

## Chapter Statistics

### Notes

**Statistics**: It is a branch of mathematics which deals with a collection, presentation, analysis and interpretation of numerical data.

**Data**: The figures or facts which are numerical, collected for a definite purpose is called data.

(i) **Primary / Raw / Ungrouped / Original Data**:

The data obtained in original form are called Raw / Primary data.

(ii) **Secondary / Organized / grouped data**:

The data condensed into groups or classes are called Secondary data.

\* Every group into which the raw data is condensed is called a class-interval.

\* The least number in the class interval is called the lower class-limit and the greatest number is called the upper class-limit.

\* The difference between the upper limit and the lower limit is called the class-size (class interval)

\* 
$$\text{Class Mark} = \frac{\text{Lower limit} + \text{Upper limit}}{2}$$

\* The difference between the maximum value and minimum value of the observation are called range.

**EXERCISE 14.2 (Page 245)**

**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? [NCERT Exemplar]

**Solution:** 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.

Blood group	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.

**EXERCISE 14.2 (Page 249)**

**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? [NCERT Exemplar]

**Solution:** 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.

Blood group	Tally marks	Number of students
A	II III	9
B	II I	6
O	II II II	12
AB	III	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?

**Solution:** The given distance (in km) are:

- ~~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~~

Here, the observation with minimum and maximum value are 2 and 32 respectively.

∴ The first class interval is 0-5,

∴ The classes are:

- 0-5, 5-10, 10-15, 15-20, 20-25, 25-30, 30-35.

The required table is:

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

From the above table we observe that:

- (i) Frequencies of class interval 5-10 and 10-15 are equal, i.e. 11 each. It shows that maximum number of engineers have their residences at 5 to 15 km away from their work place.
- (ii) Frequencies of class intervals 25-30 and 25-30 are also equal, i.e. 1 each. It shows that minimum number of engineers have their residences at 20 to 30 km away from their work place.

**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    92.2    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?

**Solution:** Here, the minimum value of the observation = 84.9

The maximum value of the observation = 99.2

∴ Some of the classes are 84–86 and 86–88, etc.

∴ Class size = 86–84 = 2 or 88–86 = 2

So the classes are: 84–86, 86–88, 88–90, 90–92, ..., 98–100.

(i) Thus, the required frequency table is:

Relative humidity (in %)	Tally marks	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, the relative humidity is high during the rainy season.

∴ The data appears to be taken in the rainy season.

(iii) Since, range = [Highest observation] – [Lowest observation]

$$= 99.2 - 84.9$$

$$= 14.3$$

**Question 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 by 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? [NCERT Exemplar]

**Solution:** (i) Here, the lowest value of the observation = 150

The Highest value of the observation = 173

∴ Classes are: 150–155, 155–160, ... 170–175.

Heights	Tally marks	Number of students
150-155		12
155-160		9
160-165		14
165-170		10
170-175		5
Total		50

(ii) Conclusions: 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?

**Solution:** (i)

Concentration of sulphur dioxide (in ppm)	Tally marks	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) The concentration of sulphur dioxide more than 0.11 parts was 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.

**Solution:** The required frequency distribution is as follows:

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

**Question 7.** The value of  $\pi$  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? [NCERT Exemplar]

**Solution:** (i)

Digits	Tally marks	Frequency
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 frequently occurring digits are 3 and 9.

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?

**Solution:** Here, the lowest observation = 1  
 The highest observation = 17

The classes are: 0-5, 5-10, 10-15, ..., 15-20.

(i) The required frequency distribution is as under.

Number of hours	Tally marks	Frequency
0-5		10
5-10		13
10-15		5
15-20		2
Total		30

(ii) Number of children who watched TV for 15 or more hours 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 2.6

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

**Solution:** Here, the lowest observation = 2.2 years

The highest observation = 4.6 years

The classes are: 2-2.5, 2.5-3.0, 3.0-3.5, ..., 4.5-5.0

Thus, required grouped frequency distribution table is as under.

Life of batteries (in years)	Tally marks	Frequencies
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
Total		40



$$\text{Class mark} = \frac{\text{Upper Limit} + \text{Lower Limit}}{2}$$

*Note:* In case both the histogram and frequency polygon are to be drawn, it is advisable first to draw histogram and then join the mid-points of the tops of the rectangles of the histogram to get frequency-polygon.

