NCERT Solutions for Class 9 Maths Chapter 14 - Statistics

Chapter 14 - Statistics Exercise Ex. 14.1

Solution 1

In our day to day life we may collect data in various ways; a few of them have been mentioned here.

1. Number of females per 1000 males in various states of our country.
2. Height and Weights of students of our class.
3. Temperature of past 10 days in our city.
4. Number of plants in our locality.
5. Rain fall in our city.
6. Marks obtained by students of the class in a test.
7. Date of birth of students.
8. Subjects taught in various schools in class X.

Solution 2

We know that the information which is collected by the investigator himself with a definite objective in his mind is primary data, whereas when the information is gathered from a source which already had the information stored, is called as secondary data. Now we may observe that the data in 1, 3, and 5 is secondary data and all others are primary data.

Chapter 14 - Statistics Exercise Ex. 14.2

Solution 1

Here, 9 students have blood groups A, 6 as B, 3 as AB and 12 as O.
So, the table representing the data is as follows:

Blood group	Number of students
A	9
B	6
AB	3
O	12
Total	30

As 12 students have the blood group O and 3 have their blood group as AB, clearly that the most common blood group and the rarest blood group among these students is O and AB respectively.

Solution 2

Given that we have to construct a grouped frequency distribution table of class size 5. So, the class intervals will be as 0 - 5, 5 - 10, 10 - 15, 15 - 20......
Required grouped frequency distribution table as following -

Distance (in km)	Tally marks	Number of engineers
0 - 5	‖‖	5
5 - 10	‖‖ ‖‖	11
10 -15	‖‖ ‖‖	11
15 - 20	‖‖ ‖‖‖‖	9
20 - 25			1
25 - 30			1
30 - 35	‖	2
Total		40

Now there are only 4 engineers whose homes are at more than or equal to 20 km distance, from their work place.
Most of the engineers are having their workplace up to 15 km distance, from their homes.

Solution 3

(i) To construct a grouped frequency distribution table of class size 2.
   Class intervals will be as follows 84 - 86, 86 - 88, and 88 - 90... ...

Relative humidity (in %)	Number of days (frequency)
84 - 86	1
86 - 88	1
88 - 90	2
90 - 92	2
92 - 94	7
94 - 96	6
96 - 98	7
98 - 100	4
Total	30

(ii) Since relative humidity is high so the data must be of a month of rainy season.

(iii) Range of data = maximum value - minimum value
                    = 99.2 - 84.9
                    = 14.3

Solution 4

(i) We have to construct a grouped frequency distribution table taking class intervals as 160 - 165, 165 - 170, etc. Now by observing the data given as above we may construct the required table as below -

Heights (in cm)	Number of students (frequency)
150 - 155	12
155 - 160	9
160 - 165	14
165 - 170	10
170 - 175	5
Total	50

(ii) From the table we can see that 50% of students are shorter than 165 cm.

Solution 5
To construct grouped frequency table class intervals to be taken as 0.00 - 0.04, 0.04 - 0.08,

Concentration of SO_2 (in ppm)	Number of days (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
Total	30

Number of days for which concentration SO2 is more than 0.11 is number of days for which concentration is in between 0.12 - 0.16, 0.16 - 0.20, 0.20 - 0.24.
So, required number of days = 2 + 4 + 2 = 8

Solution 6
By observing the data given above following frequency distribution table can be constructed

Number of heads	Number of times (frequency)
0	6
1	10
2	9
3	5
Total	30

Solution 7
(i) By observation of digits after decimal point the following table is constructed

Digit	Frequency
0	2
1	5
2	5
3	8
4	4
5	5
6	4
7	4
8	5
9	8
Total	50

(ii) From the above table the least frequency is 2 of digit 0, and the maximum frequency is 8 of digit 3 and 9. So, the most frequently occurring digits are 3 and 9 and the least occurring digit is 0.

