

## Lesson at a Glance

1. Data are collected for a definite purpose.
2. Primary data is obtained by the investigator himself or herself.
3. Secondary data is obtained from a source which already had the information stored.
4. Methods of graphical representation of data are:  
(i) Bar graph (ii) Histogram (iii) Frequency polygon.
5. Mean, median and mode are the three measures of central tendency.
6. Mean is computed by adding all the values of the observations and dividing it by the total number of observations.
7. Mean is denoted by  $\bar{x}$ .

8. Mean of  $n$  observations,  $\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$ .

9. Mean is also calculated by,  $\bar{x} = \frac{\sum_{i=1}^n f_i x_i}{\sum_{i=1}^n f_i}$ .

10. Median is the value of the middle-most observation(s).
11. If the number  $n$  of observations is odd, then

$$\text{median} = \text{value of } \left( \frac{n+1}{2} \right)^{\text{th}} \text{ observation.}$$

12. If the number  $n$  of the observations is even, then

median = mean of the values of the  $\left(\frac{n}{2}\right)^{\text{th}}$  and the  $\left(\frac{n}{2} + 1\right)^{\text{th}}$  observations.

$$\text{i.e., Median} = \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{ observation} + \left(\frac{n}{2} + 1\right)^{\text{th}} \text{ observation}}{2}$$

13. Mode is the most frequently occurring observation.

14. Mode = 3 median - 2 mean.

## TEXTBOOK QUESTIONS SOLVED

### Exercise 14.1 (Page - 239)

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

**Sol.** 1. Number of students in each section of our school.

2. Height of each student of our class.

3. Temperature each day during the month.

4. Number of languages a student of our class knows.

5. Number of metro routes in Delhi and NCR.

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

**Sol.** 1. Primary data.

2. Primary data.

3. Secondary data.

4. Primary data.

5. Secondary data.

### Exercise 14.2 (Pages - 245-246)

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?

Sol.

Blood Group	Tally Marks	Frequency
A	NJ IIII	9
B	NJ I	6
AB	III	3
O	NJ NJ II	12
		Total = 30

As the frequency of blood group O is highest, i.e., 12 and that of AB is shortest, hence O is the most common and AB is the rarest blood group.

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?

Sol.

Distance (in km)	Tally Marks	Frequency
0 - 5	NJ	5
5 - 10	NJ NJ I	11
10 - 15	NJ NJ I	11
15 - 20	NJ IIII	9
20 - 25	I	1
25 - 30	I	1
30 - 35	II	2
		Total = 40

- (i) 11 engineers each have distance 5-10 km and 10-15 km from residence to the place of work.
- (ii) One engineer each has distance between 20-25 km and 25-30 km from residence to the place of work.
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?

Sol.	Relative humidity (in %)	Tally Marks	Frequency
	84 - 86		1
	86 - 88		1
	88 - 90		2
	90 - 92		2
	92 - 94		4
	94 - 96		4
	96 - 98		4
	98 - 100		4
	Total = 30		

- (i) The given data is about the month of September (rainy season).
- (ii) Range =  $99.2 - 84.9 = 14.3$ .
4. The heights of 50 students, measured to the nearest centimetres, have been found to be 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 as a grouped frequency distribution table, taking the class intervals as 160-165, 165-170 etc.  
(ii) What can you conclude about their heights from the table?

**Sol.** (i) Grouped Frequency Distribution Table:

Height (in cm) (C.I.)	Tally Marks	Number of students (Frequency)
150 - 155		12
155 - 160		9
160 - 165		14
165 - 170		10
170 - 175		5
		<b>Total = 50</b>

- (ii) We conclude that the height of more than 50% of the students are shorter than 165 cm each.
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?

**Sol.** (i) Grouped Frequency Distribution Table:

Concentration (in ppm) (C.I.)	Tally Marks	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

(ii) Concentration was more than 0.11 (ppm) for (2 + 4 + 2) days, i.e., 8 days.

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.

Sol. Frequency Distribution Table:

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

7. The value of  $\pi$  upto 50 decimal places is given below:  
 3.14159265358979323846264338327950288419716939937510

- (i) Make a frequency of distribution of the digits from 0 to 9 after the decimal point.
- (ii) What are the most and the least frequently occurring digits?

