Statistics Exercise 1

Question 1

A survey was conducted by a group of students as a part of their environment awareness programmes, 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?

Solution

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

No. of plants (Class interval)	No. of houses (f_i)	Mid-point (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
	$\Sigma f_i = 20$		$\Sigma f_i x_i = 162$

$$M = \frac{\sum f_i x_i}{\sum f_i}$$

Mean(M) = 162/20 = 8.1

Question 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.

Solution

Here The value of mid-point (x_i) is very large. So, assumed mean or step deviation method would be simple to calculate

Here the class interval is h = 20.

We can see that step deviation method would be best here

Now 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)	$u_i = (x_i - 150)/20$	$f_i u_i$
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

Total	Σ f$_i$ = 50			Σ f$_i$u$_i$ = -12

$$M = a + \frac{\sum f_i u_i}{\sum f_i} h$$

=150 + (20 × -12/50) = 150 - 4.8 = 145.20
Thus, mean daily wage = Rs. 145.20

Question 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 c)	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Number of Children	7	6	9	13	f	5	4

Solution
Here, Mean= 18

Class interval	Number of children (f$_i$)	Mid-point (x$_i$)	f$_i$x$_i$
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	Σf$_i$ = 44+f		Σ f$_i$x$_i$ = 752+20f

$$M = \frac{\sum f_i x_i}{\sum f_i}$$

18= (752+20f)/(44+f)
18(44+f) = (752+20f)
40 = 2f
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 summarized 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	3

Solution
x_i = (Upper limit + Lower limit)/2

Here The value of mid-point (x_i) is very large. So, assumed mean or step deviation method would be simple to calculate

Now Class size (h) = 3

We can see that step deviation method would be best here

Now assumed mean A = 75.5 and class interval is h = 3
So, $u_i = (x_i - A)/h$

$u_i = (x_i - 75.5)/3$

Class Interval	Number of women (f_i)	Mid-point (x_i)	$u_i = (x_i - 75.5)/h$	$f_i u_i$

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	78.5	1	7
80-83	4	81.5	3	8
83-86	2	84.5	3	6
	$\sum f_i = 30$			$\sum f_i u_i = 4$

$$M = a + \frac{\sum f_i u_i}{\sum f_i} h$$

= 75.5 + 3×(4/30) = 75.5 + 4/10 = 75.5 + 0.4 = 75.9
The mean heart beats per minute for these women is 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 per 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?

Solution
Since, the given data is not continuous so we add 0.5 to the upper limit and subtract 0.5 from the lower limit.
Here, assumed mean (A) = 57
Class size (h) = 3

Class Interval	Number of boxes (f_i)	Mid-point (x_i)	$d_i = x_i - A$	$f_i d_i$
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
	$\Sigma\ f_i$ = 400			$\Sigma\ f_i d_i$ = 75

$$M = a + \frac{\Sigma f_i d_i}{\Sigma f_i}$$

= 57 + (75/400) = 57 + 0.1875 = 57.19

Question 6

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

Daily expenditure (in c)	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.

Solution
Here, assumed mean (A) = 225

Class Interval	Number of households (f_i)	Mid-point (x_i)	$d_i = x_i - A$	$f_i d_i$
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
	$\Sigma\ f_i$ = 25			$\Sigma\ f_i d_i$ = -350

$$M = a + \frac{\sum f_i d_i}{\sum f_i}$$

= 225 + (-350/25) = 225 - 14 = 211
The mean daily expenditure on food is 211

Question 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.
Solution

Concentration of SO_2 (in ppm)	Frequency (f_i)	Mid-point (x_i)	$f_i x_i$
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	$\sum f_i = 30$		$\sum (f_i x_i) = 2.96$

$$M = \frac{\sum f_i x_i}{\sum f_i}$$

= 2.96/30 = 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.

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

Solution

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
	$\Sigma f_i = 40$		$\Sigma f_i x_i = 499$

$$M = \frac{\Sigma f_i x_i}{\Sigma f_i}$$

= 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 %)	45-55	55-65	65-75	75-85	85-98
Number of cities	3	10	11	8	3

Solution

We will use here the step deviation method

Assumed mean =70
H=10

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
	$\Sigma\ f_i\ = 35$				$\Sigma\ f_iu_i\ = -2$

$$M = a + \frac{\Sigma f_i u_i}{\Sigma f_i} h$$

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