 – 45

∴ Mode : The maximum Frequency is 23 of the class 35 – 45.

Modal class = 35 – 45

lower limit of modal class l = 35

The frequency of modal class f_1 = 23

The frequency of the class preceding the modal class f_0 = 21.

The frequency of the class succeeding the modal class f_2 = 14

The class size h = 10

➤ $\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$

$= 35 + \left[\frac{23 - 21}{2 \times 23 - 21 - 14}\right] \times 10$

$= 35 + \left[\frac{2}{46 - 35}\right] \times 10$

$= 35 + \frac{2}{11} \times 10$

$= 35 + \frac{20}{11}$

$= 35 + 1.8$

$= 36.8$ year

So, the mode is 36.8 years.

➤ We find the mean by the method of assumed mean.

Age (in years)	Number of patients (f_i)	Mid-point (x_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
5–15	6	10	–3	–18
15–25	11	20	–2	–22
25–35	21	30	–1	–21
35–45	23	40 = a	0	0
45–55	14	50	1	14
55–56	5	60	2	10
Total	$\Sigma f_i = 80$	–	–	$\Sigma f_i u_i = -37$

➤ Mean $\bar{x} = a + h\left[\frac{\Sigma f_i u_i}{\Sigma f_i}\right]$

$= 40 + 10\left[\frac{-37}{80}\right]$

$= 40 - \frac{37}{8}$

$= \frac{320 - 37}{8}$

$= \frac{283}{8}$

$\therefore \bar{x} = 35.375$

➤ Therefore, the age of the maximum patients admitted in a hospital is 36.8 years.

The mean age of the patients is 35.37 years.

2. 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	100 – 120
Frequency	10	35	52	61	38	29

Determine the modal lifetimes of the components.

➤ Here maximum frequency is 61 in the interval 60 – 80. So the modal class is 60 – 80.

The lower limit of the modal class $l = 60$

The frequency of the modal class $f_1 = 61$

The frequency of the class preceding the modal class $f_0 = 52$.

The frequency of the class succeeding the modal class $f_2 = 38$

The class size $h = 20$

➤ Mode $= l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$

$= 60 + \left[\frac{61 - 52}{2 \times 61 - 52 - 38}\right] \times 20$

$= 60 + \frac{9}{32} \times 20$

$= 60 + \frac{45}{8}$

$= 60 + 5.625$

$= 65.625$

Therefore, the modal lifetimes of the components is 65.625 hour.

3. 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 (in ₹)	Number of families
1000 – 1500	24
1500 – 2000	40
2000 – 2500	33
2500 – 3000	28
3000 – 3500	30
3500 – 4000	22
4000 – 4500	16
4500 – 5000	7

➤ Here, the maximum frequency is 40 in the interal 1500 – 2000

$\therefore$ The modal class = 1500 – 2000.

➤ The lower limit of the modal class l = 1500

The frequency of the modal class f_1 = 40

The frequency of the class preceding the modal class f_0 = 24

The frequency of the class succeeding the modal class f_2 = 33

The class size h = 500

➤ mode $= l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$

$= 1500 + \left[\frac{40 - 24}{2 \times 40 - 24 - 33}\right] \times 500$

$= 1500 + \left[\frac{16}{80 - 57}\right] \times 500$

$= 1500 + \frac{8000}{23} = 1500 + 347.83$

$= 1847.83$

Therefore, the modal monthly expenditure of the families is ₹ 1847.83.

➤ Mean :

Expenditure (in ₹)	Number of families (f_i)	Mid point (x_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
1000 – 1500	24	1250	–4	–96
1500 – 2000	40	1730	–3	–120
2000 – 2500	33	2500	–2	–66
2500 – 3000	28	2750	–1	–28
3000 – 3500	30	3250 = a	0	0
3500 – 4000	22	3750	1	22
4000 – 4500	16	4250	2	32
4500 – 5000	7	4750	3	21
	Σf_i = 200			$\Sigma f_i u_i$ = –235

Mean $\bar{x} = a + h\left[\frac{\Sigma f_i u_i}{\Sigma f_i}\right]$

$= 3250 + 500 \times \left[\frac{-235}{200}\right]$

$= 3250 - \frac{117500}{200}$

$= 3250 - \frac{1175}{2}$

$= 3250 - 587.50$

$\therefore \bar{x} = 2662.5$

Therefore, the mean monthly expenditure is ₹ 2662.50.