**Sol.** (i) Frequency Distribution Table:

Digits	Tally Marks	Number of times
0		2
1		5
2		5
3		8
4		4
5		5
6		4
7		4
8		5
9		8
		Total = 50

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

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?

**Sol. (i) Frequency Distribution Table:**

Number of hours (C.I.)	Tally Marks	Number of children (frequency)
0 - 5		10
5 - 10		13
10 - 15		5
15 - 20		2
		<b>Total = 30</b>

(ii) 2 children watched TV for 15 hours or more.

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.

**Sol. Grouped Frequency Distribution:**

Life (in years)	Tally Marks	Number of batteries
2.0 - 2.5		2
2.5 - 3.0		6
3.0 - 3.5		14
3.5 - 4.0		11
4.0 - 4.5		4
4.5 - 5.0		3
		<b>Total = 40</b>



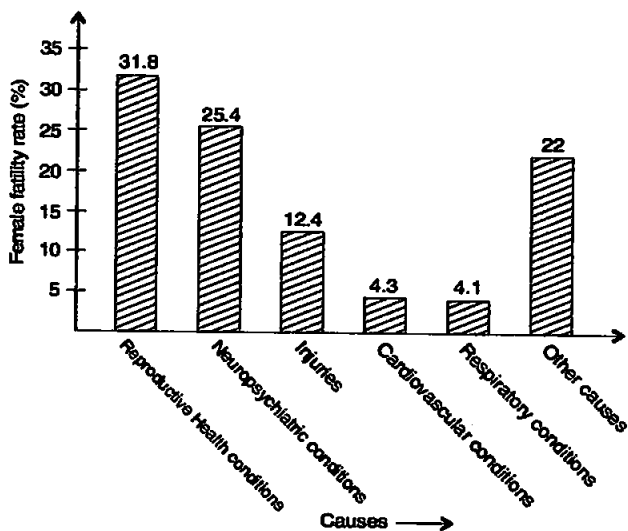
### Exercise 14.3 (Pages – 258-261)

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.

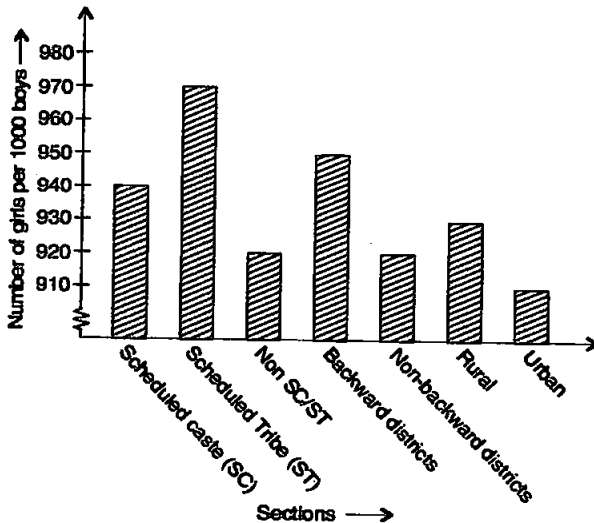
**Sol.** (i) Bar graph representing the causes of female fatality rate (in %):



- (ii) Reproductive health conditions is the major cause of illness and death of women.
- (iii) Two factors are uneducated and poor background.
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 thousand boys
Scheduled Caste (SC)	940
Scheduled Tribe (ST)	970
Non-SC/ST	920
Backward districts	950
Non-backward 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.
- Sol.** (i) Bar graph representing the number of girls (to the nearest ten) per thousand boys in different sections of society.



(ii) The highest percentage of girls per thousand boys and the lowest percentage of boys per thousand boys in different sections of Indian society are from ST and urban sections respectively.

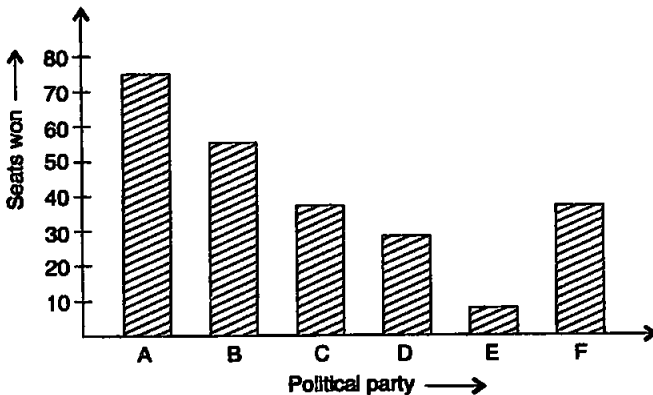
3. Given below are the seats won by different political parties in the polling outcome of a state assembly elections:

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?