Solution 8
(i) Class intervals will be 0 - 5, 5 - 10, 10 -15.....
The grouped frequency distribution table is as follows:

Hours	Number of children
0 - 5	10
5 - 10	13
10 - 15	5
15 - 20	2
Total	30

(ii) The number of children, who watched TV for 15 or more hours a week
is 2 (i.e. number of children in class interval 15 - 20).

Solution 9
To construct a grouped frequency table of class size 0.5 and starting from class interval 2 - 2.5. So, our class intervals will be as 2 - 2.5, 2.5 - 3, 3 - 3.5....... Required grouped frequency distribution table is as below -
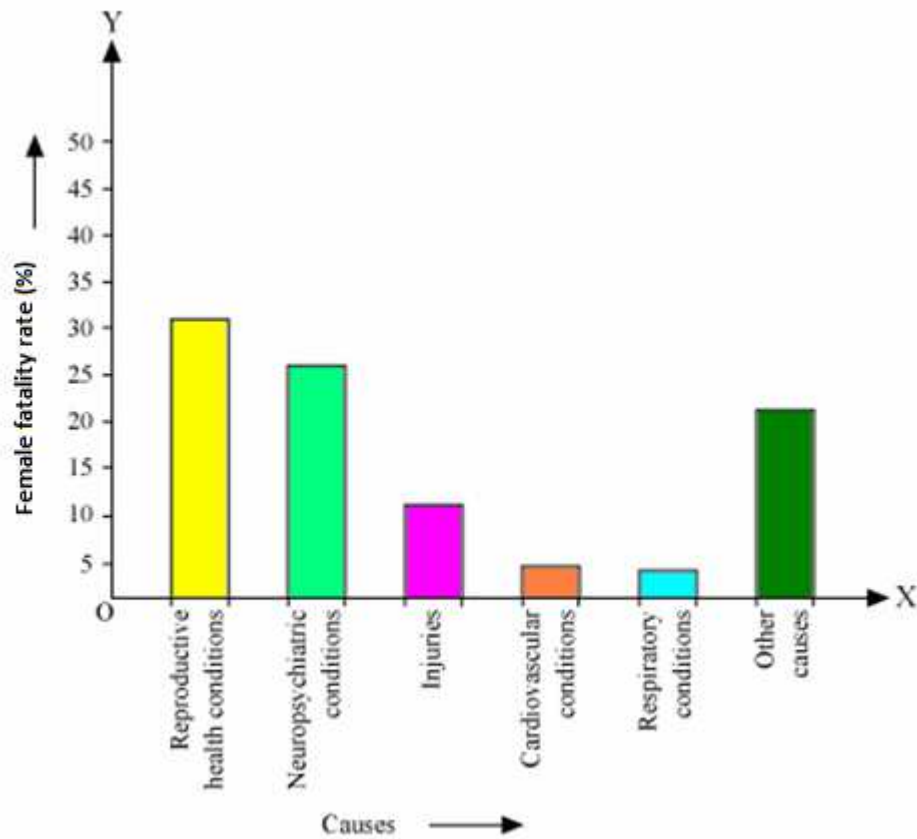
Lives of batteries (in hours)	Number of batteries
2 - 2.5	2
2.5 - 3.0	6

