NCERT Solutions for Maths: Chapter 14 - Statistics

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Class 10: Maths Chapter 14 solutions. Complete Class 10 Maths Chapter 14 Notes.

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Exercise 14.1

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.

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?

Answer

No. of plants (Class interval)	No. of houses (f_i)	Mid-point (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
	Sum $f_i = 20$		Sum f_ix_i = 162

Mean = $\bar{x} = \sum f_ix_i / \sum f_i = 162/20 = 8.1$

We would use direct method because the numerical value of f_i and x_i are small.

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

Daily wages (in Rs.)	100-120	120-140	140-160	160-180	180-200
Number of workers	12	14	8	6	10

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

Answer

Here, the value of mid-point (x_i) is very large, so assumed mean A = 150 and class interval is h = 20.

So, $u_i = (x_i - A)/h = u_i = (x_i - 150)/20$

Daily wages (Class interval)	Number of workers frequency (f_i)	Mid-point (x_i)	$u_i = (x_i - 150)/20$	f_iu_i
100-120	12	110	-2	-24
120-140	14	130	-1	-14
140-160	8	150	0	0
160-180	6	170	1	6

180-200	10	190	2	20
Total	Sum $f_i = 50$			Sum f_iu_i = -12

Mean = $\bar{x} = A + h\sum f_iu_i / \sum f_i = 150 + (20 \times -12/50) = 150 - 4.8 = 145.20$

Thus, mean daily wage = Rs. 145.20

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3. The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is Rs 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

Answer

Here, the value of mid-point (x_i) mean $\bar{x} = 18$

Class interval	Number of children (f_i)	Mid-point (x_i)	f_ix_i
11-13	7	12	84
13-15	6	14	84
15-17	9	16	144
17-19	13	18 = A	234

19-21	f	20	20f
21-23	5	22	110
23-25	4	24	96
Total	$f_i = 44+f$		Sum f_ix_i = 752+20f

Mean = $\bar{x} = \sum f_ix_i / \sum f_i = (752+20f)/(44+f)$

$\Rightarrow$ 18 = (752+20f)/(44+f)

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

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

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

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

$\Rightarrow$ 40 = 2f

$\Rightarrow$ f = 20

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 beats per minute	65 - 68	68 - 71	71 - 74	74 - 77	77 - 80	80 - 83	83 - 86
Number of women	2	4	3	8	7	4	2

Answer

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x_i = (Upper limit + Lower limit)/2

Class size (h) = 3

Assumed mean (A) = 75.5

Class Interval	Number of women (f_i)	Mid-point (x_i)	$u_i = (x_i - 75.5)/h$	f_iu_i
65-68	2	66.5	-3	-6
68-71	4	69.5	-2	-8
71-74	3	72.5	-1	-3
74-77	8	75.5	0	0
77-80	7	78.5	1	7
80-83	4	81.5	3	8
83-86	2	84.5	3	6
	Sum f_i= 30			Sum f_iu_i = 4

Mean = $\bar{x} = A + h\sum f_iu_i / \sum f_i = 75.5 + 3\times(4/30) = 75.5 + 4/10 = 75.5 + 0.4 = 75.9$

The mean heart beats per minute for these women is 75.9

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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.

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?

Answer

Since, the given data is not continuous so we add 0.5 to the upper limit and subtract 0.45 from the lower limit.

Here, assumed mean (A) = 57

Class size (h) = 3

Class Interval	Number of boxes (f_i)	Mid-point (x_i)	$d_i = x_i - A$	f_id_i
49.5-52.5	15	51	-6	90
52.5-55.5	110	54	-3	-330
55.5-58.5	135	57 = A	0	0
58.5-61.5	115	60	3	345
61.5-64.5	25	63	6	150
	Sum f_i = 400			Sum f_id_i = 75

Mean = $\bar{x} = A + \sum f_id_i / \sum f_i = 57 + (75/400) = 57 + 0.1875 = 57.19$

6. 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.

