Exercise 14.1

1. Give five examples of data that you can collect from your day-to-day life.

Answer: Following are the data we can collect in our day-to-day life which are around us

- Number of houses in our housing society.
- Monthly grocery expenses of our home.
- Number of people who have used e-services of the state govt. over a year.
- Number of students who have enrolled for the Math Olympiad in our school.
- Population increases over the decade in our city.

2. Classify the data in Q.1 above as primary or secondary data.

Answer: Think about how you have collected data:

- Did you collect the data all by yourself investigating around? If yes, primary.
- Did you obtain the data from a source where the information has been stored already? If yes, secondary.

Following are the data in Q.1

- Number of houses in our housing society.
- Monthly grocery expenses of our home.
- Number of people who have used e-services of the state govt. over a year.
- Number of students who have enrolled for the Math Olympiad in our school.
- Population increases over the decade in our city.

Based on the observation, data in Q.1, 1 and 2 are primary, and the data in 3, 4, and 5 are secondary.

Exercise 14.2

1. The blood groups of 30 students of Class VIII are recorded as follows.

A, B, O, O, AB, O, A, O, B, A, O, B, A, O, O,

A, AB, O, A, A, O, O, AB, B, A, O, B, A, B, O.

Represent this data in the form of a frequency distribution table. Which is the most common, and which is the rarest, blood group among these students?

Answer: Given that the blood group of 30 students of class VIII and we have to find the most common blood group and the rarest blood group.

By drawing a frequency distribution table, we can check which group is occurring most and which group is occurring least time.

Let us sort the data using a table to make the data more easily understandable and its important features visible.

This table is known as the frequency distribution table.

'Frequency' of a particular data refers to the number of times the data value occurs. In our case, frequency refers to the number of students having the same blood group.

The blood group of 30 students of Class VIII can be shown as follows:

Blood Group	Number of Students (Frequency)
A	9
B	6
O	12
AB	3
Total	30

- The most common (most frequently occurring) blood group is 'O'.
- The rarest blood group (least frequently occurring) is 'AB.'

Thus, the most common blood group is 'O' and the rarest blood group is 'AB.'

2. The distance (in km) of 40 engineers from their residence to their place of work was found as follows:

5	3	10	20	25	11	13	7	12	31
19	10	12	17	18	11	32	17	16	2
7	9	7	8	3	5	12	15	18	3
12	14	2	9	6	15	15	7	6	12

Construct a grouped frequency distribution table with class size 5 for the data given above, taking the first interval as 0-5 (5 not included). What main features do you observe from this tabular representation?

Answer: Since the given data is large, we need to group the data into class sizes of 5 each and construct a table that will make the important features of the data visible.

This table is known as grouped frequency distribution table. The class intervals will be 0-5, 5-10, 10-15, and so on.

The distance (in km) of 40 engineers from their residence to their place work can be represented as follows (with the help of tally marks)

Distances (in km)	Tally marks	Frequency
0 - 5	𝍸	5
5 - 10	𝍸 𝍸 |	11
10 - 15	𝍸 𝍸 |	11
15 - 20	𝍸 ||||	9
20 - 25	|	1
25 - 30	|	1
30 - 35	||	2
Total		40

3. The relative humidity (in %) of a certain city for a month of 30 days was as follows:

98.1	98.6	99.2	90.3	86.5	95.3	92.9	96.3	94.2	95.1
89.2	92.3	97.1	93.5	92.7	95.1	97.2	93.3	95.2	97.3
96.2	92.1	84.9	90.2	95.7	98.3	97.3	96.1	92.1	89

(i) Construct a grouped frequency distribution table with classes 84 – 86, 86 – 88, etc.

(ii) Which month or season do you think this data is about?

(iii) What is the range of this data?

Answer: By drawing a frequency distribution table, we can observe data.

(i) Let construct a grouped frequency distribution table with a class size of 2.

The relation humidity (in %) of a certain city for a month can be represented as follows:

Relative humidity (in %)	**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) The following features can be observed from the above table:

- The relative humidity was 92% and above, over a period of 24 days (four-fifth of a month)
- Since the relative humidity % is very high, it must be data from a month of the rainy season or monsoon such as July or August.

(iii) Range of data = maximum value – minimum value

= 99.2 – 84.9

= 14.3

5. A study was conducted to find out the concentration of sulphur dioxide in the air in parts per million (ppm) of a certain city. The data obtained for 30 days is as follows:

0.03	**0.08**	**0.08**	**0.09**	**0.04**	**0.17**
0.16	**0.05**	**0.02**	**0.06**	**0.18**	**0.20**
0.11	**0.08**	**0.12**	**0.13**	**0.22**	**0.07**
0.08	**0.01**	**0.10**	**0.06**	**0.09**	**0.18**
0.11	**0.07**	**0.05**	**0.07**	**0.01**	**0.04**

(i) Make a grouped frequency distribution table for this data with class intervals as 0.00 – 0.04, 0.04 – 0.08, and so on.

(ii) For how many days was the concentration of Sulphur dioxide more than 0.11 parts per million?

Answer: (i) A grouped frequency distribution table with a class size of '0.04' needs to be constructed for the given data.

The concentration of sulphur dioxide in the air (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
Total	**30**

(ii) From the above table, we can see that the number of days during which the concentration of sulphur dioxide is more than 0.11 ppm falls over three class intervals, 0.12 - 0.16, 0.16 - 0.20, and 0.20 - 0.24.

So, 2 + 4 + 2 = 8

Thus, 8 days had a concentration of sulphur dioxide more than 0.11 ppm.

6. Three coins were tossed 30 times simultaneously. Each time the number of heads occurring was noted down as follows:

0	1	2	2	1	2	3	1	3	0
1	3	1	1	2	2	0	1	2	1
3	0	0	1	1	2	3	2	2	0

Prepare a frequency distribution table for the data given above.

Answer: By observing the given data, we can prepare an ungrouped frequency distribution table as follows.

Number of Heads	**Frequency**
0	6
1	10
2	9

3	5
Total	30

7. The value of π up to 50 decimal places is given below:

3.14159265358979323846264338327950288419716939937510

(i) Make a frequency distribution of the digits from 0 to 9 after the decimal point.