3.0 - 5.5	14
3.5 - 4.0	11
4.0 - 4.5	4
4.5 - 5.0	3
Total	40

Chapter 14 - Statistics Exercise Ex. 14.3

Solution 1
(i) By representing causes on x axis and family fatality rate on y axis and choosing an appropriate scale (1 unit = 5% for y axis) we can draw the graph of information given above, as following
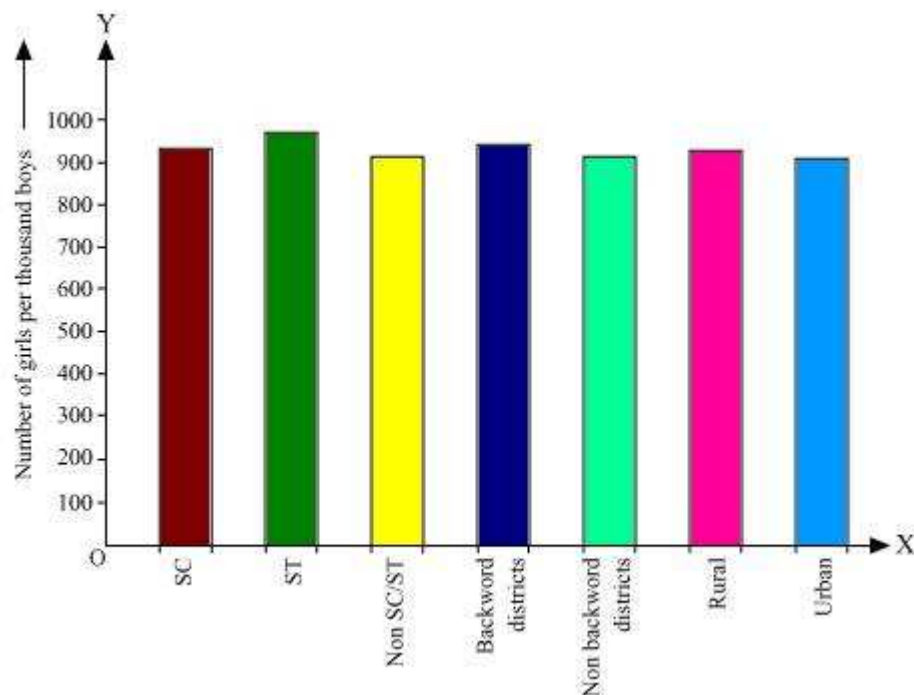

All the rectangle bars are of same width and having equal spacing between them.

(ii) Reproductive health condition is the major cause of women's ill health and death worldwide as 31.8% of women are affected by it.
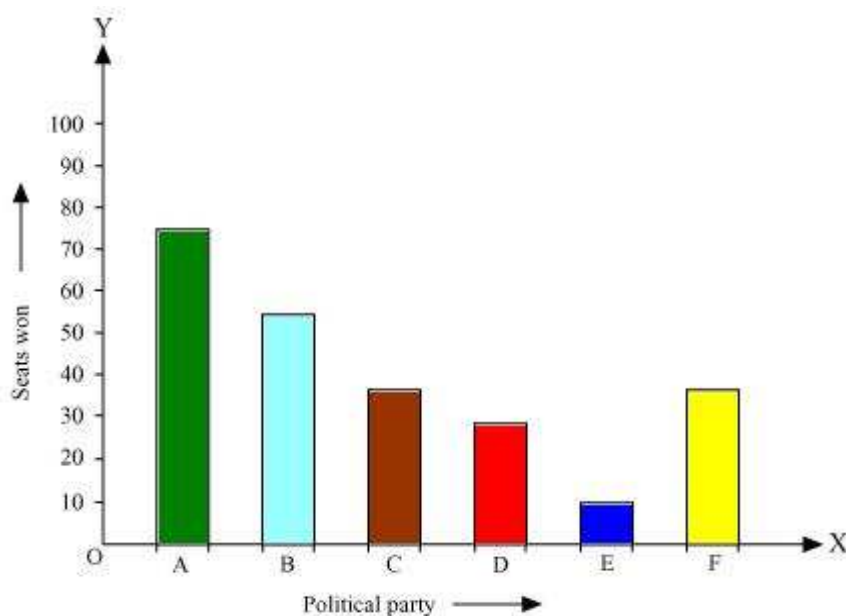
Solution 2
(i). By representing section (variable) on x axis and number of girls per thousand boys on y axis we can draw the graph of information given as above and choosing an appropriate scale (1 unit = 100 girls for y axis)

Here all the rectangle bars are of same width and have equal spacing in between them.

Solution 3

(i). By taking polling results on x axis and seats won as y axis and choosing an appropriate scale (1 unit = 10 seats for y axis) we can draw the required graph of above information as below -

Here rectangle bars are of same width and have equal spacing in between them.

(ii). We may find that political party 'A' won maximum number of seats.

