<u>Chapter 14 – Statistics</u> <u>Exercise – 14.1</u>

Question 1: 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.

No. of plants	No. of houses
0 – 2	1
2 – 4	2
4 – 6	1
6 – 8	5
8 – 10	6
10 – 12	2
12 – 14	. 3

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

Answer:

Number of plants	Class mark (x_i)	Number of houses	$f_i x_i$
		(f_i)	
0 – 2	1	1	01
2 – 4	3	2	06
4 - 6	5	1	05
6 – 8	7	5	35
8 – 10	9	6	54
10 – 12	11	2	22
12 – 14	13	3	39
Total		$\sum f_i = 20$	$\sum f_i x_i = 162$

We have, Mean $(\bar{x}) = \frac{\sum f_i x_i}{\sum f_i} = \frac{162}{20} = 8.1$ We need to plant 8.1 plants per house.

Daily wages (in ₹)	No. of workers
100 - 120	12
120 – 140	14
140 – 160	8
160 – 180	6
180 - 200	10

Question 2: Consider the following distribution of daily wages of 50 workers of a factory.

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

Answer: Step-deviation method is needed here as the data is large. Here, a = 150 and h = 20.

Class Interval	Frequency (f_i)	Class marks	$u_i = \frac{x_i - a}{b}$	$f_i u_i$
		(x_i)	n	
			$=\frac{x_i-150}{20}$	
100 – 120	12	110	-2	-24
120 – 140	14	130	-1	-14
140 – 160	8	150 = a	0	0
160 – 180	6	170	1	6
180 – 200	10	190	2	20
	$\sum f_i = 50$			$\sum f_i u_i = -12$

We have, Mean $(\bar{x}) = a + h\left(\frac{\sum f_i u_i}{\sum f_i}\right)$ = 150 + 20 $\left(\frac{-12}{50}\right)$ = 150 - $\frac{240}{50}$ = $\frac{750-24}{5}$ = 145.20

Hence, mean daily wages of the workers are Rs. 145.20

Question 3: 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	No. of
allowances	children
(in ₹)	
11 – 13	7
13 – 15	6
15 – 17	9
17 – 19	13
19 – 21	f
21 – 23	5
23 – 25	4

Answer:

Daily pocket allowance	Class marks (x_i)	Number of children (f_i)	$d_i = x_i - 18$	$f_i d_i$
(in Rs.)				
11 – 13	12	7	-6	-42
13 – 15	14	6	-4	-24
15 – 17	16	9	-2	-18
17 – 19	18 = a	13	0	0
19 – 21	20	F	2	2f
21 – 23	22	5	4	20
23 – 25	24	4	6	24
Total		$\sum f_i = 44 + f$		$\sum f_i d_i = 2f - 40$

We have, mean =
$$a + \frac{\sum f_i d_i}{\sum f_i}$$

or, 18 = 18 + $\frac{2f - 40}{44 + f}$
or, 0 = $\frac{2f - 40}{44 + f}$
or, 0 = 2f - 40
or, f = 20

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

method

Number of heart	No. of women
beats per minute	
65 - 68	2
68 – 71	4
71 – 74	3
74 – 77	8
77 – 80	7
80 - 83	4
83 - 86	2

Answer:

Class Interval	Frequency (f_i)	Class Marks (x_i)	$f_i x_i$
65 – 68	2	66.5	133
68 – 71	4	69.5	278
71 – 74	3	72.5	217.5
74 – 77	8	75.5	604
77 – 80	7	78.5	549.5
80 – 83	4	81.5	326
83 – 86	2	84.5	169
	$\sum f_i = 30$		$\sum f_i x_i = 2277$

Therefore, mean of the data = $\frac{\sum f_i x_i}{\sum f_i} = \frac{2277}{30} = 75.9$

Question 5: 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.

No. of mangoes	No. of boxes
50 - 52	15
53 – 55	110
56 - 58	135
59 – 61	115
62 - 64	25

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

Answer: Here, h = 3

Number of mangoes	Class Marks (x_i)	Number of boxes (f_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
			$=\frac{x_i-57}{3}$	
50 – 52	51	15	-2	-30
53 – 55	54	110	-1	-110
56 – 58	57 = a	135	0	0
59 – 61	60	115	1	115
62 – 64	63	25	2	50
Total		$\sum f_i = 400$		$\sum f_i u_i = 25$

We have, mean = a + $h\left(\frac{\sum f_i u_i}{\sum f_i}\right)$ = 57 + $\left(\frac{25 \times 3}{400}\right)$ = 57 + 0.19

= 57.19 mangoes.