4. The following distribution gives the state-wise teacher-student 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.
15 – 20	3
20 – 25	8
25 – 30	9
30 – 35	10
35 – 40	3
40 – 45	0
45 – 50	0
50 – 55	2

➤ Here, the maximum frequency is 10 in the interval 30 – 35

$\therefore$ The model class = 30 – 35.

➤ The lower limit of the modal class l = 30

The frequency of the modal class f_1 = 10

The frequency of the class preceding the modal class f_0 = 9

The frequency of the class succeeding the modal class f_2 = 3

The class size h = 5

$$\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$= 30 + \left[\frac{10 - 9}{20 - 9 - 3}\right] \times 5$$

$$= 30 + \left[\frac{1}{8}\right] \times 5$$

$$= 30 + \frac{5}{8}$$

$$= 30 + 0.625$$

$$= 30.6 \text{ (Approximate)}$$

➤ Mean :

We find mean by the step – deviation method

Number of students per teacher	Number of states / U.T. (f_i)	Mid point (x_i)	$u_i = \frac{x_i - a}{h}$	$\Sigma f_i u_i$
15 – 20	3	17.5	–4	–12
20 – 25	8	22.5	–3	–24
25 – 30	9	27.5	–2	–18
30 – 35	10	32.5	–1	–10
35 – 40	3	37.5 = a	0	0
40 – 45	0	42.5	1	0
45 – 50	0	47.5	2	0
50 – 55	2	52.5	3	6
Total	$\Sigma f_i = 35$			$\Sigma f_i u_i = 58$

➤ Mean $\bar{x} = a + h\left[\frac{\Sigma f_i u_i}{\Sigma f_i}\right]$

$$= 37.5 + 5 \times \left[\frac{-58}{35}\right]$$

$$= 37.5 + \left[\frac{-290}{35}\right]$$

$$= 37.5 + [-8.3]$$

$$= 37.5 - 8.3$$

$\therefore$ Mean $\bar{x} = 29.2$

Therefore, the mode of given data is 30.6 and its mean is 29.2

$\therefore$ The maximum states / U. T. have teacher - student ratio is 30.6 and the mean of this ratio is 29.2.

5. A student noted the number of cars passing through a spot on a road for 100 periods each of 3 minutes and summarised it in the table given below. Find the mode of the data :

Number of cars	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Frequency	7	14	13	12	20	11	15	8

➤ Here the maximum frequency is 20 in the interval 40 – 50.

$\therefore$ The modal class = 40-50

➤ The lower limit of the modal class $l = 40$

The frequency of the modal class $f_i = 20$

The frequency of the class preceding the modal class $f_0 = 12$

The frequency of the class succeeding the modal class $f_2 = 11$

The class size $h = 10$

$$\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

$$= 40 + \left[\frac{20 - 12}{2 \times 20 - 12 - 11}\right] \times 10$$

$$= 40 + \frac{80}{17}$$

$$= 40 + 4.7$$

$$= 44.7$$

$$= 44.7$$

Therefore, the mode of the given data is 44.7 cars.

6. 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

➤

Literacy rate (in %)	**Number cities (f_i)**	**Mid point (x_i)**	$u_i = \frac{x_i - A}{h}$	$f_i u_i$
45–55	3	50	–2	–6
55–65	10	60	–1	–10
65–75	11	70 = a	0	0
75–85	8	80	1	8
85–95	3	90	2	6
Total	$\Sigma f_i = 35$			$\Sigma f_i u_i = -2$

$$\text{Mean } \bar{x} = a + h\left[\frac{\Sigma f_i u_i}{\Sigma f_i}\right]$$

$$= 70 + 10\left[\frac{-2}{35}\right]$$

$$= 70 + \frac{-4}{7}$$

$$= \frac{486}{7}$$

$$= 69.4285$$

$\therefore \bar{x} = 69.43\%$ (Approximate)

Therefore, the mean literacy rate is 69.43% (Approximate).