Solution 4

(i). Length of leaves are represented in a discontinuous class intervals having a difference of 1 in between them. So we have to add   to each upper class limit and also have to subtract 0.5 from the lower class limits so as to make our class intervals continuous.

Length (in mm)	Number of leaves
117.5 - 126.5	3
126.5 - 135.5	5
135.5 - 144.5	9
144.5 - 153.5	12
153.5 - 162.5	5
162.5 - 171.5	4

171.5 - 180.5	2

Now taking length of leaves on x axis and number of leaves on y axis we can draw the histogram of this information as below -
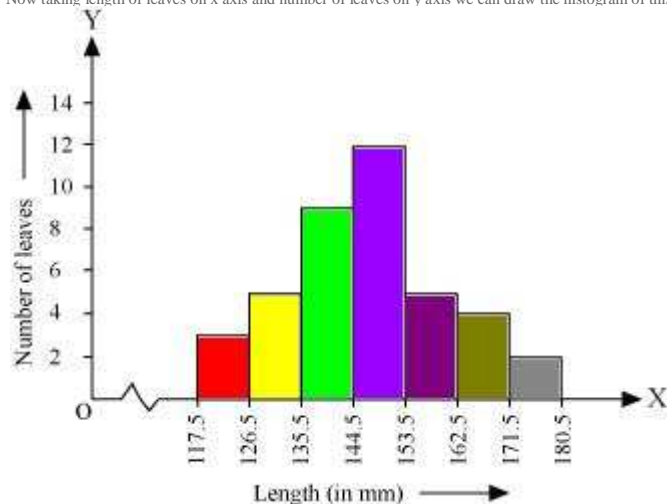

Length (in mm)

Here 1 unit on y axis represents 2 leaves.

(ii). Other suitable graphical representation of this data could be frequency polygon.

(iii). No as maximum number of leaves (i.e. 12) have their length in between of 144.5 mm and 153.5 mm. It is not necessary that all have their lengths as 153 mm.

Solution 5
(i). By taking life time (in hours) of neon lamps on x axis and number of lamps on y axis we can draw the histogram of the given information as below -

Life time (in hours)
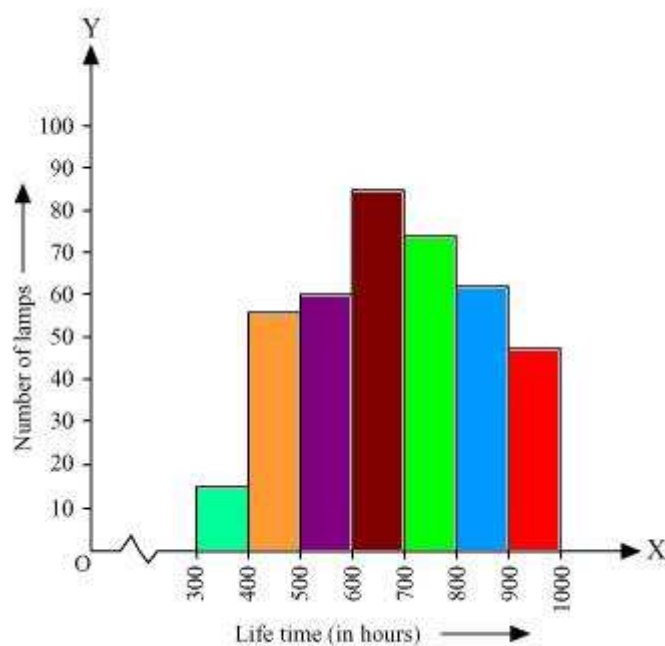
Here 1 unit on y axis represents 10 lamps.

