Chapter 14: Statistics

Exercise 14.1

Question 1: Give five examples of data that you collect from your day-to-day life.
Answer: i) production of rice in the last 6years in our country obtained from the chart.
ii) number of vehicles in our colony
iii) Number of female students in our class
iv) Weight of students in the school
v) Height of the competitors in the match obtained from the newspaper.

Question 2: Classify the data in Q.1 above as primary or secondary data.
Answer: The data collected by a researcher with a specific purpose is called primary data. It is known as raw data (data without fabrication and not tailored data).
The data gathered from a source where it already exists is called secondary data.
Hence, i) and v) are secondary data, whereas ii), iii), iv) are primary data.

Exercise 14.2

Question 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: The required frequency distribution table is

Blood groups	Tally marks	Number of students
A	~~||||~~ ||||	9
B	~~||||~~		6
O	~~||||~~ ~~||||~~ ||	12
AB	|||	3
Total		30

From the above table, we have The most common blood group is O. The rarest blood group is AB.

Question 2: The distance (in km) of 40 engineers from their residence to their place of work were 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: Here, the observation with minimum and maximum values are 2 and 32, respectively.
therefore, the class intervals are as follows:
0 to 5,
5 to 10
10 to 15
15 to 20
20 to 25
25 to 30
30 to 35
The required frequency distribution table is,

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

From the above table, we observe that:

(i) the frequencies of class intervals 5-10 and 10 – 15 are equal, i.e., 11 each. It shows that many engineers have their residences at 5 to 15 km away from their workplace.
(ii) the frequencies of class intervals 20 – 25 and 25 – 30 are also equal, i.e., each. It shows that a minimum number of engineers have their residences at 20 to 30 km away from their workplace.

Question 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 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: Here, the lowest value of observation = 84.9
The highest value of observation = 99.2
So, class intervals are,
84 to 86
86 to 88
88 to 90, ……. , 98 to 100

(i) Thus, the required frequency distribution table is,

Relative humidity (in %)	Tally marks	Frequency
84 – 86	I	1
86 – 88	I	1
88 – 90	II	2
90 – 92	II	2
92 – 94	ⅢⅢ II	7
94 – 96	ⅢⅢ I	6
96 – 98	ⅢⅢ II	7
98 – 100	IIII	4
Total		30

(ii) Since, the relative humidity is high during the rainy season, the data appears to in the rainy season.
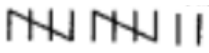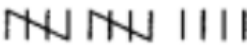
(iii) Range = (Highest observation) – (Lowest observation)
          = 99.2 – 84.9 = 14.3

Question 4: The heights of 50 students, measured to the nearest centimetres are as follows,

161 150 154 165 168 161 154 162 150 151
162 164 171 165 158 154 156 172 160 170
153 159 161 170 162 165 166 168 165 164
154 152 153 156 158 162 160 161 173 166
161 159 162 167 168 159 158 153 154 159

    i)   **Represent the data given above by a grouped frequency distribution table, taking class intervals as 160 – 165, 165 – 170 etc.**

    ii)   **What can you conclude about their heights from the table?**

Answer: (i) Here, the lowest value of the observation = 150
The highest value of the observation = 173
therefore, Class intervals are 150 – 155, 155 -160, …, 170 – 175.
The required frequency distribution table is,

Heights	Tally marks	Number of students
150 – 155	ꌗꌗ II	12
155 – 160	ꌗ IIII	9
160 – 165	ꌗꌗ IIII	14
165 – 170	ꌗꌗ	10
170 – 175	ꌗ	5
Total		50

(ii) From the above table, we can conclude that more than 50% of the students are shorter than 165 cm.

Question 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) Here, the lowest value of the observation = 0.01
The highest value of the observation = 0.22
therefore, Class intervals are 0.00 – 0.04, 0.04 – 0.08, ……., 0.20 – 0.24
The required frequency distribution table is,

The concentration of Sulphur dioxide (in ppm)	Tally marks	Number of days
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) The concentration of sulphur dioxide was more than 0.11 ppm for 8 days.