**Sol.** (i) Bar graph representing seats won by different political parties in the polling outcome of a state assembly elections:



(ii) Party A won the maximum number of seats.

4. The length of 40 leaves of a plant are 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

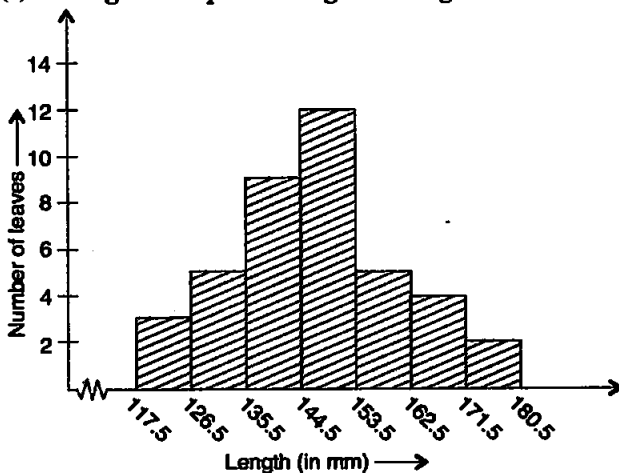
145 - 153	12
154 - 162	5
163 - 171	4
172 - 180	2

- (i) Draw a histogram to represent the given data.  
 [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 are 153 mm long? Why?

**Sol.** Lengths are not in continuous intervals, first we make continuous intervals.

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

- (i) Histogram representing the length of leaves (in mm).



- (ii) Yes, frequency polygon is another graphical representation for the same data.

(iii) No. The given data are in class intervals.

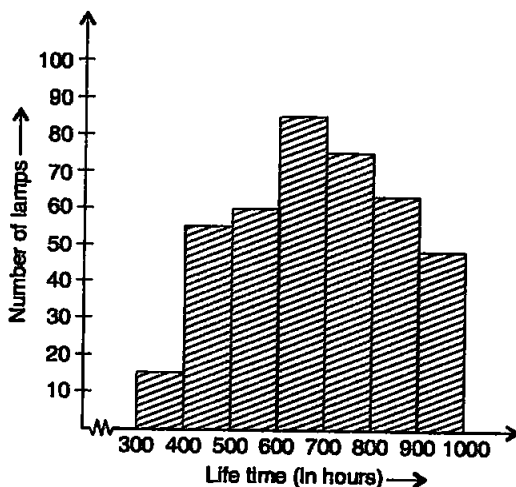
5. The following table gives the life times of 400 neon lamps:

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 life time of more than 700 hours?

Sol. (i) Histogram representing the life times of neon-lamps:



(ii) Number of lamps having life time more than 700 hours is

(74 + 62 + 48), i.e., 184.

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

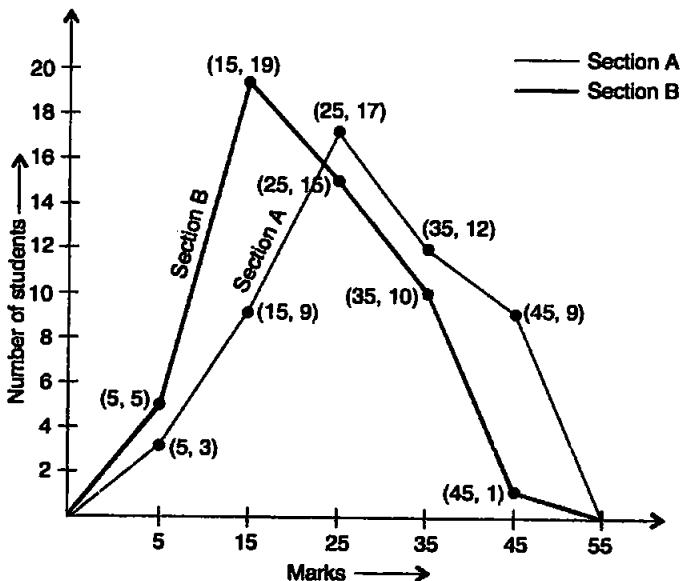
Section A		Section B	
Marks	Frequency	Marks	Frequency
0 - 10	3	0 - 10	5
10 - 20	9	10 - 20	19
20 - 30	17	20 - 30	15
30 - 40	12	30 - 40	10
40 - 50	9	40 - 50	1

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.