(ii). Number of neon lamps having their lifetime more than 700 are sum of number of neon lamps having their lifetime as 700 - 800, 800 - 900, and 900 - 1000. So number of neon lamps having their lifetime more than 700 hours is 184. (74 + 62 + 48 = 184)
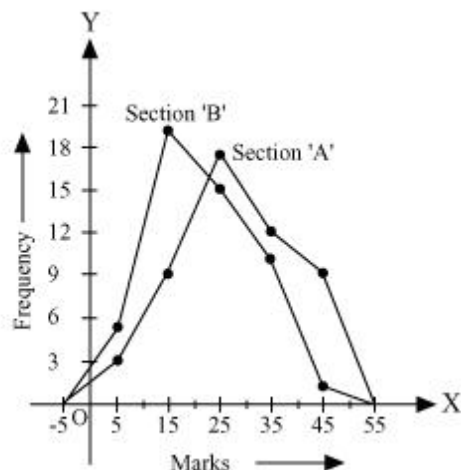
Solution 6
We can find class marks of given class intervals by using formula -

$$\text{Class mark} = \frac{\text{upper class limit} + \text{lower class limit}}{2}$$

Section A			Section B		
Marks	Class marks	Frequency	Marks	Class marks	Frequency
0 - 10	5	3	0 - 10	5	5
10 - 20	15	9	10 - 20	15	19
20 - 30	25	17	20 - 30	25	15
30 - 40	35	12	30 - 40	35	10
40 - 50	45	9	40 - 50	45	1

Now taking class marks on x axis and frequency on y axis and choosing an appropriate scale (1 unit = 3 for y axis) we can draw frequency polygon as below -

From the graph we can see performance of students of section 'A' is better than the students of section 'B' as for good marks.

Solution 7

$$\frac{1}{2}$$

We observe that given data is not having its class intervals continuous. There is a gap of 1 in between of them. So we have to add $= 0.5$ to upper class limits and subtract 0.5 from lower class limits.
Also class mark of each interval can be found by using formula -

$$\text{Class mark} = \frac{\text{upper class limit} + \text{lower class limit}}{2}$$

Now continuous data with class mark of each class interval can be represented as following -

Number of balls	Class mark	Team A	Team B
0.5 - 6.5	3.5	2	5
6.5 - 12.5	9.5	1	6
12.5 - 18.5	15.5	8	2
18.5 - 24.5	21.5	9	10
24.5 - 30.5	27.5	4	5
30.5 - 36.5	33.5	5	6
36.5 - 42.5	39.5	6	3
42.5 - 48.5	45.5	10	4
48.5 - 54.5	51.5	6	8
54.5 - 60.5	57.5	2	10

Now by taking class marks on x axis and runs scored on y axis we can construct frequency polygon as following -
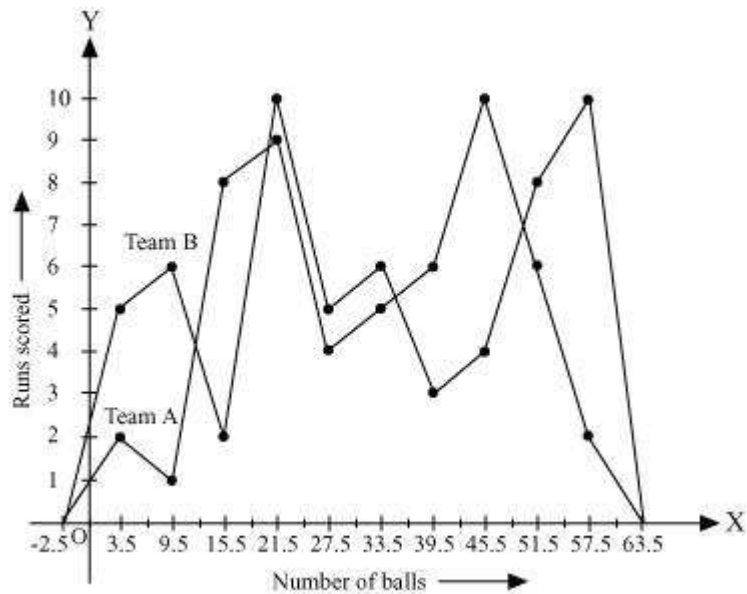
Solution 8
Here data is having class intervals of varying width. We may find proportion of children per 1 year interval as following -