Question 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: The required frequency distribution table is,

Number of heads occurring	Tally marks	Frequency
0	𝖭𝖧𝖩 𝖨	6
1	𝖭𝖧𝖩 𝖭𝖧𝖩	10
2	𝖭𝖧𝖩 𝖨𝖨𝖨𝖨	9
3	𝖭𝖧𝖩	5
Total		30

Question 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) The required frequency distribution table,

Digits	Tally marks	Frequency
0	𝖨𝖨	2
1	𝖭𝖧𝖩	5
2	𝖭𝖧𝖩	5
3	𝖭𝖧𝖩 𝖨𝖨𝖨	8
4	𝖨𝖨𝖨𝖨	4
5	𝖭𝖧𝖩	5
6	𝖨𝖨𝖨𝖨	4

7	||||	4
8	ⅢⅡ	5
9	ⅢⅡ |||	8
Total		50

(ii) The most frequently occurring digits are 3 and 9, and the least frequently occurring digit is 0.

Question 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 as 5 – 10.
(ii) How many children watched television for 15 or more hours a week?

Answer: (i) Here, the lowest value of the observation = 1 and the highest value of the observation = 17
therefore, Class intervats are 0 – 5, 5 – 10 ., 15 – 20
The required frequency distribution table is,

Number of hours	Tally marks	Number of children
0 – 5	ⅢⅡ ⅢⅡ	10
5 – 10	ⅢⅡ ⅢⅡ |||	13
10 – 15	ⅢⅡ	5
15 – 20	||	2
Total		30

(ii) Number of children who watched television for 15 or more hours in a week = 2.

Question 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 the interval 2 – 2.5.

Answer: Here, the lowest value of the observation = 2.2
and the highest value of the observation = 4.6
therefore, Class intervals are 2.0 – 2.5, 2.5 – 3.0, …., 4.5 – 5.0
The required frequency distribution table is,

Life of batteries (in years)	Tally marks	Number of batteries
2.0 – 2.5	||	2
2.5 – 3.0	ⅢⅠ	6
3.0 – 3.5	Ⅲ Ⅲ ||||	14
3.5 – 4.0	Ⅲ Ⅲ |	11
4.0 – 4.5	||||	4
4.5 – 5.0	|||	3
Total		40

Exercise 14.3

Question 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 %)

Sl. No.	Causes	Female fatality rate (in %)
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 significant role in the cause in (ii) above being the major cause.

Answer: (i) The required graphical representation is shown as follows:
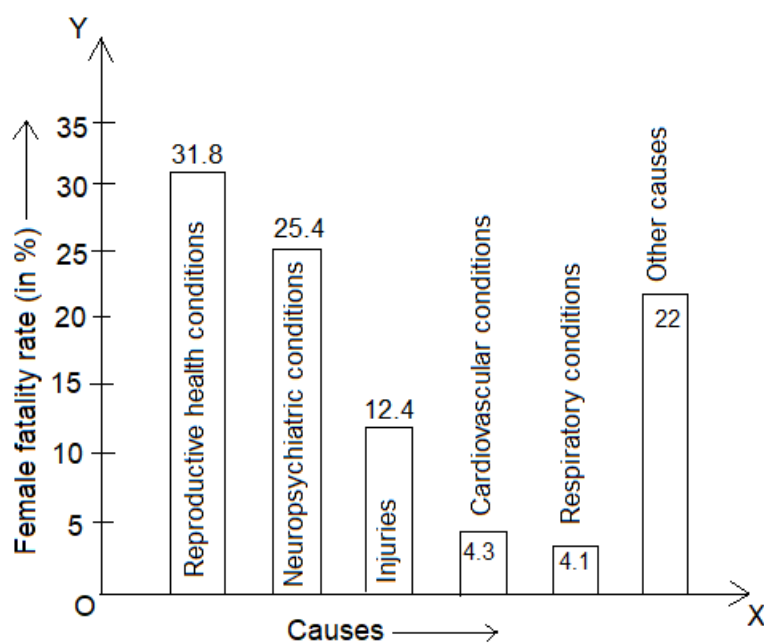
(ii) The major cause of women's ill health and death worldwide is 'reproductive health conditions'.
(iii). Two factors may be un education and low background.