(ii) What are the most and the least frequently occurring digits?

Answer:

(i) We can represent the digits from 0 to 9 by constructing a simple, ungrouped frequency distribution table as follows.

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

(ii) It can be easily observed from the table that

- The most frequently occurring digits are 3 and 9, with a max frequency of 8.
- The least frequently occurring digit is ‘0’ with the lowest frequency of 2.

8. Thirty children were asked about the number of hours they watched TV programmes in the previous week. The results were found as follows:

1	**6**	**2**	**3**	**5**	**12**	**5**	**8**	**4**	**8**
10	**3**	**4**	**12**	**2**	**8**	**15**	**1**	**17**	**6**
3	**2**	**8**	**5**	**9**	**6**	**8**	**7**	**14**	**12**

(i) Make a grouped frequency distribution table for this data, taking class width 5 and one of the class intervals 5-10.

(ii) How many children have watched television for 15 or more hours a week?

Answer:(i) A grouped frequency distribution table can be constructed as follows with the class intervals of 0 - 5, 5 - 10, 10 - 15, 15 - 20, and so on.

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

(ii) We can observe from the table that the number of children who watched television for 15 or more hours a week is 2 (which falls under the class interval '15-20').

9. A company manufactures car batteries of a particular type. The lives (in years) of 40 such batteries were recorded as follows:

2.6	**3.0**	**3.7**	**3.2**	**2.2**	**4.1**	**3.5**	**4.5**
3.5	**2.3**	**3.2**	**3.4**	**3.8**	**3.2**	**4.6**	**3.7**
2.5	**4.4**	**3.4**	**3.3**	**2.9**	**3.0**	**4.3**	**2.8**
3.5	**3.2**	**3.9**	**3.2**	**3.2**	**3.1**	**3.7**	**3.4**
4.6	**3.8**	**3.2**	**2.6**	**3.5**	**4.2**	**2.9**	**3.6**

Construct a grouped frequency distribution table for this data, using class intervals of size 0.5 starting from interval 2 – 2.5.

Answer: The required grouped frequency distribution table can be constructed as follows, with class intervals of '2-2.5', '2.5 - 3', '3-3.5', '3.5 - 4', and so on.

Lives of batteries (in years)	No. of batteries (Frequency)
2 - 2.5	2
2.5 - 3	6
3 - 3.5	14
3.5 - 4	11
4 - 4.5	4
4.5 - 5	3
Total	**40**

Exercise 14.3

1. A survey conducted by an organisation for the cause of illness and death among the women between the ages 15 – 44 (in years) worldwide found the following figures (in %):

S.No.	Causes	Female fatality rate (%)
1.	**Reproductive health conditions**	**31.8**
2.	**Neuropsychiatric conditions**	**25.4**
3.	**Injuries**	**12.4**
4.	**Cardiovascular conditions**	**4.3**
5.	**Respiratory conditions**	**4.1**
6.	**Other causes**	**22.0**

(i) Represent the information given above graphically.

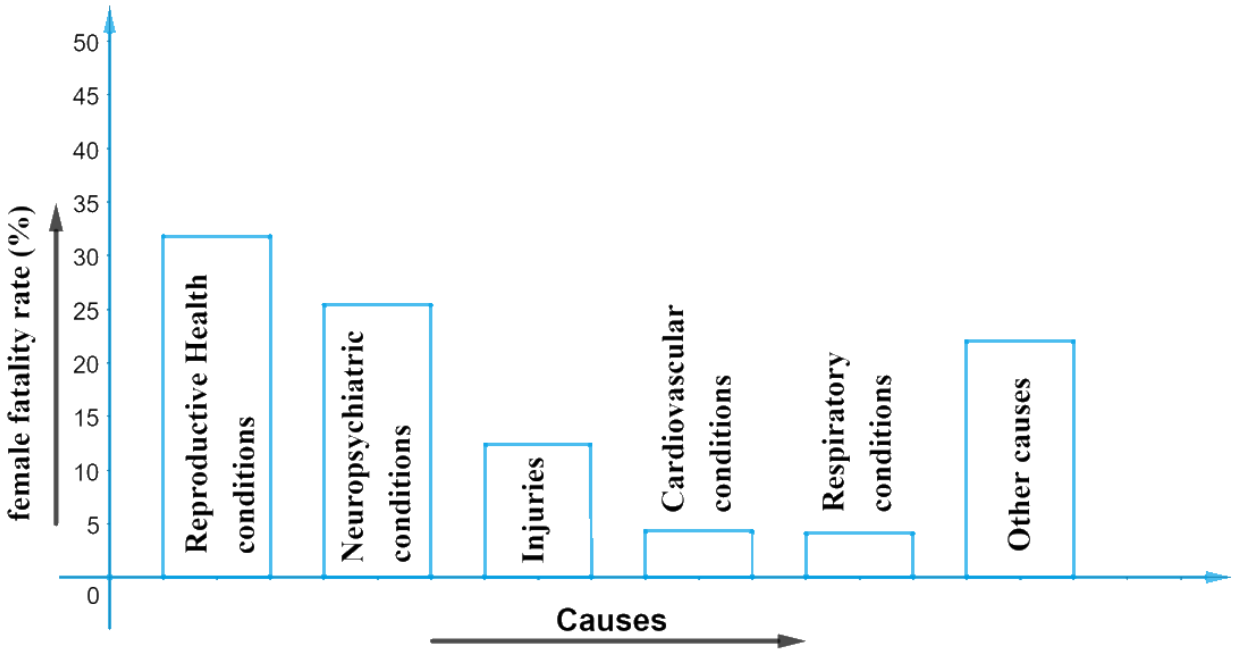
(ii) Which condition is the major cause of women's ill health and death worldwide?

(iii) Try to find out, with the help of your teacher, any two factors which play a major role in the cause in (ii) above being the major cause.

Answer: The given data can be represented by using a bar graph as shown below:

- We will represent the causes on the x-axis, maintaining equal widths for all bars and with equal gaps in between. One cause will be represented by one bar.
- We will represent the fatality rate on the y-axis with a scale of one unit as 5% as the max value is 31.8%.