Age (in years)	Frequency (Number of children)	Width of class	Length of rectangle
1 - 2	5	1	$\frac{5 \cdot 1}{1} = 5$
2 - 3	3	1	$\frac{3 \cdot 1}{1} = 3$
3 - 5	6	2	$\frac{6 \cdot 1}{2} = 3$
5 - 7	12	2	$\frac{12 \cdot 1}{2} = 6$
7 - 10	9	3	$\frac{9 \cdot 1}{3} = 3$
10 - 15	10	5	$\frac{10 \cdot 1}{5} = 2$
15 - 17	4	2	$\frac{4 \cdot 1}{2} = 2$

Now taking age of children on x axis and proportion of children per 1 year interval on y axis we may draw histogram as below -
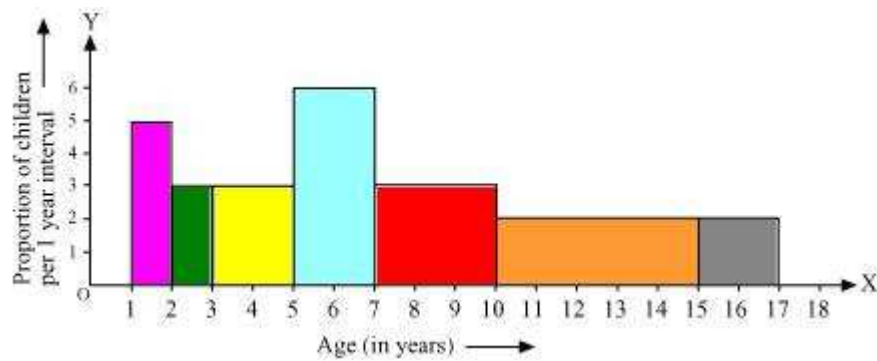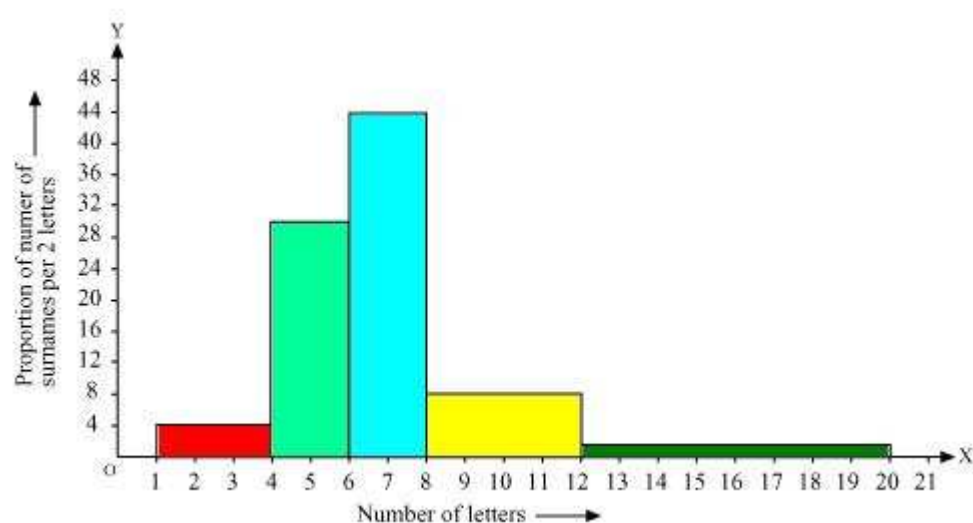
Solution 9
(i). Given data is having class intervals of varying width. We need to compute the adjusted frequency

Number of letters	Frequency (Number of surnames)	Width of class	Length of rectangle
1 - 4	6	3	$\dfrac{6 \cdot 2}{3} = 4$
4 - 6	30	2	$\dfrac{30 \cdot 2}{2} = 30$
6 - 8	44	2	$\dfrac{44 \cdot 2}{2} = 44$
8 -12	16	4	$\dfrac{16 \cdot 2}{4} = 8$
12 - 20	4	8	$\dfrac{4 \cdot 2}{8} = 1$

Now by taking number of letters on x axis and proportion of number of surnames per 2 letters interval on y axis and choosing an appropriate scale (1 unit = 4 students for y axis) we will construct the histogram as below

(ii). The class interval in which the maximum number of surname lie is
6 - 8 as there are 44 number of surnames in it i.e. maximum for this data.