## NCERT TEXTBOOK QUESTIONS SOLVED

### EXERCISE 14.3 (Page 258)

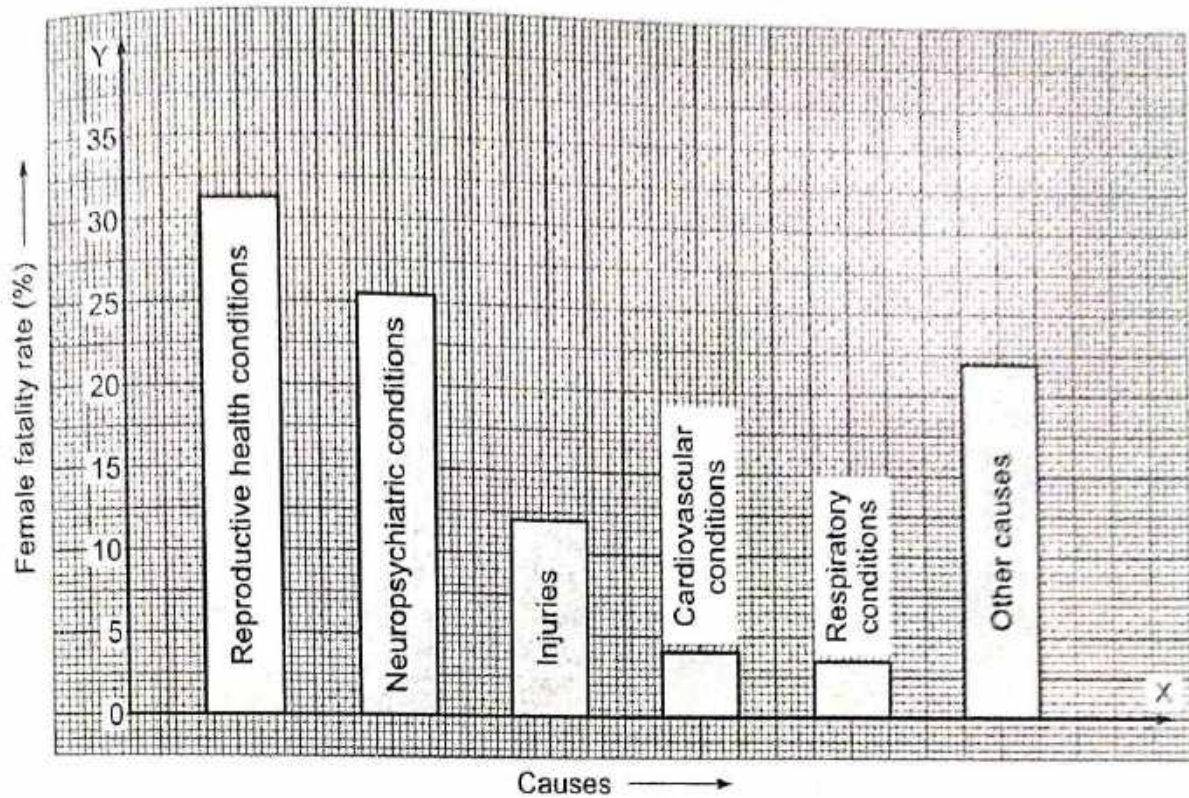
*Question 1.* A survey conducted by an organisation for the cause of illness and death among the women between the ages 15–44 (in years) worldwide, found the following figures (in %):

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

Solution: (i) The required graphical representation is given below:



(ii) The major cause of women's ill health and death worldwide is 'reproductive health conditions'.

(iii) The two factors are:

(a) Deficiency disease

(b) Improper diets.