(i) The information in the table is represented graphically below:



(ii) Reproductive health conditions can be considered as the major cause of women's ill health worldwide as it is the highest female fatality rate on y-axis as seen above.

(iii) The factors contributing to (ii) can be as follows:

- Lack of awareness/knowledge about reproductive health.
- Stigma in society about reproductive health-related topics.
- Affordability of treatment cost.

2. The following data on the number of girls (to the nearest ten) per thousand boys in different sections of Indian society are given below.

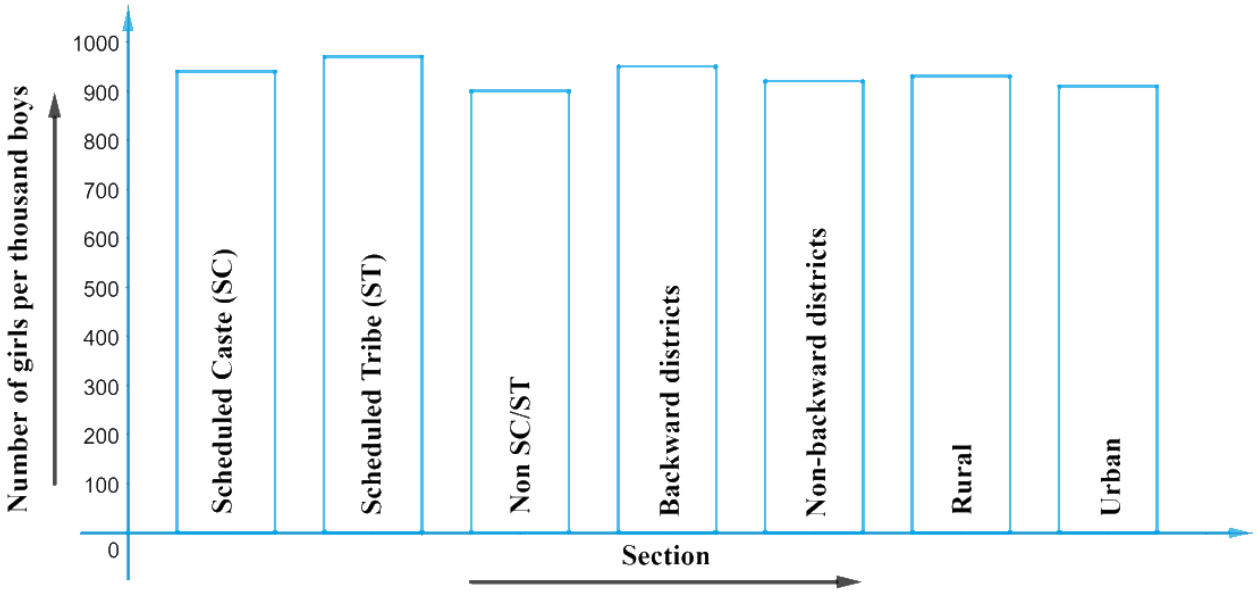
S.No.	Section	Number of girls per thousand boys
1.	Scheduled Caste (SC)	940
2.	Scheduled Tribe (ST)	970
3.	Non-SC/ST	920
4.	Backward districts	950
5.	Non-backward districts	920
6.	Rural	930
7.	Urban	910

(i) Represent the information above by a bar graph.

(ii) In the classroom, discuss what conclusions can be arrived at from the graph.

Answer: (i) The above data can be represented on a bar graph as below:

- Represent the 'section' on the x-axis and the number of girls per thousand boys on the y-axis.
- We will select a scale of 1 unit = 100 girls for the y-axis as the max value does not exceed 1000.
- We will maintain equal width for all the bars on the x-axis and also maintain equal gaps in between the bars.

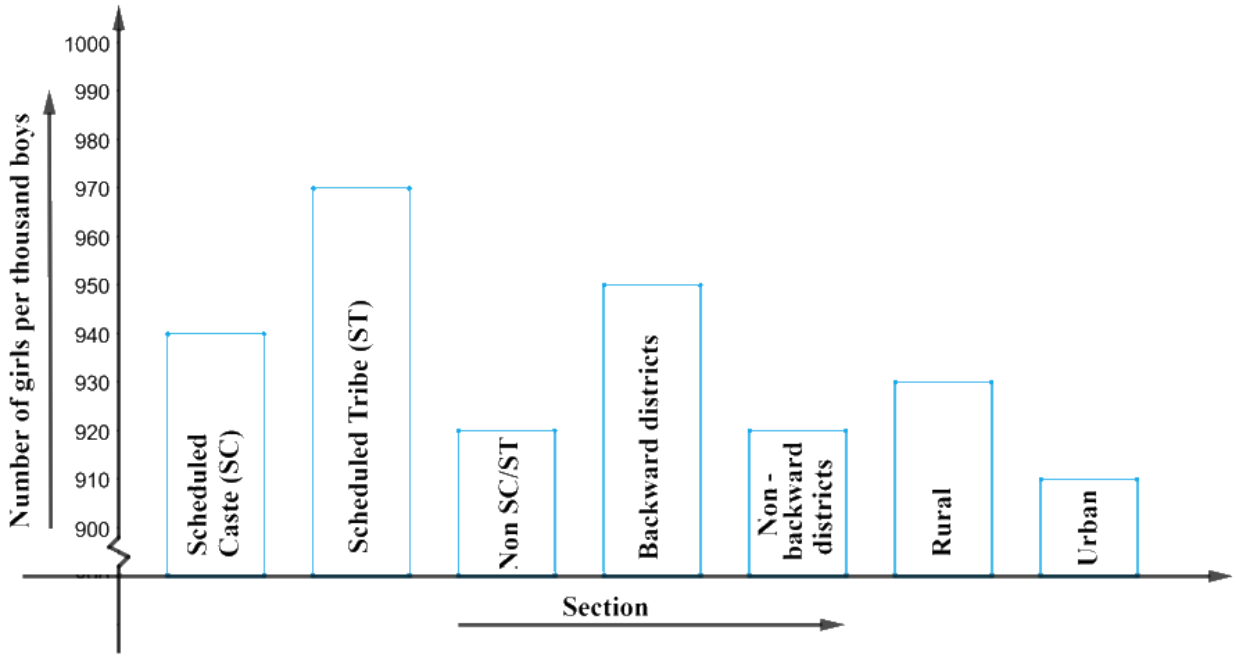


Point to note:

i. The values variations occur mostly in the range of 900-970.

ii. The values are the same until 900.

iii. Hence to make the variations more visible and distinct and for a better study of the graph, we can keep the starting value on the y-axis as '900' with a scale of 1 unit as '10' and reconstruct the graph.



