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For students to receive good grades, using these solutions as a reference tool will be beneficial. Additionally, students can rehearse problem-solving by accessing the chapter-by-chapter solutions for Class 10 Math exercises.

NCERT Solutions for Class 10 Maths Chapter 14

1. A survey was conducted by a group of students as a part of their environment awareness program, 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:

To find the mean value, we will use the direct method because the numerical value of f_i and x_i are small.

Find the midpoint of the given interval using the formula.

Midpoint (x_i) = (upper limit + lower limit)/2

No. of plants(Class interval)	**No. of housesFrequency (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 $f_i x_i$ = 162**

The formula to find the mean is:

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

= 162/20

= 8.1

Therefore, the 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.)	**500-520**	**520-540**	**540-560**	**560-580**	**580-600**
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:

Find the midpoint of the given interval using the formula.

Midpoint (x_i) = (upper limit + lower limit)/2

In this case, the value of mid-point (x_i) is very large, so let us assume the mean value, a = 550.

Class interval (h) = 20

So, $u_i = (x_i – a)/h$

$u_i = (x_i – 550)/20$

Substitute and find the values as follows:

Daily wages(Class interval)	**Number of workersfrequency (f_i)**	**Mid-point (x_i)**	**$u_i = (x_i – 550)/20$**	**$f_i u_i$**
500-520	12	510	-2	-24
520-540	14	530	-1	-14
540-560	8	550 = a	0	0

560-580	6	570	1	6
580-600	10	590	2	20
Total	**Sum f_i = 50**			**Sum f_iu_i = -12**

So, the formula to find out the mean is:

Mean = $\bar{x} = a + h(\sum f_iu_i / \sum f_i) = 550 + [20 \times (-12/50)] = 550 – 4.8 = 545.20$

Thus, mean daily wage of the workers = Rs. 545.20

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 c)	**11-13**	**13-15**	**15-17**	**17-19**	**19-21**	**21-23**	**23-35**
Number of children	**7**	**6**	**9**	**13**	**f**	**5**	**4**

Solution:

To find out the missing frequency, use the mean formula.

Given, 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	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**

The mean formula is

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

Now substitute the values and equate to find the missing frequency (f)

⇒ 18 = (752 + 20f)/ (44 + f)

⇒ 18(44 + f) = (752 + 20f)

⇒ 792 + 18f = 752 + 20f

⇒ 792 + 18f = 752 + 20f

⇒ 792 – 752 = 20f – 18f

⇒ 40 = 2f

⇒ f = 20

So, the missing frequency, f = 20.

4. Thirty women were examined in a hospital by a doctor, and the number of heartbeats per minute were recorded and summarised as follows. Find the mean heartbeats 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**

Solution:

From the given data, let us assume the mean as a = 75.5

x_i = (Upper limit + Lower limit)/2

Class size (h) = 3

Now, find the u_i and f_iu_i as follows:

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 = a	0	0
77-80	7	78.5	1	7
80-83	4	81.5	2	8

83-86	2	84.5	3	6
	Sum f_i= 30			**Sum f_iu_i = 4**

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

$= 75.5 + 3 \times (4/30)$

$= 75.5 + (4/10)$

$= 75.5 + 0.4$

$= 75.9$

Therefore, the mean heart beats per minute for these women is 75.9

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?

Solution:

The given data is not continuous, so we add 0.5 to the upper limit and subtract 0.5 from the lower limit as the gap between two intervals is 1.

Here, assumed mean (a) = 57

Class size (h) = 3

Here, the step deviation is used because the frequency values are big.

Class Interval	**Number of boxes (f_i)**	**Mid-point (x_i)**	**$u_i = (x_i – 57)/h$**	**f_iu_i**
49.5-52.5	15	51	-2	-30
52.5-55.5	110	54	-1	-110
55.5-58.5	135	57 = a	0	0
58.5-61.5	115	60	1	115

61.5-64.5	25	63	2	50
	Sum f_i = 400			**Sum f_iu_i = 25**

The formula to find out the Mean is:

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

= 57 + 3(25/400)

= 57 + 0.1875

= 57.19

Therefore, the 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 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:

Find the midpoint of the given interval using the formula.

Midpoint (x_i) = (upper limit + lower limit)/2

Let us assume the mean (a) = 225

Class size (h) = 50

Class Interval	**Number of households (f_i)**	**Mid-point (x_i)**	**$d_i = x_i - A$**	**$u_i = d_i/50$**	**f_iu_i**
100-150	4	125	-100	-2	-8
150-200	5	175	-50	-1	-5
200-250	12	225 = a	0	0	0
250-300	2	275	50	1	2
300-350	2	325	100	2	4

Sum $f_i = 25$ **Sum $f_iu_i = -7$**

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

= 225 + 50(-7/25)

= 225 – 14

= 211

Therefore, the mean daily expenditure on food is 211.

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:

To find out the mean, first find the midpoint of the given frequencies as follows:

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	0.22	0.44

Total	**Sum f_i = 30**	**Sum ($f_i x_i$) = 2.96**

The formula to find out the mean is

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

= 2.96/30

= 0.099 ppm

Therefore, the mean concentration of SO_2 in the air is 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**

Solution:

Find the midpoint of the given interval using the formula.

Midpoint (x_i) = (upper limit + lower limit)/2

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 $f_i x_i$ = 499**

The mean formula is,

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

= 499/40

= 12.48 days

Therefore, the mean number of days a student was absent = 12.48.

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:

Find the midpoint of the given interval using the formula.

Midpoint (x_i) = (upper limit + lower limit)/2

In this case, the value of mid-point (x_i) is very large, so let us assume the mean value, a = 70.