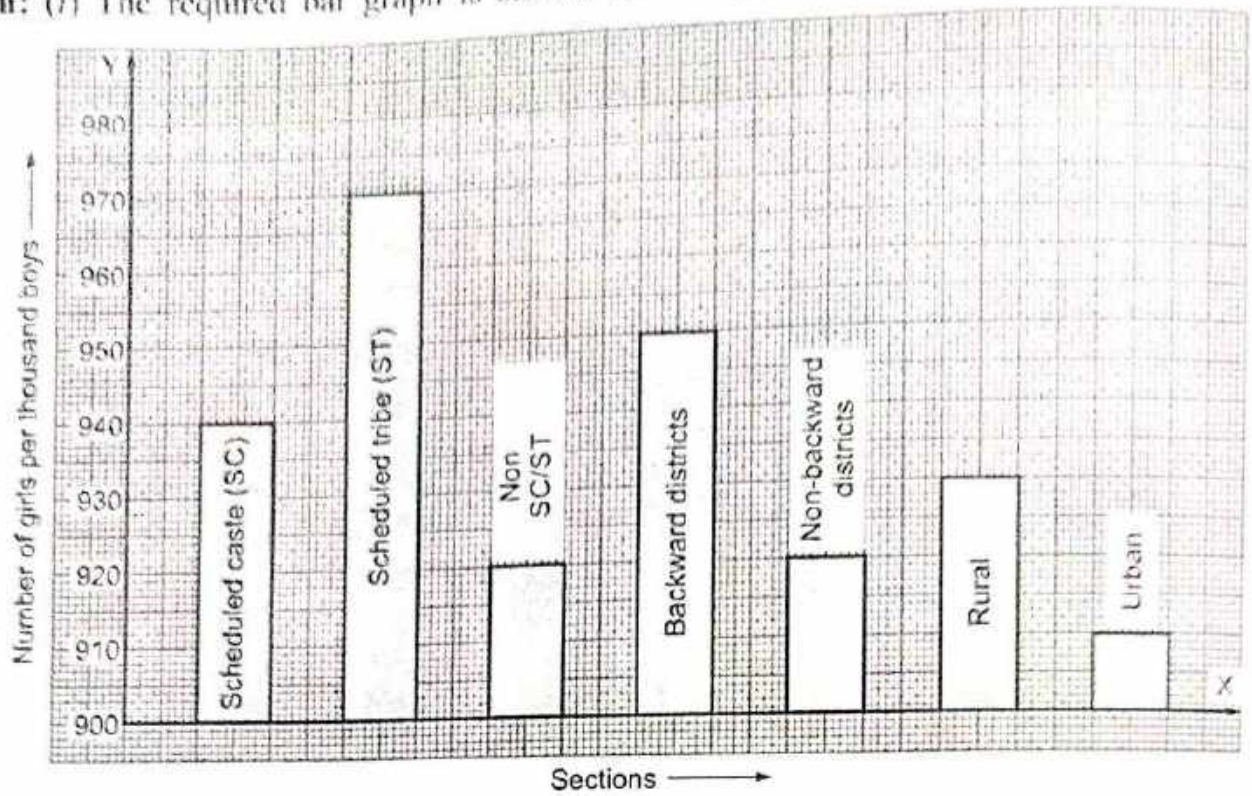
Question 2. The following data on the number of girls (to the nearest ten) per thousand boys in different sections of Indian society is given below.

Section	Number of girls per 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 above information by a bar graph.

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

**Solution:** (i) The required bar graph is shown in the figure below.



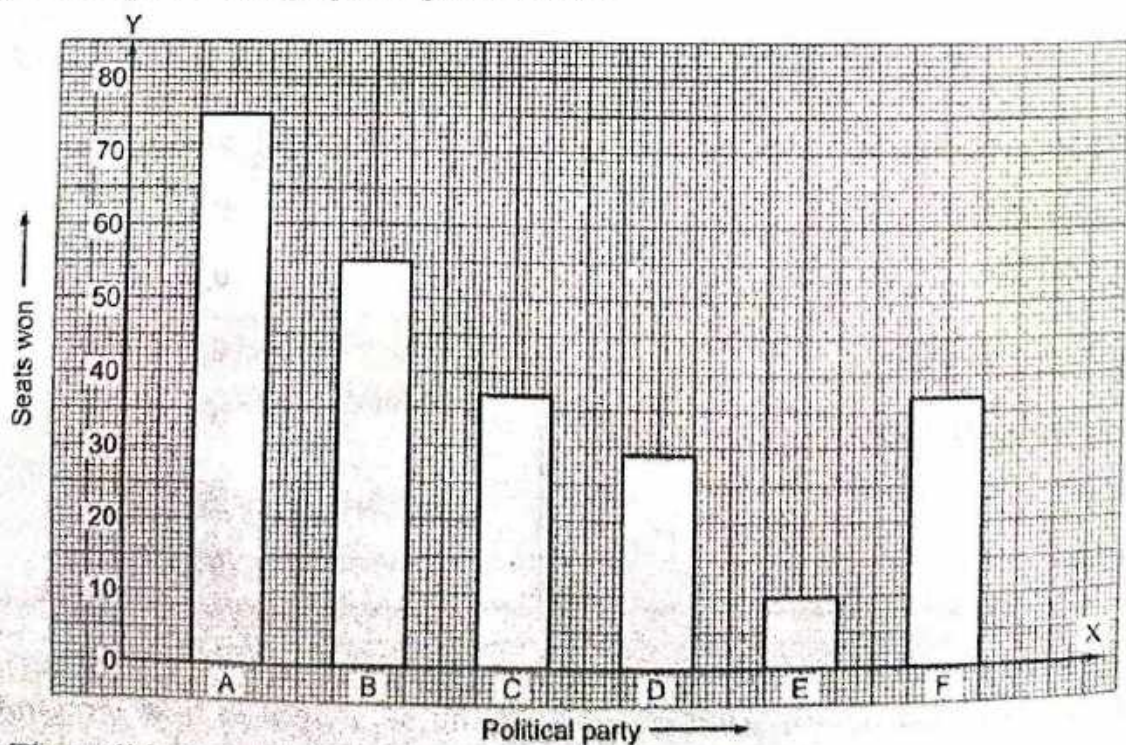
- (ii) (a) Number of girls (per thousand boys) are maximum in scheduled tribes whereas  
 (b) minimum in urban.