Answer

Here, assumed mean (A) = 225

Class Interval	Number of households (f_i)	Mid-point (x_i)	$d_i = x_i - A$	f_id_i
100-150	4	125	-100	-400
150-200	5	175	-50	-250
200-250	12	225	0	0
250-300	2	275	50	100
300-350	2	325	100	200
	Sum f_i = 25			Sum f_id_i = -350

Mean = $\bar{x} = A + \sum f_id_i / \sum f_i = 225 + (-350/25) = 225 - 14 = 211$

The mean daily expenditure on food is 211

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7. To find out the concentration of SO_2 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

Concentration of SO_2 (in ppm)	Frequency (f_i)	Mid-point (x_i)	f_ix_i
0.00-0.04	4	0.02	0.08
0.04-0.08	9	0.06	0.54
0.08-0.12	9	0.10	0.90
0.12-0.16	2	0.14	0.28
0.16-0.20	4	0.18	0.72
0.20-0.24	2	0.20	0.40
Total	Sum f_i = 30		Sum (f_ix_i) = 2.96

Mean = $\bar{x} = \sum f_i x_i / \sum f_i$

= 2.96/30 = 0.099 ppm

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.

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

Answer

Class interval	Frequency (f_i)	Mid-point (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_ix_i = 499	

Mean = $\bar{x} = \sum f_ix_i / \sum f_i$

= 499/40 = 12.48 days

9. 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	85-98
Number of cities	3	10	11	8	3

Answer

Class Interval	Frequency (f_i)	(x_i)	$d_i = x_i - a$	$u_i = d_i/h$	f_iu_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
	Sum f_i = 35				Sum f_iu_i = -2

Mean = $\bar{x} = a + (\sum f_i u_i / \sum f_i) \times h$

= 70 + (-2/35) x 10 = 69.42

Exercise 14.2

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.

Answer

Modal class = 35 – 45, l = 35, class width (h) = 10, f_m = 23, f_1 = 21 and f_2 = 14

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

$$= 35 + \left\{\frac{23 - 21}{46 - 21 - 14}\right\} \times 10$$

$$= 35 + \frac{20}{11} = 35 + 1.8 = 36.8 \text{ yr}$$

Calculation of Mean:

Class Interval	Frequency (f_i)	Mid-point (x_i)	f_ix_i
5-15	6	10	60
15-25	11	20	220
25-35	21	30	630
35-45	23	40	920
45-55	14	50	700
55-65	5	60	300
	Sum f_i = 80		Sum f_ix_i = 2830

Mean = $\bar{x} = \sum f_ix_i / \sum f_i$

= 2830/80 = 35.37 yr

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

Lifetime (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.

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Answer

Modal class of the given data is 60–80.

Modal class = 60-80, l = 60, f_m = 61, f_1 = 52, f_2 = 38 and h = 20

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

$$= 60 + \left\{\frac{61 - 52}{122 - 52 - 38}\right\} \times 20$$

$$= 60 + \frac{9 \times 20}{32} = 60 + \frac{45}{8} = 60 + 5.625 = 65.625 \text{ h}$$

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	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

Modal class = 1500-2000, l = 1500, $f_m = 40$, $f_1 = 24$, $f_2 = 33$ and h = 500

$$\text{Mode} = l + \left\{\frac{f_m - f_1}{2f_m - f_1 - f_2}\right\} \times h = 1500 + \left\{\frac{40 - 24}{80 - 24 - 33}\right\} \times 500$$
$$= 1500 + \frac{16 \times 500}{23} = 1500 + \frac{8000}{23}$$
$$= 1500 + 347.83$$
$$= ₹\ 1847.83$$

Calculation for mean:

Class Interval	fi	xi	di = xi - a	ui = di/h	fiui
1000-1500	24	1250	-1500	-3	-72
1500-2000	40	1750	-1000	-2	-80
2000-2500	33	2250	-500	-1	-33
2500-3000	28	275	0	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
	fi = 200				fiui = -35

Mean = $\bar{x} = a + (\sum f_i u_i / \sum f_i) \times h$

= 2750 + (35/200) x 500

= 2750 - 87.50 = 2662.50

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