Question 6: The table below shows the daily expenditure on food of 25 households in a locality.

Daily expenditure	No. of
100 - 150	nousenoids
150 - 200	
200 - 250	12
250 - 300	2
300 - 350	2

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

Answer: Here, a = 225 and h = 50

Class Interval	Frequency (<i>f_i</i>)	Class Marks (x _i)	$u_i = \frac{x_i - a}{h}$ $u_i = \frac{x_i - 225}{50}$	$f_i u_i$
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
	$\sum f_i = 25$			$\sum f_i u_i = -7$

Therefore, Mean
$$(\bar{x}) = a + h\left(\frac{\sum f_i u_i}{\sum f_i}\right)$$

= 225 + 50 $\left(\frac{-7}{25}\right)$
= 225 - 14
= 211

Hence, the mean daily expenditure on food is Rs. 211

Question 7: To find out the concentration of SO2 in the air (in parts per million, i.e. ppm), the data was collected for 30 localities in a certain city and is presented below:

Concentration of SO_2 (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_2 in the air.

Answer: Here, h = 0.04

Concentration of SO_2	Class marks (x_i)	Frequency (f_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
			$u_i = \frac{x_i - 0.10}{0.04}$	
0.00 - 0.04	0.02	4	-2	-8
0.04 - 0.08	0.06	9	-1	-9
0.08 – 0.12	0.10 = a	9	0	0
0.12 – 0.16	0.14	2	1	2
0.16 – 0.20	0.18	4	2	8
0.20 - 0.24	0.22	2	3	6
		$\sum f_i = 30$		$\sum f_i u_i = -1$

We have, Mean = a +
$$h\left(\frac{\sum f_i u_i}{\sum f_i}\right)$$

= 0.10 + $\frac{(-1) \times 0.04}{30}$
= 0.10 + 0.001
= 0.099 ppm

Question 8 : 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.

No. of days	No. of students
0-6	11
6 – 10	10
10 – 14	7
14 – 20	4
20 – 28	4
28 – 38	3
38 – 40	1

Answer:

Class interval	Frequency (f_i)	Class marks (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
	$\sum f_i = 40$		$\sum f_i x_i = 499$

Therefore, mean of the number of days = $\frac{\sum f_i x_i}{\sum f_i} = \frac{499}{40} = 12.48$ days.

Question 9: The following table gives the literacy rate (in percentage) of 35 cities. Find the mean literacy rate.

Literacy rate (in %)	No. of cities
45 – 55	3
55 – 65	10
65 – 75	· 11
75 – 85	8
85 – 95	3

Answer:

Literacy rate (in %)	Class marks (x_i)	Number of cities (f_i)	$u_i = \frac{x_i - a}{h}$	f _i u
			$u_i = \frac{x_i - 70}{10}$	
45 – 55	50	3	-2	-6
55 – 65	60	10	-1	-10
65 – 75	70 = a	11	0	0
75 – 85	80	8	1	8
85 – 95	90	3	2	6
		$\sum f_i = 35$		$\sum f_i u_i = -2$

Mean = a +
$$h\left(\frac{\sum f_i u_i}{\sum f_i}\right)$$

= 70 + $\frac{(-2) \times 10}{35}$
= 70 - 0.57
= 69.43%

Exercise 14.2

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

Age (in years)	No. of patients
5 - 15	6
15 – 25	11
25 - 35	21
35 – 45	23
45 – 55	14
55 – 65	5

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

Answer: For Mode:

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

Hence, maximum frequency = 23Modal class = 35 - 45 = 10

Here, I = 35 $f_1 = 23$ $f_0 = 21$ $f_2 = 12$ h = 10

Mode = I +
$$\left[\frac{f_{1-f_0}}{2f_{1-f_0-f_2}}\right]h$$

= 35 + $\left[\frac{23-21}{46-21-14}\right]10$
= 35 + $\left[\frac{2}{11}\right]10$

= 36.8 years.

For Mean,

Age (in years)	Class Mark	Number of Patients	$u_{i=}\frac{x_i-30}{10}$	$f_i u_i$
	(x_i)	(f_i)		
5 – 15	10	6	-2	-12
15 – 25	20	11	-1	-11
25 – 35	30 = a(let)	21	0	0
35 – 45	40	23	1	23
45 – 55	50	14	2	18
55 – 65	60	5	3	15
Total		$\sum f_i = 80$		$\sum f_i u_i = 43$

Here, a = 30, $\sum f_i u_i = 43$, $\sum f_i = 80$, h = 10 We have ,

Mean = $a + \frac{\sum f_i u_i}{\sum f_i} \times h = 30 + \frac{43 \times 10}{80} = 30 + 5.37 = 35.37$ years Hence, the maximum number of patients in the hospital are of the age 36.8 years. The average age of the patients admitted is 35.37 years.

