

CBSE Class-10 Mathematics

NCERT solution

Chapter - 14

Statistics - 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?

Ans. Since, number of plants and houses are small in their values, so we use direct method.

Number of plants	Number of houses (f_i)	Class Marks (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	$\sum f_i = 20$		$\sum f_i x_i = 162$

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

Hence mean number of plants per house is 8.1.

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.

Ans.

Daily wages (in Rs.)	No. of workers (f_i)	Class Marks (x_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
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
	$\sum f_i = 50$			$\sum f_i u_i = -12$

From given data, Assume mean (a) = 150, Width of the class (h) = 20

$$\therefore \bar{u} = \frac{\sum f_i u_i}{\sum f_i} = \frac{-12}{50} = -0.24$$

Using formula, Mean (\bar{x}) = $a + h\bar{u} = 150 + 20(-0.24) = 150 - 4.8 = 145.2$

Hence mean daily wages of the workers of factory is Rs. 145.20.

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 Rs.)	11 – 13	13 – 15	15 – 17	17 – 19	19 – 21	21 – 23	23 – 25
Number of houses	7	6	9	13	f	5	4

Ans.

Daily pocket allowance (in Rs.)	No. of children (f_i)	Class Marks (x_i)	$d_i = x_i - a$	$f_i d_i$
11 - 13	7	12	- 6	- 42
13 - 15	6	14	- 4	- 24
15 - 17	9	16	- 2	- 18
17 - 19	13	18	0	0
19 - 21	f	20	2	$2f$
21 - 23	5	22	4	20
23 - 25	4	24	6	24
	$\sum f_i = 44 + f$			$\sum f_i d_i = 2f - 40$

From given data, Assume mean (a) = 18

$$\begin{aligned}
 \therefore (\bar{x}) &= a + \frac{\sum f_i d_i}{\sum f_i} \\
 \Rightarrow 18 &= 18 + \frac{2f - 40}{44 + f} \\
 \Rightarrow \frac{2f - 40}{44 + f} &= 0 \\
 \Rightarrow 2f - 40 &= 0 \\
 \Rightarrow 2f &= 40 \\
 \Rightarrow f &= 20
 \end{aligned}$$

Hence missing frequency is 20.

4. Thirty women were examined in a hospital by a doctor and the number of heart beats per minute were recorded and summarized as follows:

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

Ans.

No. of heart beats per min.	No. of women (f_i)	Class Marks (x_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
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	78.4	1	7
80 - 83	4	81.5	2	8
83 - 86	2	84.5	3	6
	$\sum f_i = 30$			$\sum f_i u_i = 4$

(in the class interval 77-80 , 78.4 changes to 78.5)

From given data, Assume mean (a) = 75.5, Width of the class (h) = 3

$$\therefore \bar{u} = \frac{\sum f_i u_i}{\sum f_i} = \frac{4}{30} = 0.13 \text{ (approx.)}$$

Using formula, Mean (\bar{x}) = $a + h\bar{u}$ = 75.5 + 3 (0.13) = 75.5 + 0.39 = 75.89

Hence mean heart beat per minute for women is 75.89.

5. In a retail market, fruit vendors were selling mangoes kept in packing boxes. These boxes contained varying number 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	12	14	8	6	10

{change the frequency in above table as: 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?

Ans. Since value of number of mangoes and number of boxes are large numerically. So we use step-deviation method

we convert the class interval firstly into exclusive form given as

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True Class Interval	No. of boxes (f_i)	Class mark (x_i)	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
49.5-52.5	15	51	-2	-30
52.5-55.5	110	54	-1	-110
55.5-58.5	135	57	0	0
58.5-61.5	115	60	1	115
61.5-64.5	25	63	2	50
	$\sum f_i = 400$			$\sum f_i u_i = 25$

From given data, Assume mean (a) = 57, Width of the class (h) = 3

$$\therefore \bar{u} = \frac{\sum f_i u_i}{\sum f_i} = \frac{25}{400} = 0.0625 \text{ (approx.)}$$

Using formula, Mean (\bar{x}) = $a + h\bar{u} = 57 + 3(0.0625) = 57 + 0.1875 = 57.1875 = 57.19$ (approx.)

Hence mean number of mangoes kept in a packing box is 57.19.

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

Daily expenditure (in Rs.)	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.

Ans.

Daily expenditure	No. of households (f_i)	Class Marks (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	0	0
250 - 300	2	275	1	2
300 - 350	2	325	2	4
	$\sum f_i = 25$			$\sum f_i u_i = -7$

From given data, Assume mean (a) = 225, Width of the class (h) = 50

$$\therefore \bar{u} = \frac{\sum f_i u_i}{\sum f_i} = \frac{-7}{25} = -0.28$$

Using formula, Mean (\bar{x}) = $a + h\bar{u}$ = 225 + 50 (- 0.28) = 225 - 14 = 211

Hence mean daily expenditure on food is Rs. 211.

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)	0.00 - 0.04	0.04 - 0.08	0.08 - 0.12	0.12 - 0.16	0.16 - 0.20	0.20 - 0.24
Frequency	4	9	9	2	4	2

Find the mean concentration of SO₂ in the air.

Ans.

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

From given data, Assume mean (a) = 0.10, Width of the class (h) = 0.04

$$\therefore \bar{u} = \frac{\sum f_i u_i}{\sum f_i} = \frac{-1}{30} = -0.033 \text{ (approx.)}$$

Using formula, Mean $(\bar{x}) = a + h\bar{u} = 0.10 + 0.04(-0.033) = 0.10 - 0.0013 = 0.0987$ (approx.)

Hence mean concentration of SO_2 in air is 0.0987 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

Ans.

Number of days	No. of students (f_i)	Class Marks (x_i)	$d_i = x_i - a$	$f_i d_i$
0 - 6	11	3	- 14	- 154
6 - 10	10	8	- 9	- 90
10 - 14	7	12	- 5	- 35
14 - 20	4	17	0	0
20 - 28	4	24	7	28
28 - 38	3	33	16	48
38 - 40	1	39	22	22
	$\sum f_i = 40$			$\sum f_i d_i = -181$

From given data, Assume mean (a) = 17

$$\therefore (\bar{x}) = a + \frac{\sum f_i d_i}{\sum f_i} = 17 + \frac{(-181)}{40} = 17 - 4.52 = 12.48$$

Hence mean 12.48 number of days a student was absent.

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

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

Ans.

Literacy rate (in %)	No. of cities (f_i)	Class Marks (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	0	0
75 - 85	8	80	1	8
85 - 95	3	90	2	6
	$\sum f_i = 35$			$\sum f_i u_i = -2$

From given data, Assume mean (a) = 70, Width of the class (h) = 10

$$\therefore \bar{u} = \frac{\sum f_i u_i}{\sum f_i} = \frac{-2}{35} = -0.057$$

Using formula, Mean (\bar{x}) = $a + h\bar{u}$ = 70 + 10 (- 0.057) = 70 - 0.57 = 69.43

Hence mean literacy rate is 69.43%.