As we can see, the above graph shows a clear image of the data and helps us to arrive at conclusions easily.

(ii) It can be observed from the graph that:

i. The number of girls per thousand boys represented in the graph is maximum for Scheduled Tribe (ST).

ii. The number of girls per thousand boys represented in the graph is lowest for urban.

iii. The number of girls per thousand boys are higher in rural area than in urban.

iv. The number of girls per thousand boys are also higher in backward districts than in non-backwards.

3. Given below are the seats won by different political parties in the polling outcome of state assembly elections:

Political party	A	B	C	D	E	F
Seats won	75	55	37	29	10	37

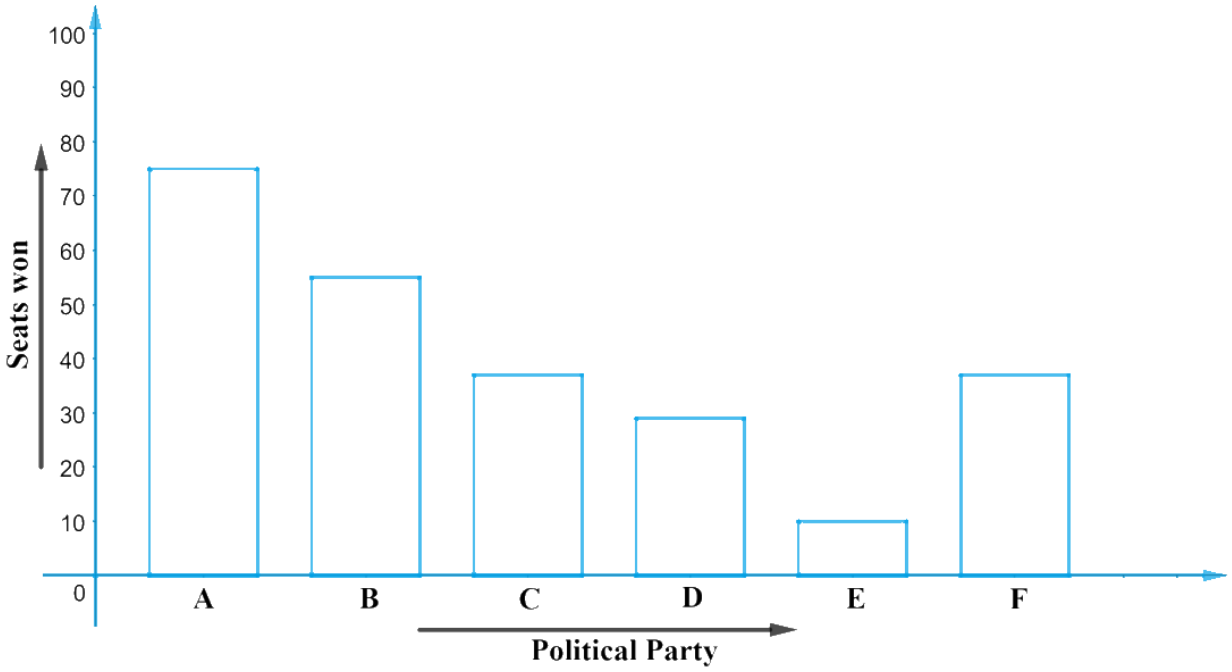
(i) Draw a bar graph to represent the polling results.

(ii) Which political party won the maximum number of seats?

Answer: The given data is represented on a bar graph by:

i. Taking 'Political Party' on the x-axis and seats won on the y-axis with a scale of 1 unit = 10 seats on the y-axis.

ii. Maintaining equal width for all the bars in the x-axis with equal gaps in between them.



(ii) From the graph, it can be observed that the political party 'A' won the maximum number of results.

4. The length of 40 leaves of a plant is measured correctly to one millimetre, and the obtained data is represented in the following table:

S.No.	Length (in mm)	Number of leaves
1.	118 – 126	3
2.	127 – 135	5
3.	136 – 144	9
4.	145 – 153	12
5.	154 – 162	5
6.	163 – 171	4
7.	172 – 180	2

(i) Draw a histogram to represent the given data. [Hint: First, make the class intervals continuous.]

(ii) Is there any other suitable graphical representation for the same data?

(iii) Is it correct to conclude that the maximum number of leaves is 153 mm long? Why?

Answer: (i) From the given data, we can observe that the length of leaves is given in discontinuous class intervals, having a difference of 1 unit in between each

For making the class intervals continuous, we will do the following:

We have to find the difference between the upper limit and the lower limit of a class. We then add half of the resultant difference to each upper limits and subtract the same resultant difference from each of the lower limits. Since the difference between the upper limit and the lower limit of a class is 1 i.e, (127 – 126 = 1). So half of 1 is 0.5.

Now the frequency distribution table is given below.