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

Section	Number of girls per thousands of boys
Scheduled caste (SC)	940
Scheduled Tribe (ST)	970
Non-SC/ST	920
Backward districts	950
Non-backwards districts	920

Rural	930
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)
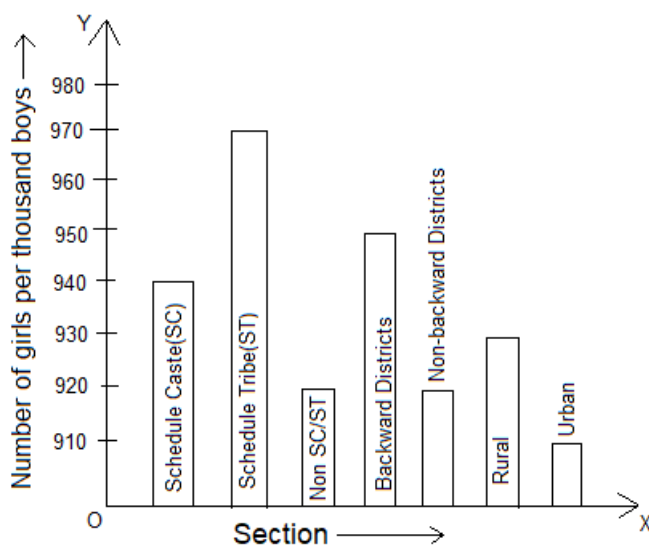
(ii) We conclude that several girls per thousand boys are maximum in scheduled tribe section whereas minimum in an urban area.
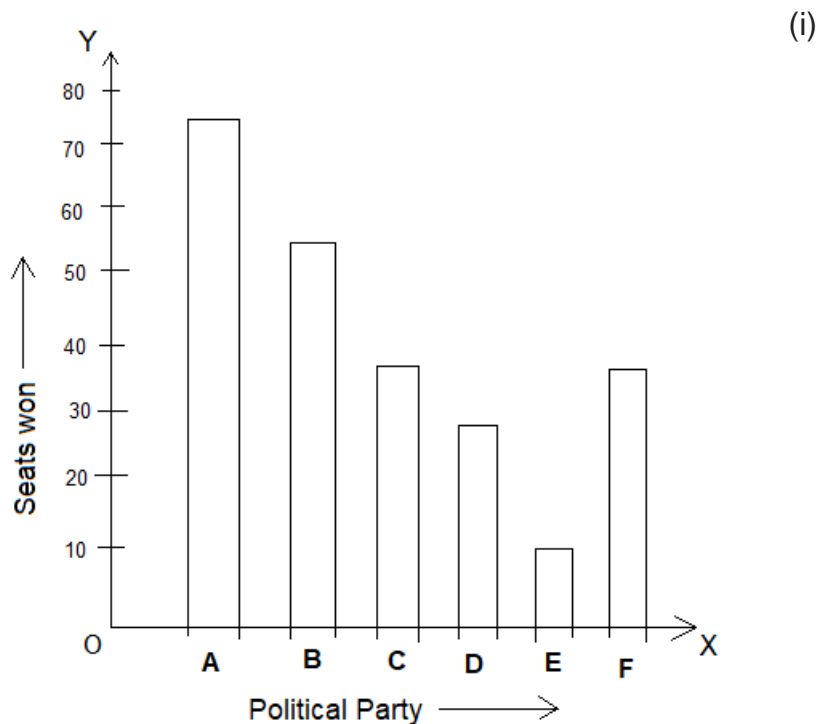
Question 3: Given below are the seats won by different political parties in the polling outcome of a state assembly elections

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

E	10
F	37

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

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

Answer: (i)

(ii) The political party A won the maximum number of seats.

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

Length (in mm)	Number of leaves
118 – 126	3
127 – 135	5

136 – 144	9
145 – 153	12
154 – 162	5
163 – 171	4
172 – 180	2

(i) Draw a histogram to represent the given data.
(ii) Is there any other suitable graphical representation for the same data?
(iii) Is it correct to conclude that the maximum number of leaves 153 mm long and Why?

Answer: (i) The given frequency distribution table is not continuous. Therefore, first, we have to modify it to be a constant distribution.