**Question 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?

**Solution:** (i) The required bar graph is given below:



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

**Question 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:

- (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?

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

**Solution:** (i) The given frequency distribution is not continuous. Therefore, first we have to modify it to be continuous distribution.

$$\therefore \frac{127 - 126}{2} = \frac{1}{2} = 0.5$$

$\therefore$  The modified class intervals are:

$$(118 - 0.5) - (126 + 0.5) \Rightarrow 117.5 - 126.5$$

$$(127 - 0.5) - (135 + 0.5) \Rightarrow 126.5 - 135.5$$

$$(136 - 0.5) - (144 + 0.5) \Rightarrow 135.5 - 144.5$$

$$(145 - 0.5) - (153 + 0.5) \Rightarrow 144.5 - 153.5$$

$$(154 - 0.5) - (162 + 0.5) \Rightarrow 153.5 - 162.5$$

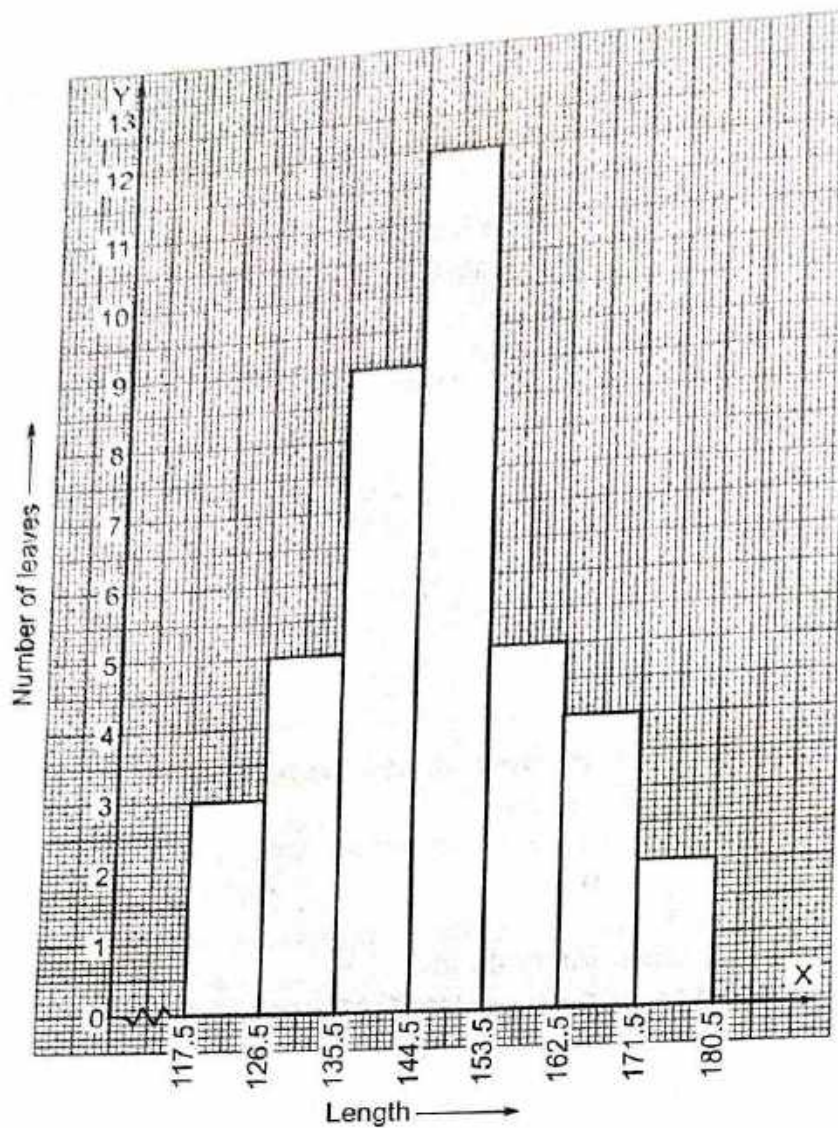
$$(163 - 0.5) - (171 + 0.5) \Rightarrow 162.5 - 171.5$$