Section B

● **Write the answer of the following questions.** [Each carries 4 Marks] **[40]**

7. A survey was conducted by a group of students as a part of their environment awareness programme, in which they collected the following data regarding the number of plants in 20 houses in a locality. Find the mean number of plants per house.

Number of plants	0 – 2	2 – 4	4 – 6	6 – 8	8 – 10	10 – 12	12 – 14
Number of houses	1	2	1	5	6	2	3

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

➤

Number of plants	**Number of houses (f_i)**	**Midpoint x_i**	f_ix_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	$\Sigma f_i = 20$	–	$\Sigma f_ix_i = 162$

Mean $\bar{x} = \frac{\Sigma f_i x_i}{n(\Sigma f_i)} = \frac{162}{20} = 8.1$

Therefore, the number of plants per house is 8.1

We use direct method to find mean because the numerical value of x_i and f_i are very small.

8. The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is ₹ 18. Find the missing frequency f.

Daily pocket allowance (in ₹)	11 – 13	13 – 15	15 – 17	17 – 19	19 – 21	21 – 23	23 – 25
Number of children	7	6	9	13	f	5	4

➤

Daily pocket allowance (in ₹)	**Number of children (f_i)**	**Midpoint (x_i)**	f_ix_i
11 – 13	7	12	84
13 – 15	6	14	84
15 – 17	9	16	144
17 – 19	13	18	234
19 – 21	f	20	$20f$
21 – 23	5	22	110
23 – 25	4	24	96
Total	$\Sigma f_i = 44 + f$	–	$\Sigma f_ix_i = 752 + 20f$

$$\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$$

$$\therefore\ 18 = \frac{752 + 20f}{44 + f}$$

$$\therefore\ 18\ (44 + f) = 752 + 20f$$

$$\therefore\ 792 + 18f = 752 + 20f$$

$\therefore\ 792 - 752 = 20f - 18f$

$\therefore\ 40 = 2f$

$\therefore\ 2f = 40$

$\therefore\ f = 20$

Here, the missing frequency is 20.

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

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

Find the mean number of mangoes kept in a packing box. Which method of finding the mean did you choose ?

➤

Number of mangoes	**Number of Boxes (f_i)**	**Mid-point (x_i)**	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
50–52	15	51	–2	– 30
53–55	110	54	–1	– 110
56–58	135	$57 = a$	0	0
59–61	115	60	1	115
62–64	25	63	2	50
Total	$\Sigma f_i = 400$			$\Sigma f_i u_i = 25$

➤ Mean $\bar{x} = a + h\left[\frac{\Sigma f_i u_i}{\Sigma f_i}\right]$

$= 57 + 3 \times \frac{25}{400}$

$= 57 + \frac{3}{16}$

$= \frac{912 + 3}{16}$

$= \frac{915}{16}$

$= 57.1875$

$= 57.19$ (Approximate)

$\therefore\ \bar{x} = 57.19$ (Approximate)

Therefore, the mean number of mangoes kept in packing box is 57.19

We choose step deviation method to find the mean.

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

Daily expenditure (in ₹)	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350
Number of households	4	5	12	2	2

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

➤

Daily expenditure (in ₹)	**Frequency (f_i)**	**Mid-point (x_i)**	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
100 – 150	4	125	–2	–8
150 – 200	5	175	–1	–5
200 – 250	12	225 = a	0	0
250 – 300	2	275	1	2
300 – 350	2	325	2	4
Total	$\Sigma f_i = 25$			$\Sigma f_i u_i = -7$

$$\bar{x} = a + h\left[\frac{\Sigma f_i u_i}{\Sigma f_i}\right]$$

$$= 225 + 50\left[\frac{-7}{25}\right]$$

$$= 225 + 50 \times \frac{-7}{25}$$

$$= 225 + (-14)$$

$$= 225 - 14$$

$\therefore \bar{x} = 211$

Therefore, the mean daily expenditure on food is ₹ 211.