Thus, the modified frequency distribution table is:

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, the required histogram of the frequency distribution is shown below:
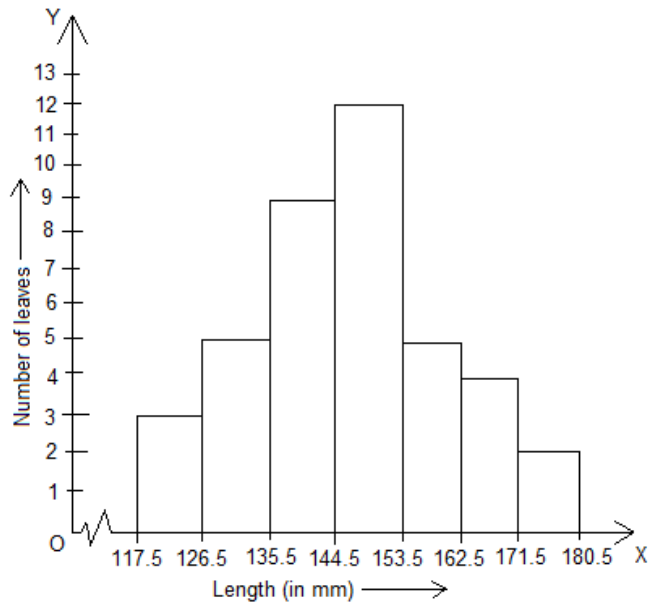
(ii) Yes, another suitable graphical representation is a 'frequency polygon'.

(iii) No, it is not a correct statement. The maximum number of leaves lie in the class interval of 145 – 153.
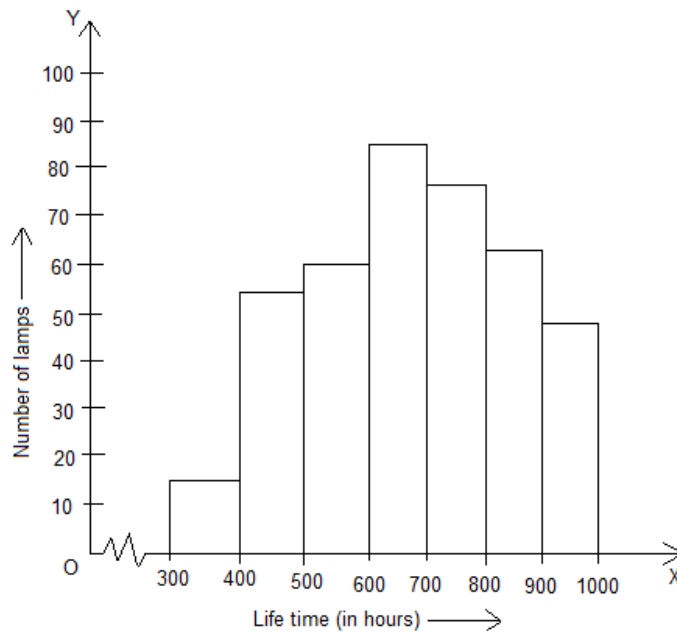
Question 5: The following table gives the lifetimes of 400 neon lamps

Lifetime (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 700 h?

Answer:

(ii) Number of lamps having life time of more than 700 hours = 74 + 62 + 48 = 184.

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

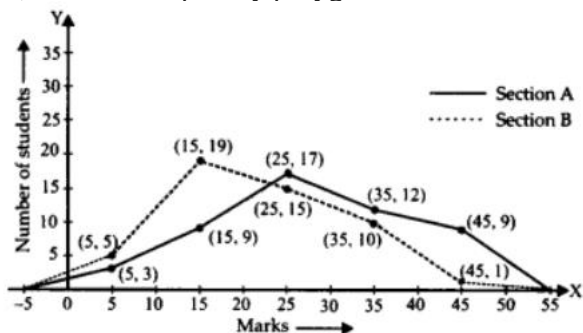| Section A		Section B	
Marks	Frequency	Marks	Frequency
0 – 10	3	0 – 10	5
10 – 20	9	10 – 20	19

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 teams.

Answer: To draw a frequency polygon, we mark the class marks along the x-axis. Therefore, the modified table is:

Marks	Class	Frequency of section A	Frequency of section B
0 – 10	5	3	5
10 – 20	15	9	19
20 – 30	25	17	15
30 – 40	35	12	10
40 – 50	45	9	1

So, the two frequency polygons are as shown below:

From the above frequency polygon, we can see that more students of section A have secured well.

Question 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.

Answer: The given class intervals are not continuous. Therefore, we first modify the distribution as constant.