$$(172 - 0.5) - (180 + 0.5) \Rightarrow 171.5 - 180.5$$

Thus, the modified frequency distribution 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 above frequency distribution is as shown here:



*Note:* Since, the scale on the x-axis starts at 117.5 (and not at the origin), a break, i.e., a kink , near the origin signify that this graph is drawn with a scale beginning at 117.5, and not at the origin.

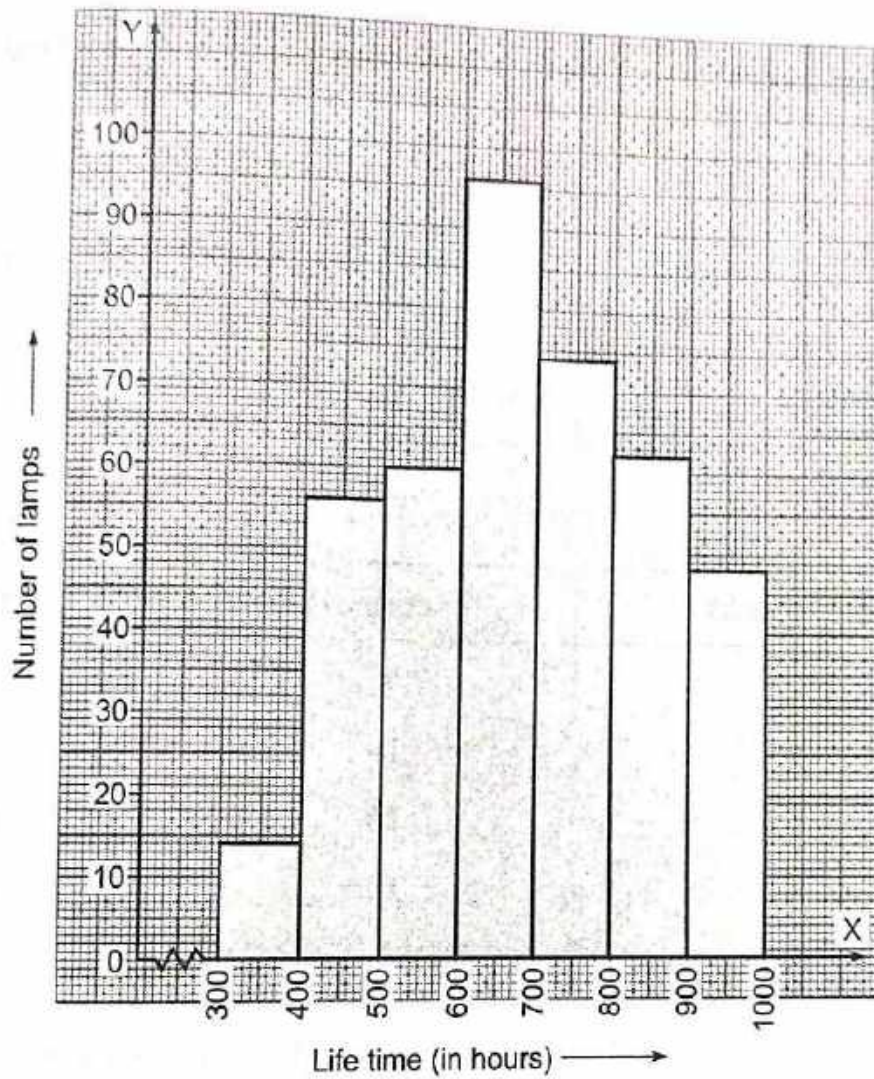
- (ii) Yes, other suitable graphical representation is a 'frequency polygon'.
- (iii) No, it is not a correct statement. The maximum number of leaves are not 153 mm long only, rather they are from 145 mm to 153 mm long.

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

<i>Life time (in hours)</i>	<i>Number of lamps</i>
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?

Solution: (i) The required histogram is shown as:



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