Question 2: The following data gives information on the observed lifetimes (in hours) of 225 electrical components.

Life times (in hours)	Frequency
0 – 20	10
20 - 40	35
40 - 60	52
60 - 80	61
80 - 100	38
100 - 120	29

Determine the modal lifetimes of the components.

Answer: Modal class is 60 – 80, as 61 is maximum frequency.

Here, I =60, $f_m = 61$, $f_1 = 52$, $f_2 = 38$ and h = 20.

Therefore, Mode = I +
$$\left[\frac{f_m - f_1}{2f_m - f_1 - f_2}\right]h$$

= 60 + $\left[\frac{61 - 52}{122 - 52 - 38}\right]20$
= 60 + $\left(\frac{9 \times 20}{32}\right)$ = 60 + $\frac{45}{8}$
= 60 + 5.63 = 65.36 hr

Question 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

Answer: Here, maximum frequency = 40 Therefore, modal class = 1500 - 2000 and I = 1500, $f_0 = 24$, $f_1 = 40$, $f_2 = 33$

Mode = I +
$$\left[\frac{f_m - f_1}{2f_m - f_1 - f_2}\right]h$$

= 1500 + $\left[\frac{40 - 24}{80 - 24 - 33}\right]500$
= 1500 + $\left(\frac{16 \times 500}{23}\right)$ = 1500 + 347.83 = Rs. 1847.83

For Mean,

Expenditure	Class Mark	Number of	$x_i - 2750$	$f_i u_i$
(in Rupees)	(x_i)	Families	$u_{i=}$ 500	
		(f_i)		
1000 – 1500	1250	24	-3	-72
1500 – 2000	1750	40	-2	-80
2000 – 2500	2250	33	-1	-33
2500 – 3000	2750=a(let)	28	0	0
3000 - 3500	3250	30	1	30
3500 – 4000	3750	22	2	44
4000 – 4500	4250	16	3	48
4500 - 5000	4750	7	4	28
Total		$\sum f_i = 200$		$\sum f_i u_i = -35$

Here, a = 2750,
$$\sum f_i u_i = -35$$
, $\sum f_i = 200$, h = 500

We have ,

Mean =
$$a + \frac{\sum f_i u_i}{\sum f_i} \times h = 2750 + \frac{-35 \times 500}{200} = 2750 - 87.50 = Rs.2662.50$$

Question 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/UT
15 – 20	3
20 – 25	8
25 – 30	9
30 – 35	10
35 - 40	3 `
40 – 45	0
45 – 50	0
50 – 55	2

Class Interval	Frequency (f_i)	Class Marks	$x_i - a$	$f_i u_i$
		(x_i)	$u_{l=}$ h	
15 – 20	3	17.5	-3	-9
20 – 25	8	22.5	-2	-16
25 – 30	9 (<i>f</i> ₁)	27.5	-1	-9
30 – 35	10 (<i>f</i> _m)	32.5 = a	0	0
35 – 40	$3(f_2)$	37.5	1	3
40 – 45	0	42.5	2	0
45 – 50	0	47.5	3	0
50 – 55	2	52.5	4	8
	$\sum f_i = 35$			$\sum f_i u_i = -23$

Answer: Here, h = 5

Since, the maximum frequency is 10, so the modal class is (30 - 35)

Here, I = 30

$$f_m = 10$$

 $f_1 = 9$
 $f_2 = 3$
 $h = 5$
 $a = 32.5$
Mode = I + $\left[\frac{f_m - f_1}{2f_m - f_1 - f_2}\right]h$
 $= 30 + \left[\frac{10 - 9}{2 \times 10 - 9 - 3}\right] \times 500$
 $= 30 + \frac{5}{20 - 12}$
 $= 30.63$
Median = $a + \frac{\sum f_i u_i}{\sum f_i} \times h$
 $= 32.5 + \frac{-23}{35} \times 5$
 $= 29.22$

Question 5: 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 the mode of the data.