11. 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	6 – 10	10 – 14	14 – 20	20 – 28	28 – 38	38 – 40
Number of students	11	10	7	4	4	3	1

➤

Number of days class	**Number of students (f_i)**	**Midpoint (x_i)**	$f_i x_i$
0 – 6	11	3	33
6 – 10	10	8	80
10 – 14	7	12	84
14 – 20	4	17	68
20 – 28	4	24	96
28 – 38	3	33	99
38 – 40	1	39	39
Total	$\Sigma f_i = 40$		$\Sigma f_i d_i = 499$

Mean $\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$

$= \frac{499}{40}$

$\therefore$ = 12.47 (Approximate)

Therefore, the mean number of days a student absent is 12.47 (approximate)

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

Runs scored	Number of batsmen
3000 – 4000	4
4000 – 5000	18
5000 – 6000	9
6000 – 7000	7
7000 – 8000	6
8000 – 9000	3
9000 – 10000	1
10000 – 11000	1

Find mode of the data.

➤ Here, the maximum frequency is 18 in the interval 4000 – 5000.

$\therefore$ The modal class = 4000 – 5000.

➤ The lower limit of the modal class l = 4000

The frequency of the modal class f_1 = 18

The frequency of the class preceding the modal class f_0 = 4

The frequency of the class succeeding the modal class f_2 = 9

The class size h = 1000

$$\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right]$$

$$= 4000 + \left[\frac{18 - 4}{36 - 4 - 9}\right] \times 1000$$

$$= 4000 + \left[\frac{14}{23}\right] \times 1000$$

$$= 4000 + 608.695$$

= 4608.7 (Approximate)

Therefore, the mode of the given data is 4608.7 runs (Approximate).

13. If the median of the distribution given below is 28.5. Find the values of x and y.

Class interval	Frequency
0 – 10	5
10 – 20	x
20 – 30	20
30 – 40	15
40 – 50	y
50 – 60	5
Total	60

➤

Class interval	Frequency (f_i)	Cumulative frequency (cf)
0 – 10	5	5
10 – 20	x	$5 + x$
20 – 30	20	$25 + x$
30 – 40	15	$40 + x$
40 – 50	y	$40 + x + y$
50 – 60	5	$45 + x + y$
Total	$\mathbf{45 + x + y = 60}$	

➤ We have $n = 60$ $[\because \Sigma f_i = 60]$

$\therefore 45 + x + y = 60$

$\therefore x + y = 60 - 45$

$\therefore x + y = 15$ ....(i)

➤ It is given that median is 28.5.

$\therefore$ The median class is 20 – 30.

➤ $n = 60 \therefore \frac{n}{2} = \frac{60}{2} = 30$

➤ Lower limit of the median class $l = 20$

Number of observation $n = 60$

The cumulative frequency of the class preceding the median class cf = $5 + x$

Frequency of the median class $f = 20$

Class size $h = 10$

➤ Median = $l + \frac{\frac{n}{2} - cf}{f} \times h$

$\therefore 28.5 = 20 + \frac{30 - (5 + x)}{20} \times 10$

$\therefore 28.5 - 20 = \frac{30 - 5 - x}{20} \times 10$

$\therefore 8.5 = \frac{25 - x}{2}$

$\therefore 25 - x = 17$

$\therefore x = 25 - 17 = 8$

From (i) $x + y = 15$ and $x = 8$

$\therefore 8 + y = 15 \Rightarrow y = 7$

Therefore the values of x and y are 8 and 7 respectively.

14. A life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are given only to persons having age 18 years onwards but less than 60 year.

Age (in years)	Number of policy holders
Below 20	2
Below 25	6
Below 30	24
Below 35	45
Below 40	78
Below 45	89
Below 50	92
Below 55	98
Below 60	100

➤ The given distribution is of less than type. So convert it into frequency distribution with cumulative frequency.

➤ There are 2 policy holders with age less than 20 years. So the frequency of the class 15 – 20 is 2

➤ There are 6 policy holders with age less than 25. So the number of policy holder in the interval 20 – 25 = The number of policy holders with age less than 25 – the number of policy holders with age less than 20 = 6 – 2 = 4.

➤ Similarly, we find the frequency for other class and get the following frequency distribution.