Chapter 14 - Statistics Exercise Ex. 14.4
Solution 1

The number of goals scored by team is
2, 3, 4, 5, 0, 1, 3, 3, 4, 3

$$\text{Mean of data} = \frac{\text{Sum of all observations}}{\text{Total number of observations}}$$

$$\text{Mean score} = \frac{2+3+4+5+0+1+3+3+4+3}{10}$$

$$= \frac{28}{10} = 2.8$$

$$= 2.8 \text{ goals}$$

Arranging the number of goals in ascending order
0, 1, 2, 3, 3, 3, 3, 4, 4, 5
As the number of observations is 10. 10 is an even number. So, median score will be

$$\text{Median score} = \frac{5^{th} \text{ observation} + 6^{th} \text{ observation}}{2}$$

$$= \frac{3+3}{2}$$

$$= \frac{6}{2}$$

$$= 3$$

Mode of data is the observation with the maximum frequency in data.
So, mode score of data is 3 as it is having maximum frequency as 4 in the data.

Solution 2
The marks of 15 students in mathematics test are
41, 39, 48, 52, 46, 62, 54, 40, 96, 52, 98, 40, 42, 52, 60

$$\text{Mean of data} = \frac{\text{Sum of all observation}}{\text{Total number of observation}}$$

$$= \frac{41+39+48+52+46+62+54+40+96+52+98+40+42+52+60}{15}$$

$$= \frac{822}{15} = 54.8$$

Arranging the scores obtained by 15 students in an ascending order
39, 40, 40, 41, 42, 46, 48, 52, 52, 52, 54, 60, 62, 96, 98

$$\frac{15+1}{2}$$

As the number of observations is 15 that is odd so, median of data will be $= 8^{th}$ observation while data is arranged in an ascending or descending order
So, median score of data = 52
Mode of data is the observation with the maximum frequency in data. So mode of this data is 52 having the highest frequency in data as 3.

Solution 3

$$\frac{10}{2} \qquad \frac{10}{2}+1$$

Total number of observation in the given data is 10 (even number). So median of this data will be mean of $\frac{10}{2}$ i.e. 5th and $\frac{10}{2}+1$ i.e. 6th observations

$$\text{So, median of data} = \frac{5^{th} \text{ observation} + 6^{th} \text{ observation}}{2}$$

$$\Rightarrow 63 = \frac{x+x+2}{2}$$

$$\Rightarrow 63 = \frac{2x+2}{2}$$

$$\Rightarrow 63 = x+1$$

$$\Rightarrow x = 62$$

Solution 4
Arranging the data in an ascending order
14, 14, 14, 14, 17, 18, 18, 18, 22, 23, 25, 28
Here observation 14 is having the highest frequency i.e. 4 in given data. So, mode of given data is 14.

Solution 5
As

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i}$$

Values of $\sum f_i x_i$ and $\sum f_i$ can be computed

Salary (in Rs) (x_i)	Number of workers (f_i)	$f_i x_i$
3000	16	3000 * 16 = 48000
4000	12	4000 * 12 = 48000
5000	10	5000 * 10 = 50000
6000	8	6000 * 8 = 48000
7000	6	7000 * 6 = 42000
8000	4	8000 * 4 = 32000
9000	3	9000 * 3 = 27000
10000	1	10000 * 1 = 10000
Total	$\sum f_i = 60$	$\sum f_i x_i = 305000$

$$\text{Mean salary} = \frac{305000}{60}$$
$$= 5083.33$$

So, mean salary of 60 workers is Rs 5083.33.

Solution 6

(i) Mean is appropriate measure of central tendency in all the cases where it is important to take all observations into account and data does not have any extreme values for example in case of temperature of a month

(ii) Mean is not suitable in cases where there are very high and low values for example salary in a company.