S.No.	Length (in mm)	Number of leaves
1.	117.5 – 126.5	3
2.	126.5 – 135.5	5
3.	135.5 – 144.5	9
4.	144.5 – 153.5	12
5.	153.5 – 162.5	5
6.	162.5 – 171.5	4
7.	171.5 – 180.5	2

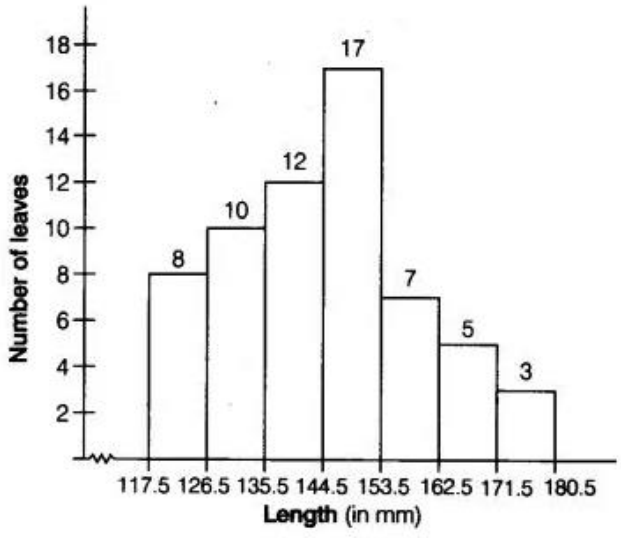
The above data is represented through a histogram as below:

i. Represent length of leaves on the x-axis (in mm) and the number of leaves on the y-axis.

ii. Put a scale of ‘1 unit = 2 leaves on y-axis since the lower-class value is 2 and the highest-class value is 12.

iii. Also, since the interval of first-class is starting from 117.5 and not from zero, we represent it on the graph by making a kink on the x-axis.

iv. Now draw rectangular bars of equal width and the lengths according to the class interval's frequencies.



(ii) The other suitable graphical representation of the given data would be a frequency polygon.

(iii) The maximum number of leaves lie between 144.5 mm and 153.5 mm in length. Hence, we can't conclude that the maximum leaves are 153 mm long.

5. The following table gives the lifetimes of 400 neon lamps.

Life Time (in hours)	Number of Lamps
300 – 400	**14**
400 – 500	**56**
500 – 600	**60**
600 – 700	**86**
700 – 800	**74**
800 – 900	**62**
900 – 1000	**48**

(i) Represent the given information with the help of a histogram.

(ii) How many lamps have a lifetime of more than 700 hours?

Answer: (i) From the data given we plot the histogram as:

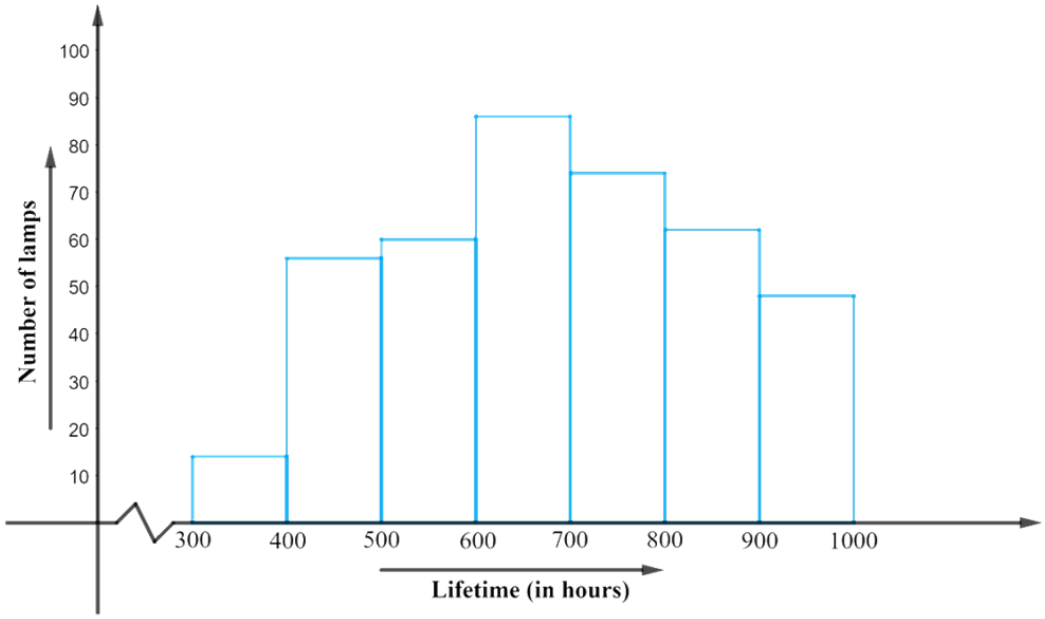
i. Represent the lifetime (in hours) in x-axis.

ii. Represent the number of lamps in y-axis.

iii. Class intervals are from 300-400 till 900-1000

iv. Take "1 unit = 10 lamps" on y–axis as the lowest value of frequency is 14 and the highest is 86.

v. Also, since the first interval is starting from 300 and not '0', we show it by marking a 'kink' or a break on the x-axis.



It can be seen from the above graph that:

(ii) The number of neon lamps having their lifetime of more than 700 hours lies in the class intervals 700 – 800, 800 – 900, 900 – 1000.

Hence, their corresponding frequencies when added up will be (74 + 62 + 48) = 184 lamps.

6. The following table gives the distribution of students of two sections according to the marks obtained by them:

Section A		Section B	
Marks	Frequency	Marks	Frequency
0 – 10	3	0 – 10	5
10 – 20	9	10 – 20	19
20 – 30	17	20 – 30	15
30 – 40	12	30 – 40	10
40 – 50	9	40 – 50	1

Represent the marks of the students of both the sections on the same graph by two frequency polygons. From the two polygons compare the performance of the two sections.

Answer: Frequency polygons can be drawn independently without drawing histograms. This requires the midpoints of the class intervals used in the data. The mid-points are called class-marks.

Class Mark = (Upper Limit + Lower Limit)/2

Now, the data table with the inclusion of class marks is as follows:

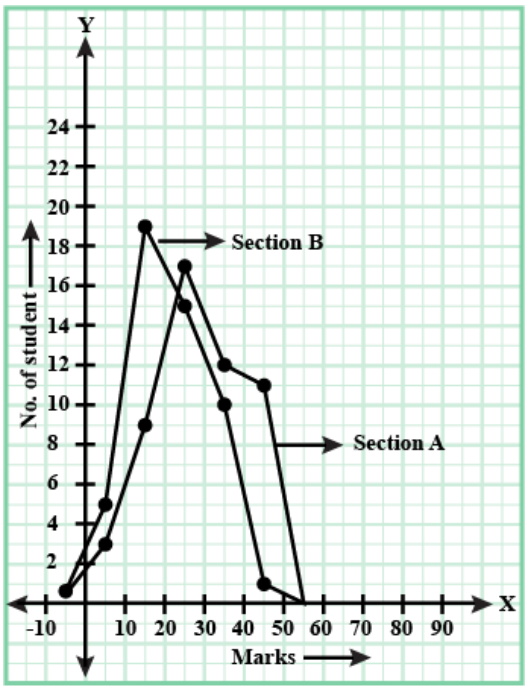
For section A,

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

For section B,

Marks	Class-marks	Frequency
0-10	5	5
10-20	15	19
20-30	25	15
30-40	35	10
40-50	45	1