**Sol.**

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

Frequency polygons, representing marks of students of both the sections.



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

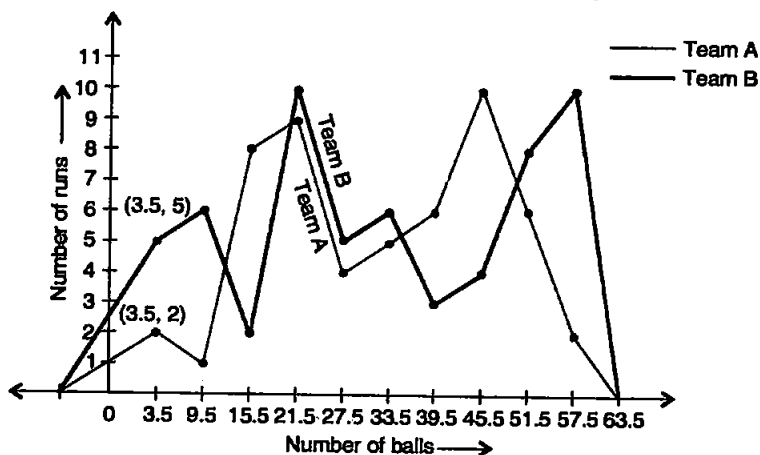
Represent the data of both the teams on the same graph by frequency polygons.

[Hint. First make the class intervals continuous.]

**Sol.** Let us represent the data into continuous class-intervals.

Number of balls	Class Mark	Runs of Team A	Runs of Team B
0.5 - 6.5 (1 - 6)	3.5	2	5
6.5 - 12.5 (7 - 12)	9.5	1	6
12.5 - 18.5 (13 - 18)	15.5	8	2
18.5 - 24.5 (19 - 24)	21.5	9	10
24.5 - 30.5 (25 - 30)	27.5	4	5
30.5 - 36.5 (31 - 36)	33.5	5	6
36.5 - 42.5 (37 - 42)	39.5	6	3
42.5 - 48.5 (43 - 48)	45.5	10	4
48.5 - 54.5 (49 - 54)	51.5	6	8
54.5 - 60.5 (55 - 60)	57.5	2	10

Frequency polygons representing the runs scored by two teams A and B on the first 60 balls are given below.



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

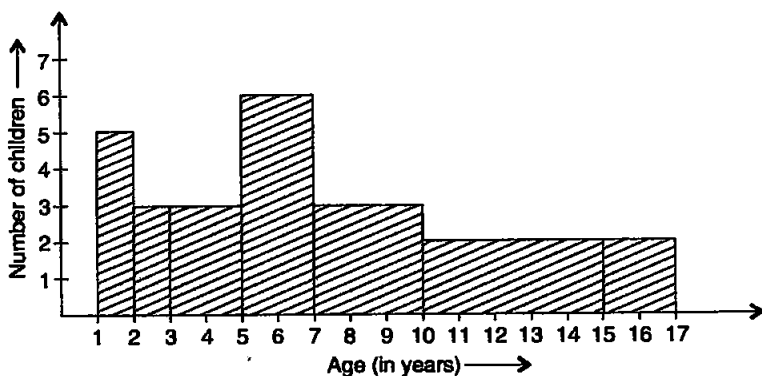
Age (in years)	Number of children
1 - 2	5
2 - 3	3
3 - 5	6
5 - 7	12
7 - 10	9
10 - 15	10
15 - 17	4

Draw a histogram to represent the data above.