Answer:

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

Maximum frequency = 18 Therefore, Modal class = 4000 - 5000 Here, I = 4000 $f_0 = 4$ $f_1 = 18$ $f_2 = 9$ Mode = I + $\left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right]h$ = 4000 + $\left[\frac{18 - 4}{36 - 4 - 9}\right]1000$ = 4000 + $\frac{14000}{23}$ = 4000 + 608.7 = 4680.7 runs

Exercise 14.3

Question 1: 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.

Monthly consumption	65 - 85	85 - 105	105 – 125	125 - 145	145 – 165	165 – 185	185 – 205
(in units)							
No. of	4	5	13	20	14	8	4
consumers							

Answer:

Monthly	Number of	Cumulative	Class mark	$u_i \frac{x_i - a}{a}$	$f_i u_i$
consumption	consumers	frequency	(x_i)	h = h	
	(f_i)	(cf)			
65 – 85	4	4	75	-3	-12
85 – 105	5	9	95	-2	-10
105 – 125	13	22	115	-1	-13
125 – 145	20	42	135 = a	0	0
145 – 165	14	56	155	1	14
165 – 185	8	64	175	2	16
185 – 205	4	68	195	3	12
	$\sum f_i = 68$				$\sum f_i u_i = 7$

We have, Mean = a +
$$\frac{\sum f_i u_i}{\sum f_i} \times h$$

= 135 + $\frac{7}{68} \times 20$
= 135 + $\frac{35}{17}$
= 137.06 units

Here, n = 68 $\frac{n}{2} = \frac{68}{2} = 34$ Therefore, Median class = 125 - 145 Here, I = 125 n = 68 f = 20 cf = 22 h = 20 Median = I + $\left(\frac{n}{2}-cf}{f}\right)$ h = 125 + $\left(\frac{34-22}{20}\right)$ 20 = 125 + 12 units = 137 units Maximum Frequency = 20 Modal class = 125 - 145 = 20 Here, I = 125 $f_0 = 13$ $f_1 = 20$ $f_2 = 14$ Mode = I + $\left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right]h$ = 125 + $\left(\frac{20 - 13}{40 - 13 - 14}\right)20$ = 125 + $\frac{7 \times 20}{13}$ = 125 + 10.76 = 135.76 units

Mean > Median > Mode

Question 2: If the median	of the distribution	given below is	3 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	у
50 - 60	5
Total	60

Answer:

Class Interval	Frequency	Cumulative Frequency
0 – 10	5	5
10 – 20	x	5 + x(c)
20 – 30	20(f)	25 + x
30 - 40	15	40 + x

40 – 50	Υ	40 + x + y
50 - 60	5	45 + x + y
Total	n = 60	

We have 45 + x + y = 60.....(1) [Given] Since, n = 60 $\frac{n}{2} = \frac{60}{2} = 30$ Since the median lies in the class interval (20 – 30). Here, l = 20 f = 20

cf = 5 + xh = 10

Therefore, Median = I + $\left(\frac{\frac{n}{2}-cf}{f}\right)h$ Or, 28.5 = 20 + $\left(\frac{30-5-x}{20}\right)10$

Or, 28.5 = 20 + $\left(\frac{25-x}{2}\right)$

Or, 57 = 40 + 25 - x

Or,
$$25 - x = 57 - 40$$

Or, x = 25 - 17 = 8

Putting x = 8 in eq. (1) we get, 45 + 8 + y = 60or, y = 60 - 53or, y = 7

Question 3: 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

Age	Number of
(in years)	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

to persons having age 18 years onwards but less than 60 years.

Answer:

Age (in years)	Number of policy holders	Cumulative frequency
0 – 20	2	2
20 – 25	6 - 2 = 4	6
25 – 30	24 - 6 = 18	24
30 – 35	45 – 24 = 21	45
35 – 40	78 – 45 = 33	78
40 – 45	89 - 78 = 11	89
45 – 50	92 - 89 = 3	92
50 – 55	98 - 92 = 6	98
55 - 60	100 - 98 = 2	100
Total	100	

Here, $\frac{n}{2} = \frac{100}{2} = 50$ Therefore, median class = 35 - 40I = 35cf = 45

h = 5f = 33

We have, Median = I + $\binom{\frac{n}{2}-cf}{f}h$

$$= 35 + \left(\frac{50 - 45}{33}\right)5$$
$$= 35 + \frac{25}{33}$$
$$= 35 + 0.76 = 35.76$$
years

Question 4: The lengths of 40 leaves of a plant are measured correct to nearest millimetre, and the data obtained is represented in the following table:

Length (in mm)	Number of leaves
118 – 126	3
127 – 135	5
136 – 144	9
145 – 153	12
154 – 162	5
163 – 171	4
172 – 180	2

Find the median length of the leaves.