Representing these data on a graph using two frequency polygon, we get



Class Marks	Section A frequency	Section B frequency
5	3	5
15	9	19
25	17	15
35	12	10
45	9	1

7. The runs scored by two teams, A and B, on the first 60 balls in a cricket match are given below.

Number of balls	Team A	Team B
1–6	2	5
7–12	1	6
13–18	8	2
19–24	9	10
25–30	4	5
31–36	5	6
37–42	6	3
43–48	10	4
49–54	6	8
55–60	2	10

Represent the data of both the teams on the same graph by frequency polygons. [Hint: First make the class intervals continuous.]

Answer:

i. It can be observed from the given data that the class intervals of the given data are not continuous. There is a gap of '1' unit between them. So, to make the class intervals continuous, 0.5 has to be added to every upper-class limit and 0.5 has to be subtracted from the lower-class limit:

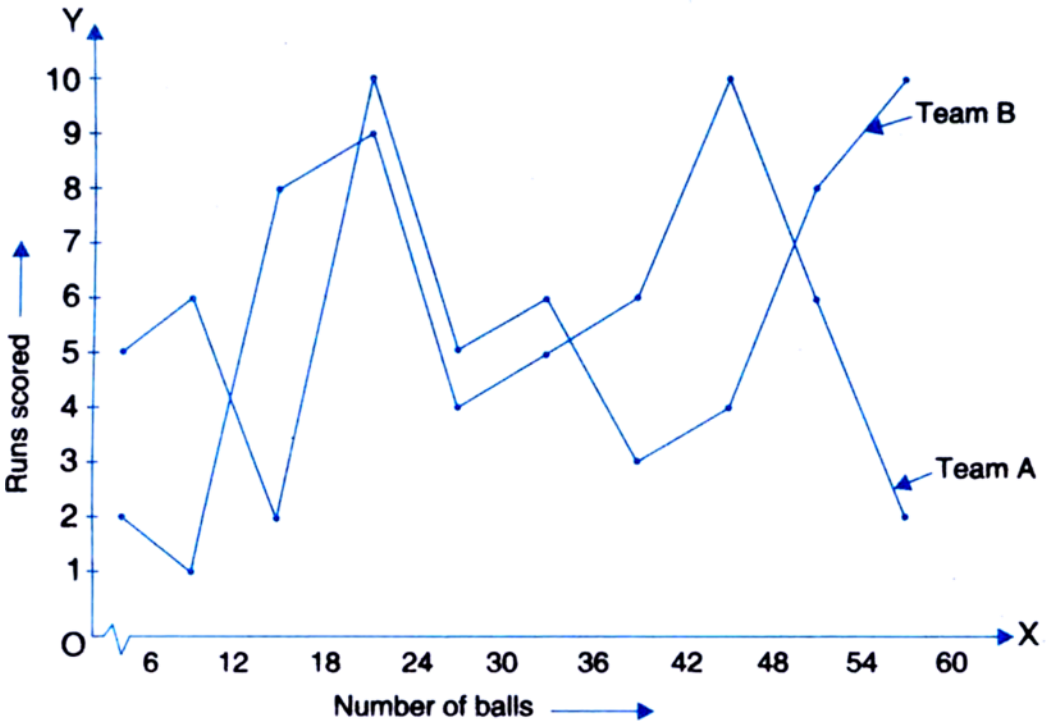
ii. The number of balls class mark can also be found as shown below:
Class Mark = (Upper Limit + Lower Limit) / 2

The data table with continuous interval and with class mark is as below:

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

The frequency polygon for the above data can be constructed by

- Number of balls on x-axis using class mark values.
- Runs scored on y-axis with an approximate scale of "1 unit = 1 run" as the lowest run is 1 and the highest is 10.



8. A random survey of the number of children of various age groups playing in a park was found as follows:

Age (in years)	Number of children
1 – 2	5
2–3	3
3–5	6
5–7	12
7–10	9
10–15	10
15 – 17	4

Draw a histogram to represent the data above.

Answer:

i. From the given data, we can observe that the class intervals have varying widths. This will make the rectangular bars have varying widths and will give us a misleading picture of the data.

ii. The areas of the rectangles should be proportional to the frequencies in a histogram.

iii. So, we need to make certain modifications in the lengths so that area is proportional to the frequencies.

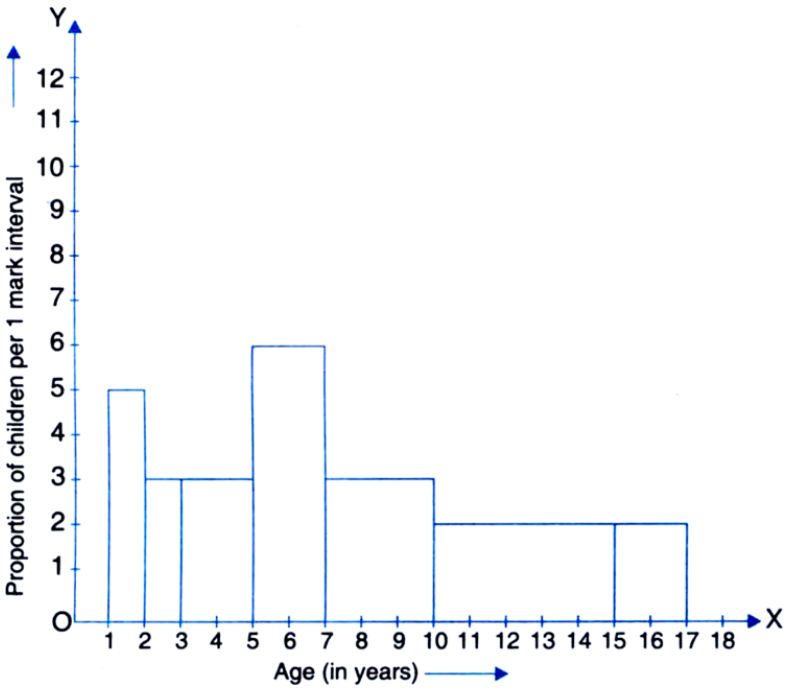
iv. The lengths of the rectangles are then modified to be proportionate to the class size

v. For instance, when the class size is 5, the length of the rectangle is 10. So when the class size is 1, the length of the rectangle will be $10/5 \times 1 = 2$