Number of Balls	Class Marks	Frequency Team A	Frequency 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, the required frequency polygons are as shown below:
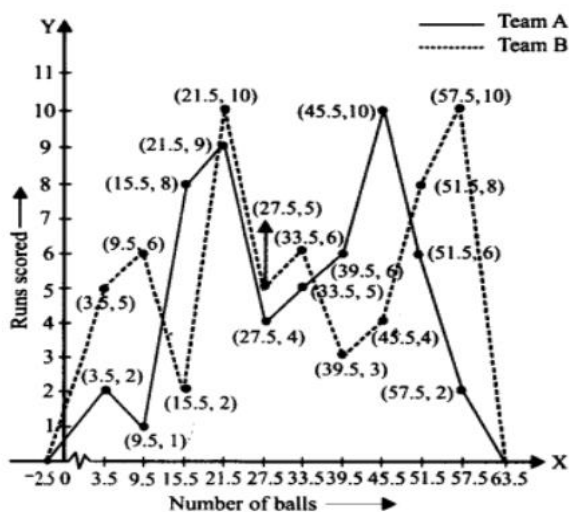
Question 8: A random survey of the number of children of various age groups playing in a park was found as follows:

Age (in years)	Number of children
1 – 2	5
2 – 3	6
3 – 5	3

5 – 7	12
7 – 10	9
10 – 15	10
15 - 17	4

Draw a histogram to represent the data above.

Answer: Here, the class sizes are different. So, we need to calculate the adjusted frequencies corresponding to each rectangle, i.e., the rectangle's length.

$$Adjusted\ frequency\ or\ length\ of\ the\ rectangle$$
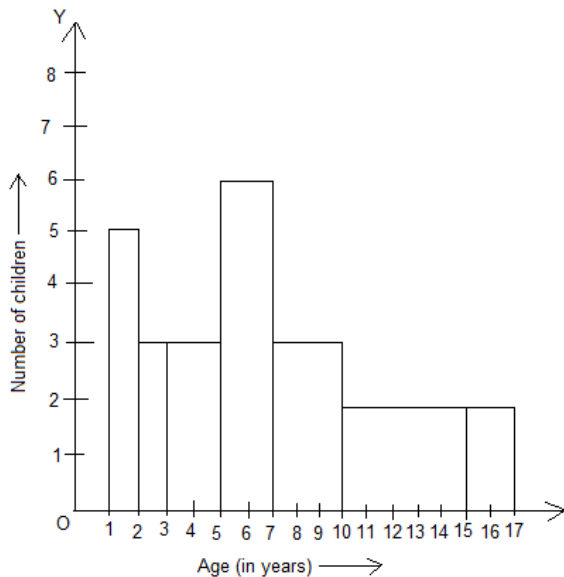$$= \left[\frac{minimum\ class\ size}{class\ size}\right] \times Frequency$$

Here, the minimum class size = 2 – 1 = 1
Therefore, We have the following table for adjusted frequencies or length of rectangles:

Age (in years)	Frequency	Width of the class	Length of the rectangle
1 – 2	5	1	$\frac{1}{1} \times 5 = 5$
2 – 3	6	1	$\frac{1}{1} \times 3 = 3$
3 – 5	3	2	$\frac{1}{2} \times 6 = 3$
5 – 7	12	2	$\frac{1}{2} \times 12 = 6$
7 – 10	9	3	$\frac{1}{3} \times 9 = 3$
10 – 15	10	5	$\frac{1}{5} \times 10 = 2$

15 – 17	4	2	$\frac{1}{2} \times 4 = 2$

Now, the required histogram is shown below:

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

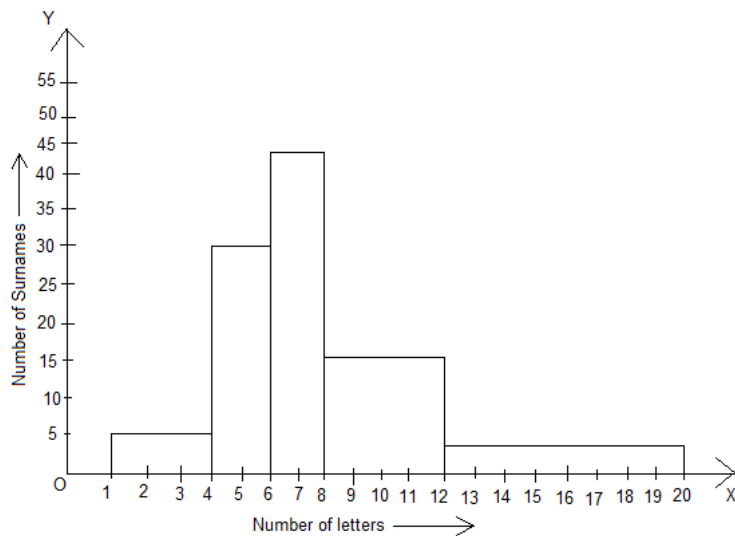| Number of letters	Number of surnames
1 – 4	6
4 – 6	30
6 – 8	44
8 – 12	16
12 - 20	4