Class interval (h) = 10

So, $u_i = (x_i – a)/h$

$u_i = (x_i – 70)/10$

Substitute and find the values as follows:

Class Interval	**Frequency (f_i)**	**(x_i)**	**$u_i = (x_i – 70)/10$**	**f_iu_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
	Sum f_i = 35			**Sum f_iu_i = -2**

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

= 70 + (-2/35) × 10

= 69.43

Therefore, the mean literacy part = 69.43%

Exercise 14.2 Page: 275

1. The following table shows the ages of the patients admitted to 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.

Solution:

To find out the modal class, let us the consider the class interval with high frequency.

Here, the greatest frequency = 23, so the modal class = 35 – 45,

Lower limit of modal class = l = 35,

class width (h) = 10,

f_m = 23,

f_1 = 21 and f_2 = 14

The formula to find the mode is

Mode = $l + [(f_m – f_1)/ (2f_m – f_1 – f_2)] \times h$

Substitute the values in the formula, we get

Mode = 35+[(23-21)/(46-21-14)]×10

= 35 + (20/11)

= 35 + 1.8

= 36.8 years

So the mode of the given data = 36.8 years

Calculation of Mean:

First find the midpoint using the formula, x_i = (upper limit +lower limit)/2

Class Interval	**Frequency (f_i)**	**Mid-point (x_i)**	**$f_i x_i$**

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**

The mean formula is

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

= 2830/80

= 35.375 years

Therefore, the mean of the given data = 35.375 years

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.

Solution:

From the given data the modal class is 60–80.

Lower limit of modal class = l = 60,

The frequencies are:

f_m = 61, f_1 = 52, f_2 = 38 and h = 20

The formula to find the mode is

Mode = $l + [(f_m - f_1)/(2f_m - f_1 - f_2)] \times h$

Substitute the values in the formula, we get

Mode = 60 + [(61 – 52)/ (122 – 52 – 38)] × 20

Mode = 60 + [(9 × 20)/32]

Mode = 60 + (45/8) = 60 + 5.625

Therefore, modal lifetime of the components = 65.625 hours.

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 Rs.)	**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**

Solution:

Given data:

Modal class = 1500-2000,

l = 1500,

Frequencies:

f_m = 40 f_1 = 24, f_2 = 33 and

h = 500

Mode formula:

Mode = $l + [(f_m – f_1)/ (2f_m – f_1 – f_2)] \times h$

Substitute the values in the formula, we get

Mode = 1500 + [(40 – 24)/ (80 – 24 – 33)] × 500

Mode = 1500 + [(16 × 500)/23]

Mode = 1500 + (8000/23) = 1500 + 347.83

Therefore, modal monthly expenditure of the families = Rupees 1847.83

Calculation for mean:

First find the midpoint using the formula, x_i =(upper limit +lower limit)/2

Let us assume a mean, (a) be 2750.

Class Interval	**f_i**	**x_i**	**$d_i = x_i – a$**	**$u_i = d_i/h$**	**f_iu_i**
1000-1500	24	1250	-1500	-3	-72
1500-2000	40	1750	-1000	-2	-80
2000-2500	33	2250	-500	-1	-33
2500-3000	28	2750 = a	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
	$f_i = 200$				**$f_iu_i = -35$**

The formula to calculate the mean,

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

Substitute the values in the given formula

= 2750 + (-35/200) × 500

= 2750 – 87.50

= 2662.50

So, the mean monthly expenditure of the families = Rs. 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

No 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**

Solution:

Given data:

Modal class = 30 – 35,

l = 30,

Class width (h) = 5,

f_m = 10, f_1 = 9 and f_2 = 3

Mode Formula:

Mode = $l + [(f_m – f_1)/ (2f_m – f_1 – f_2)] \times h$

Substitute the values in the given formula

Mode = 30 + [(10 – 9)/ (20 – 9 – 3)] × 5

= 30 + (5/8)

= 30 + 0.625

= 30.625

Therefore, the mode of the given data = 30.625

Calculation of mean:

Find the midpoint using the formula, x_i =(upper limit +lower limit)/2

Class Interval	Frequency (f_i)	Mid-point (x_i)	f_ix_i
15-20	3	17.5	52.5
20-25	8	22.5	180.0
25-30	9	27.5	247.5
30-35	10	32.5	325.0
35-40	3	37.5	112.5
40-45	0	42.5	0
45-50	0	47.5	0
50-55	2	52.5	105.0
	Sum $f_i = 35$		**Sum $f_ix_i = 1022.5$**

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

= 1022.5/35

= 29.2 (approx)

Therefore, mean = 29.2

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

Run Scored	Number of Batsman
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.

Solution:

Given data:

Modal class = 4000 – 5000,

l = 4000,

class width (h) = 1000,

$f_m = 18$, $f_1 = 4$ and $f_2 = 9$

Mode Formula:

Mode = $l + [(f_m – f_1)/ (2f_m – f_1 – f_2)] \times h$

Substitute the values

Mode = 4000 + [(18 – 4)/ (36 – 4 – 9)] × 1000

= 4000 + (14000/23)

= 4000 + 608.695

= 4608.695

= 4608.7 (approximately)

Thus, the mode of the given data is 4608.7 runs.

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

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

Solution:

Given Data:

Modal class = 40 – 50, l = 40,

Class width (h) = 10, $f_m = 20$, $f_1 = 12$ and $f_2 = 11$

Mode = $l + [(f_m – f_1)/(2f_m – f_1 – f_2)] \times h$

Substitute the values

Mode = 40 + [(20 – 12)/ (40 – 12 – 11)] × 10

= 40 + (80/17)

= 40 + 4.7

= 44.7

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