Sol.	Age (in years)	Number of children	Class size	Length of the rectangle
	1 - 2	5	1	$\frac{5}{1} \times 1 = 5$
	2 - 3	3	1	$\frac{3}{1} \times 1 = 3$
	3 - 5	6	2	$\frac{6}{2} \times 1 = 3$



5 - 7	12	2	$\frac{12}{2} \times 1 = 6$
7 - 10	9	3	$\frac{9}{3} \times 1 = 3$
10 - 15	10	5	$\frac{10}{5} \times 1 = 2$
15 - 17	4	2	$\frac{4}{2} \times 1 = 2$



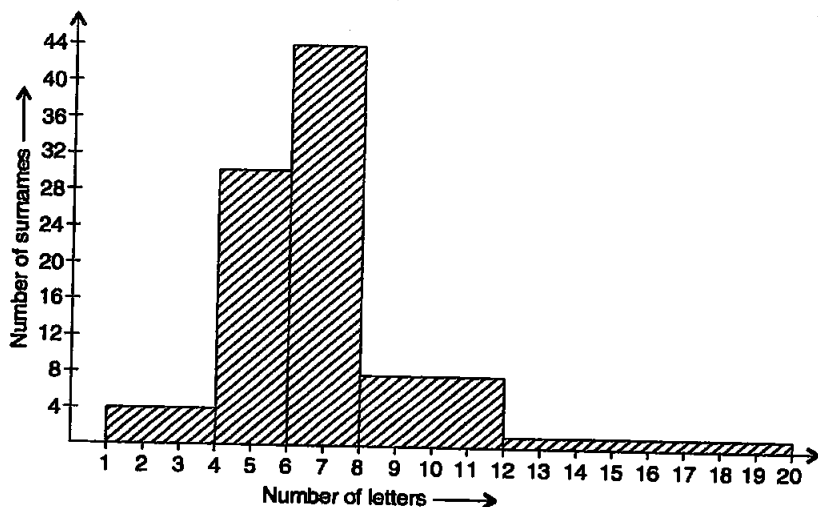
9. 100 surnames were randomly picked up from a local telephone directory and a frequency distribution of the number of letters in the English alphabet in the surnames was found as follows:

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.

Sol.	Number of letters	Number of surnames	Class size	Length of the rectangle
	1 - 4	6	3	$\frac{6}{3} \times 2 = 4$
	4 - 6	30	2	$\frac{30}{2} \times 2 = 30$
	6 - 8	44	2	$\frac{44}{2} \times 2 = 44$
	8 - 12	16	4	$\frac{16}{4} \times 2 = 8$
	12 - 20	4	8	$\frac{4}{8} \times 2 = 1$

- (i) Histogram representing the number of letters in English alphabet in the surnames is given below.



- (ii) Maximum number of surnames lies in the interval 6-8.

### Exercise 14.4 (Page -269)

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.

**Sol.** Arranging the data in ascending order, we get

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

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

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

(ii) For median:  $n = 10$ .

Median is the mean of the values of observations at 5th and the 6th places.

$$\therefore \text{Median} = \frac{3+3}{2} = 3.$$

(iii) Mode: 3 occurs maximum number of times. Hence, mode is 3.

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.

**Sol.** Arranging the data in ascending order, we get

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

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

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

(ii) For median:  $n = 15$ , median is the value of the observation at the  $\frac{15+1}{2}$ th place, i.e., 8th place.

$$\therefore \text{Median} = 52.$$

(iii) Mode: '52' occurs maximum number of times.

$$\therefore \text{Mode} = 52.$$

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.

**Sol.** Given observations: 29, 32, 48, 50,  $x$ ,  $x + 2$ , 72, 78, 84, 95.

Here  $n = 10$ , Median is mean of the values of the

observations at  $\frac{10}{2}$ th, and  $\left(\frac{10}{2} + 1\right)$ th i.e., 5th and 6th

places.

$$\therefore \text{Median} = \frac{x + (x + 2)}{2} \Rightarrow \frac{2x + 2}{2} = 63$$

$$\Rightarrow 2x = 126 - 2 = 124 \Rightarrow x = 62.$$

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

**Sol.** Arranging the data in ascending order, we have

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

We notice 14 occurs maximum number of times.

Hence, the mode is 14.

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

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

**Sol.**

Salary (in ₹) ( $x$ )	Number of workers ( $f$ )	$xf$
3000	16	48000
4000	12	48000
5000	10	50000
6000	8	48000
7000	6	42000
8000	4	32000
9000	3	27000
10000	1	10000
	$\Sigma f = 60$	$\Sigma xf = 305000$

$$\text{Mean} = \frac{\sum xf}{\sum f} = \frac{305000}{60} = 5083.33.$$

Hence, 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.

**Sol.** (i) Mean height of the students of a class.

- (ii) Median weight of a pen, a book, a rubber band, a match box and a chair.

□□