We will proceed in similar manner, to get the following table:

Age (in years)	**Number of children (frequency)**	**Width of class**	**Length of rectangle**
1-2	5	1	$(5 / 1) \times 1 = 5$
2-3	3	1	$(3 / 1) \times 1 = 3$
3-5	6	2	$(6 / 2) \times 1 = 3$
5-7	12	2	$(12 / 2) \times 1 = 6$
7-10	9	3	$(9 / 3) \times 1 = 3$
10-15	10	5	$(10 / 5) \times 1 = 2$
15-17	4	2	$(4 / 2) \times 1 = 2$

Taking the age of children on x-axis and the proportion of children per year on y-axis, the histogram will be:



9. 100 surnames were randomly picked up from a local telephone directory, and a frequency distribution of the number of letters in the English alphabet in the surnames was found as follows:

Number of letters	Number of surnames
1–4	6
4–6	30
6–8	44
8–12	16
12–20	4

(i) Draw a histogram to depict the given information.
(ii) Write the class interval in which the maximum number of surnames lie.

Answer:

i. It can be observed from the given data that it has class intervals of varying widths.

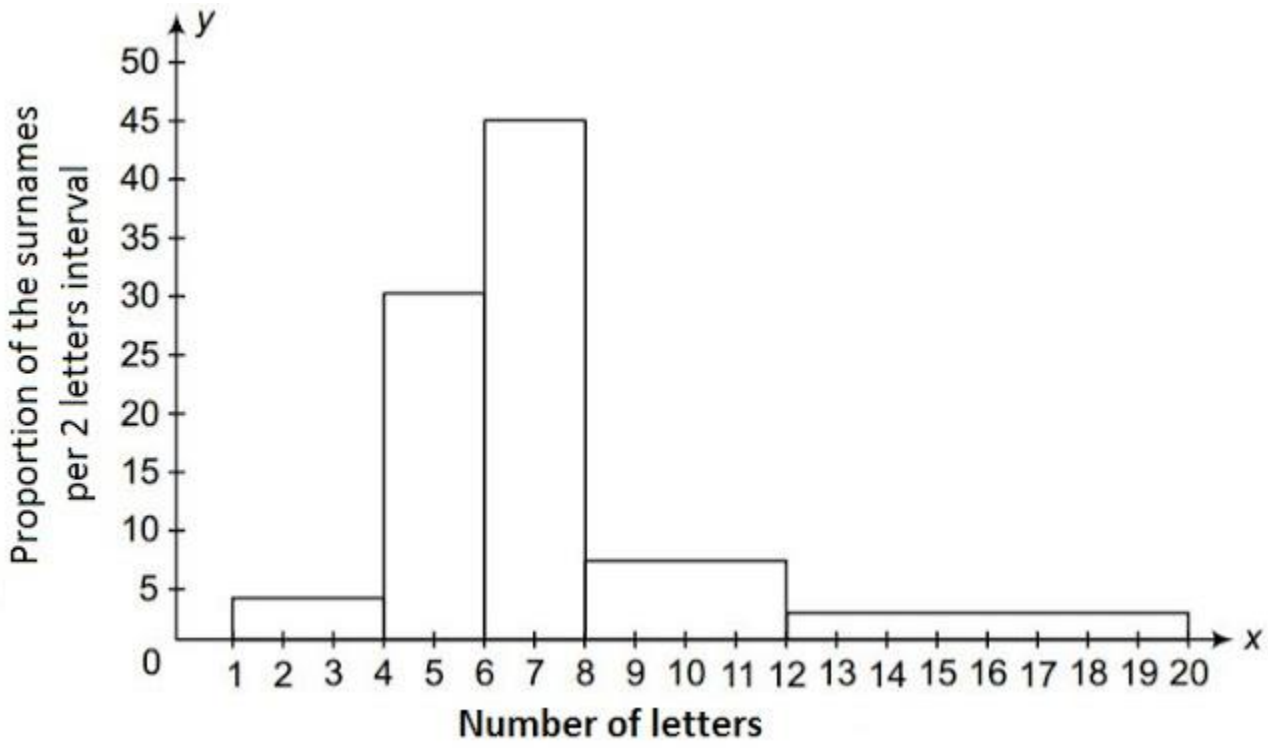
ii. The proportion of the number of surnames per 2 letters (class interval of minimum class size for reference) can be made.

(i) The length of rectangles are calculated as below:

Number of letters	Number of surnames	Width of class	Length of rectangle
1-4	6	3	(6 / 3) × 2 = 4
4-6	30	2	(3 0/ 2) × 2 = 30
6-8	44	2	(44 / 2) × 2 = 44
8-12	16	4	(16 / 4) × 2 = 8
12-20	4	8	(4 / 8) × 2 = 1

We will take the number of letters on the x-axis and the proportion of the number of surnames per every 2-letter interval on the y-axis.

We will choose an appropriate scale of 1 unit = 4 surnames for the y-axis. The histogram can be constructed as follows:



(ii) The class interval in which the maximum number of surnames lie is 6 – 8.

Exercise 14.4

1. The following number of goals were scored by a team in a series of 10 matches:

2, 3, 4, 5, 0, 1, 3, 3, 4, 3

Find the mean, median and mode of these scores.

Answers: Given - Number of goals that was scored by a team in a series of 10 matches

The mean (or average) of a number of observations is the sum of the values of all the observations divided by the total number of observations.

The median is the value of the given number of observations, which divides it into exactly two parts. So, when the data is arranged in ascending (or descending) order the median of ungrouped data can be calculated based on the number of observations being even or odd.

The mode is the value of the observation which occurs most frequently.