Answer:

Class interval	Frequency	Cumulative Frequency
117.5 – 126.5	3	3
126.5 – 135.5	5	8
135.5 – 144.5	9	17 (c)
144.5 – 153.5	12 (f)	29
153.5 – 162.5	5	34
162.5 – 171.5	4	38
171.5 – 180.5	2	40
	n = 40	

Here, n = 40 Hence, $\frac{n}{2} = \frac{40}{2} = 20$

Since, 12 is the maximum frequency, so the median class = 144.5 - 153.5l = 144.5cf = 17h = 9f = 12

We have, Median = I + $\binom{\frac{n}{2}-cf}{f}h$

$$= 144.5 + \left(\frac{20-17}{12}\right)9$$
$$= 144.5 + \frac{9}{4}$$
$$= 144.5 + 2.25 = 146.75 \text{ mm}$$

Hence, the median length of leaves is 146.75mm

Question 5: The following table gives the distribution of the lifetime of 400 neon lamps:

Life time	Number of
(in hours)	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 lifetime of a lamp.

Answer:

Lifetime (in hours)	Number of lamps	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	400	

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

Median class is 3000 - 3500So, f = 86 cf = 130 h = 500

We have, Median = I +
$$\left(\frac{\frac{n}{2} - cf}{f}\right)$$
h
= 3000 + $\left(\frac{200 - 130}{86}\right)$ 500
= 3000 + $\frac{35000}{86}$
= 3000 + 406.8 = 3406.98 hours

Question 6: 100 surnames were randomly picked up from a local telephone directory and the frequency distribution of the number of letters in the English

Number of	Number of
letters	surnames
1 – 4	6
4 – 7	30
7 – 10	40
10 – 13	16
13 – 16	4
16 – 19	4

alphabet in the surnames was obtained as follows:

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.

Answer: Here, h = 3

Class	Frequency	Cumulative	Class	$\frac{x_i - a}{1}$	$f_i u_i$
interval	(f_i)	Frequency	marks (x_i)	$u_{l=}$ h	
		(cf)			
1 – 4	6	6	2.5	-2	-12
4 – 7	30 (<i>f</i> ₁)	36 (c)	5.5	-1	-30
7 – 10	40 (f_m)	76	8.5 = a	0	0
10 – 13	16 (<i>f</i> ₂)	92	11.5	1	16
13 – 16	4	96	14.5	2	8
16 – 19	4	100	17.5	3	12
			n = 100		$\sum_{i=-6}^{\infty} f_i u_i$

 \therefore n = 100

$$\therefore \quad \frac{n}{2} = \frac{100}{2} = 50$$

Since 40 is the maximum frequency, so the median class is (7 - 10)

Here, l = 7, $f_m = 40$, cf = 36 and h = 3.

:. Median =
$$l + \left(\frac{\frac{n}{2} - cf}{f_m}\right) \times h$$

= $7 + \left(\frac{50 - 36}{40}\right) \times 3 = 7 + \frac{14}{40} \times 3$
= $7 + \frac{21}{20} = 7 + \frac{10.5}{10}$
= $7 + 1.05 = 8.05$
Mean = $a + \frac{\sum f_i u_i}{\sum f_i} \times h = 8.5 + \frac{(-6)}{100} \times 3$

$$= 8.5 + \frac{(-18)}{100} = 8.50 - 0.18 = 8.32$$

Now since the maximum number of letters in surnames = 40

 \therefore Modal class = 7 - 10

$$\therefore \text{ Mode } = l + \left(\frac{f_m - f_1}{2f_m - f_1 - f_2}\right) \times h$$
$$= 7 + \left(\frac{40 - 30}{80 - 30 - 16}\right) \times 3$$
$$= 7 + \frac{10}{34} \times 3 = 7 + \frac{30}{34} = 7 + 0.88$$
$$= 7.88$$

Question 7:

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

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

Answer:

Weight (in kg)	Number of Students (f_i)	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	30	

Here, $\frac{n}{2} = \frac{30}{2} = 15$ \therefore Median class = 55 - 60, So, I = 55, f = 6, cf = 13, h = 5 Median weight = $l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$ $= 55 + \left(\frac{15 - 13}{2}\right) \times 5 = 55 + \frac{55}{3}$ = 55 + 1.67 = 56.67 kg