    (i)   **Draw a histogram to depict the given information.**

    (ii)   **Write the class interval in which the maximum number of surnames lie.**

Answer: (i) Since class intervals of the given frequency distribution are unequal, the minimum class size = 6 – 4 = 2.
Therefore, we have the following table for the length of rectangles:

Number of letters	Frequency	Width of the class	Length of the rectangle
1 – 4	6	3	$\dfrac{2}{3} \times 6 = 4$
4 – 6	30	2	$\dfrac{2}{2} \times 30 = 30$
6 – 8	44	2	$\dfrac{2}{2} \times 44 = 44$
8 – 12	16	4	$\dfrac{2}{4} \times 16 = 8$
12 – 20	4	8	$\dfrac{2}{8} \times 4 = 1$

The required histogram is shown below:

(ii) The maximum frequency is 44, corresponding to the class interval 6 – 8.
Therefore, a Maximum number of surnames lie in the class interval 6 – 8.

Exercise 14.4

Question 1: A team scored the following number of goals 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.

Answer: To find the mean, here, n=10

$$\bar{x} = \frac{\sum_{i=1}^{n=10} x_i}{n}$$

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

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

Thus, mean = 2.8

To find median:
Now arranging the given data in ascending order,
we have 0,1, 2, 3, 3, 3, 3, 4, 4, 5
given, n = 10, an even number

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

$$= \frac{\frac{10}{2}th\ term + \left(\frac{10}{2}+1\right)th\ term}{2}$$

$$= \frac{5th\ term + 6th\ term}{2} = \frac{3+3}{2} = \frac{6}{2} = 3.$$

Thus, median = 3

To find mode:
In the given data, observation 3 occurs four times,
i.e., a maximum number of times.
Thus, mode = 3

Question 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: To find the mean, here, n=15

$$\bar{x} = \frac{\sum_{i=1}^{n=15} x_i}{n}$$

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

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

Thus, mean = 54.8

To find median:
Arranging the given data in ascending order,
we have 39, 40, 40, 41, 42, 46, 48, 52, 52, 52, 54, 60, 62, 96, 98
n = 15, an odd number.

Median $= \left(\frac{n+1}{2}\right)$th term
$= \left(\frac{15+1}{2}\right)$the term
$= \left(\frac{16}{2}\right)$the term
$= 8^{th}$ term
$= 52$

Thus, median = 52

To find mode:
In the given data, the observation 52 occurs three times,
i.e., the maximum number of times.
Thus, mode = 52

Question 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: Here, the given observations are in ascending order.
Since, n = 10 (an even number)

$$median = \frac{\frac{n}{2}th\ term + \left(\frac{n}{2}+1\right)th\ term}{2}$$

$$= \frac{\frac{10}{2}th\ term + \left(\frac{10}{2}+1\right)th\ term}{2}$$

$$= \frac{5th\ term + 6th\ term}{2}$$

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

$$= \frac{2x+2}{2} = (x+1)$$

Since, median = 63 [Given]
since, x + 1 = 63
or, x = 63 – 1 = 62
Thus, the required value of x is 62.

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

Answer: Arranging the given data in ascending order, we have 14, 14, 14, 14, 17, 18, 18, 18, 22, 23 25, 28.
Since observation 14 is occurring the maximum number of times (i.e. four times) therefore, Mode of the given data = 14

Question 5: Find the mean salary of 60 workers of a factory from the following table

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

Answer:

Salary (in rupees) (x_i)	Number of workers (f_i)	$f_i x_i$
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	$\sum_{i=1}^{8} f_i = 60$	$\sum_{i=1}^{8} f_i x_i = 305000$

Thus, the required mean salary = Rs. 5083.33

Question 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 central tendency measure.

Answer: (i) Mean height of the students of a class.
(ii) Median weight of a pen, a book, a rubber band, a matchbox and a chair.

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