The number of goals scored by the team is

2, 3, 4, 5, 0, 1, 3, 3, 4, 3

Mean of data = Sum of all observation/Total number of observations

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

Mean score = (2 + 3 + 4 + 5 + 0 + 1 + 3 + 3 + 4 + 3) / 10

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

= 2.8 goals

Arranging the number of goals in ascending order, 0, 1, 2, 3, 3, 3, 3, 4, 4, 5

The number of observations is 10, which is an even number. Therefore, the median score will be the average of 10/2 i.e., 5th and 10/2 + 1 i.e., 6th observation while arranged in ascending or descending order.

Median Score $= \frac{\left(\frac{n}{2}\right)^{th} observaton + \left(\frac{n}{2}+1\right)^{th} observation}{2}$

$= \frac{\left(\frac{10}{2}\right)^{th} observaton + \left(\frac{10}{2}+1\right)^{th} observation}{2}$

$= \frac{(5)^{th}\text{th observation} + (5+1)^{th}\text{ observation})}{2}$

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

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

Mode of data is the observation with the maximum frequency in data.

Therefore, the mode score of data is 3 as it has a maximum frequency of 4 in the data.

2. In a mathematics test given to 15 students, the following marks (out of 100) are recorded.

41, 39, 48, 52, 46, 62, 54, 40, 96, 52, 98, 40, 42, 52, 60
Find the mean, median and mode of this data.

Answer: The mean (or average) of a number of observations is the sum of the values of all the observations divided by the total number of observations.

The median is the value of the given number of observations, which divides it into exactly two parts. So, when the data is arranged in ascending (or descending) order the median of ungrouped data can be calculated based on the number of observations being even or odd.

The mode is that value of the observation which occurs most frequently.

The marks of 15 students in mathematics test are:

41, 39, 48, 52, 46, 62, 54, 40, 96, 52, 98, 40, 42, 52, 60

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

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

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

Arranging the scores obtained by 15 students in ascending order,

39, 40, 40, 41, 42, 46, 48, 52, 52, 52, 54, 60, 62, 96, 98

As the number of observations is 15 which is odd, therefore, the median of data will be (15 + 1)/2 = 8^{th} observation

Median $= \left(\frac{n}{2} + 1\right)^{th}$

$= \left(\frac{15}{2} + 1\right)^{th} = \frac{16}{2} = 8$

Therefore, the median of the data = 52

The mode of data is the observation with the maximum frequency in data.

Therefore, the mode of this data is 52 having the highest frequency of 3.

3. The following observations have been arranged in ascending order. If the median of the data is 63, find the value of x.

29, 32, 48, 50, x, x+2, 72, 78, 84, 95

Answer: It can be observed that the total number of observations in the given data 29, 32, 48, 50, x, x + 2, 72, 78, 84, 95 is 10 (even number).

Number of observations (n) = 10

Given that Median = 63

Since the number of observations is even, the median can be calculated as

Median $= \frac{\left(\frac{n}{2}\right)^{th} observaton + \left(\frac{n}{2}+1\right)^{th} observation}{2}$

$= \frac{\left(\frac{10}{2}\right)^{th} observaton + \left(\frac{10}{2}+1\right)^{th} observation}{2}$

$= \frac{(5)^{th} observaton + (6)^{th} observation}{2}$

$63 = \frac{(x + x + 2)}{2}$

$63 = \frac{(2x + 2)}{2}$

$63 = x + 1$

$X = 63 - 1$

$\therefore X = 62$

4. Find the mode of 14, 25, 14, 28, 18, 17, 18, 14, 23, 22, 14, 18.

Answer: The mode is the value of the observation, which has the highest frequency.

Arranging the data in ascending order,

14, 14, 14, 14, 17, 18, 18, 18, 22, 23, 25, 28

It can be observed that 14 has the highest frequency, i.e., 4, in the given data.

Therefore, the mode of the given data is 14.

5. Find the mean salary of 60 workers in a factory from the following table.

Salary (in Rs.)	Number of Workers
3000	16
4000	12
5000	10
6000	8
7000	6
8000	4
9000	3
10000	1
Total	60

Answer:

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

$$\bar{x}(\text{Mean}) = \frac{\Sigma fixi}{\Sigma fi} = \frac{305000}{60} = ₹\ 5083.33$$

The mean salary is ₹5083.33.

6. Give one example of a situation in which

(i) the mean is an appropriate measure of central tendency.

(ii) the mean is not an appropriate measure of central tendency, but the median is an appropriate measure of central tendency.

Answer: Extreme values in the data affect the mean. This is one of the drawbacks of mean, so if the data has a few points which are very far from most of the other points (like 1,7,8,9,9), then the mean is not a good representative of this data.

Since the median and mode are not affected by extreme values present in the data, they give a better estimate of the average in such a situation.

When any data has a few observations such that these are very far from the other observations in it, it is better to calculate the median than that of mean as the median gives a better estimate of average in this case.

(i) Consider the following example − The following data represent the heights of the members of a family:

154.9 cm, 162.8 cm, 170.6 cm, 158.8 cm, 163.3 cm, 166.8 cm, 160.2 cm

In this case, it can be observed that the observations in the given data are close to each other.

Therefore, the mean will be an appropriate measure of central tendency.

(ii) The following data represents the marks obtained by 12 students in an exam:

48, 59, 46, 52, 54, 46, 97, 42, 49, 58, 60, 99

In this case, it can be observed that some observations are very far from the other observations.

Therefore, the mean will not be an appropriate measure of central tendency but the median will be an appropriate measure of central tendency.

Alternative Solution:

(i) Mean marks obtained in the examination

(ii) Runs scored by Mahendra Singh Dhoni in 7 matches are

39, 51, 56, 102, 83, 48, 91

Here,

Mean = (39 + 51 + 56 + 102 + 83 + 48 + 91) / 7

= 470 / 7

= 67.1.

Median,

Arranging in ascending order, we get 39, 48, 51, 56, 83, 91, 102

n = 7

Median = $[(n+1)/2]^{th}$ observation

= $((7+1)/2)^{th}$ observation

= $(8/2)^{th}$ observation

= 4^{th} observation

= 56