Age(in years) Class interval	**The number of policy holders frequency (f_i)**	**Cumulative frequency (cf)**
15 – 20	2	2
20 – 25	4	6
25 – 30	18	24
30 – 35	21	45
35 – 40	33	78
40 – 45	11	89
45 – 50	3	92
59 – 55	6	98
55 – 60	2	100
Total	$n = 100$	

➤ Here $n = 100 \Rightarrow \frac{n}{2} = \frac{100}{2} = 50$

➤ The cumulative frequency greater than 50 is 78 which lies in the interval 35 – 40.

$\therefore$ The median class is 35 – 40

➤ The lower limit of the median class is $l = 35$

Number of observations $n = 100$

The cumulative frequency of the class preceding the median class $cf = 45$

The frequency of the median class $f = 33$

Class size $h = 5$

➤ Median $= l + \frac{\frac{n}{2} - cf}{f} \times h$

$$= 35 + \frac{50 - 45}{33} \times 5$$

$$= 35 + \frac{5}{33} \times 5$$

$$= 35 + 0.7575$$

$$= 35 + 0.76 = 35.76$$

Therefore, the median age of policy holders is 35.76 year.

15. The following table gives the distribution of the life time of 400 neon lamps :

Life time (in hours)	Number of lamps
1500 – 2000	14
2000 – 2500	56
2500 – 3000	60
3000 – 3500	86
3500 – 4000	74
4000 – 4500	62
4500 – 5000	48

Find the median life time of a lamp.

➤ We find cumulative frequency at first.

Life time (in hours)	**Number of lamps (f_i)**	**Cumulative frequency. (cf)**
1500 – 2000	14	14
2000 – 2500	56	70
2500 – 3000	60	130
3000 – 3500	86	216
3500 – 4000	74	290
4000 – 4500	62	352
4500 – 5000	48	400
Total	$n = 400$	

➤ Here, $n = 400$ $\therefore$ $\frac{n}{2} = \frac{400}{2} = 200$

➤ The cumulative frequency just greater than 200 is 216 which lies in the interval 3000 – 3500

The median class = 3000 – 3500

➤ Lower limit of the median class $l = 3000$

Number of observations $n = 400$

The cumulative frequency of the class preceding the median class $cf = 130$

Frequency of the median class $f = 86$

Class size $h = 500$

$$\text{Median} = l + \frac{\frac{n}{2} - cf}{f} \times h$$

$$= 3000 + \left[\frac{200 - 130}{86}\right] \times 500$$

$$= 3000 + \frac{70}{86} \times 500$$

$$= 3000 + \frac{35000}{86}$$

$$= 3000 + 406.98$$

$$= 3406.98$$

Therefore median life time of the lamp is 3406.98 hours.

16. The distribution below gives the weights of 30 students of a class. Find the median weight of the students.

Weight (in kg)	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65	65 – 70	70 – 75
Number of students	2	3	8	6	6	3	2

➤ At first we find the cumulative frequency.

Weight (in kg)	**Number of students (f_i)**	**Cumulative frequency (cf)**
40 – 45	2	2
45 – 50	3	5
50 – 55	8	13
55 – 60	6	19
60 – 65	6	25
65 – 70	3	28
70 – 75	2	30
Total	$\Sigma f_i = 30 = n$	

➤ Here, $n = 30 \Rightarrow \frac{n}{2} = \frac{30}{2} = 15$

➤ The cumulative frequency just greater than 15 is 19 which lies in the interval 55 – 60

$\therefore$ The median class is 55 – 60

➤ Lower limit of the median class $l = 55$

Number of observations $n = 30$

The cumulative frequency of the class preceding the median class $cf = 13$.

The frequency of the median class $f = 6$

Class size $h = 5$

$$\text{Median} = l + \frac{\frac{n}{2} - cf}{f} \times h$$

$$= 55 + \left[\frac{15 - 13}{6}\right] \times 5$$

$$= 55 + \frac{2}{6} \times 5$$

$$= 55 + \frac{10}{6} = 55 + 1.67$$

$\therefore$ Median = 56.67 kg.

Therefore, the median weight of the student is 56.67 kg.