Solution

STATISTICS

Class 09 - Mathematics

Section A

1.
(d) frequency of the corresponding class interval
Explanation:
A histogram is a display of statistical information that uses rectangles to show the frequency of data items in successive numerical intervals of equal size. In the most common form of histogram, the independent variable is plotted along the horizontal axis and the dependent variable is plotted along the vertical axis.

2.
(b) 2.5 cm
Explanation:
1 cm = 30 km
So for 75 km
$\frac{75}{30}$ = 2.5 cm

3.
(c) 5 cm
Explanation:
Use unitary method
0.25 cm - 100 people
So 1 cm - 400 people
So for 2000 people:
$\frac{2000}{400}$= 5 cm

4.
(b) horizontal axis and vertical axis
Explanation:
In a histogram the class limits are marked on the horizontal axis and the frequency is marked on the vertical axis. Thus, a rectangle is constructed on each class interval.

5.
(d) 4.5 cm
Explanation:
Mean growth of plants = $\frac{4.5+4+4+4.5+5.5}{5}$
= 4.5 cm

6. **(a)** X-axis
Explanation:
Histogram states that a two dimensional frequency density diagram is called as a histogram. The histograms are diagrams which represent the class interval and the frequency in the form of a rectangle. There will be as many adjoining rectangles as there are class intervals.

7.
(c) 2
Explanation:
Adjusted frequency = $\left(\frac{\text{frequency of the class}}{\text{width of the class}}\right) \times 5$
Therefore, Adjusted frequency of 25 - 45 = $\frac{8}{20} \times 5 = 2$

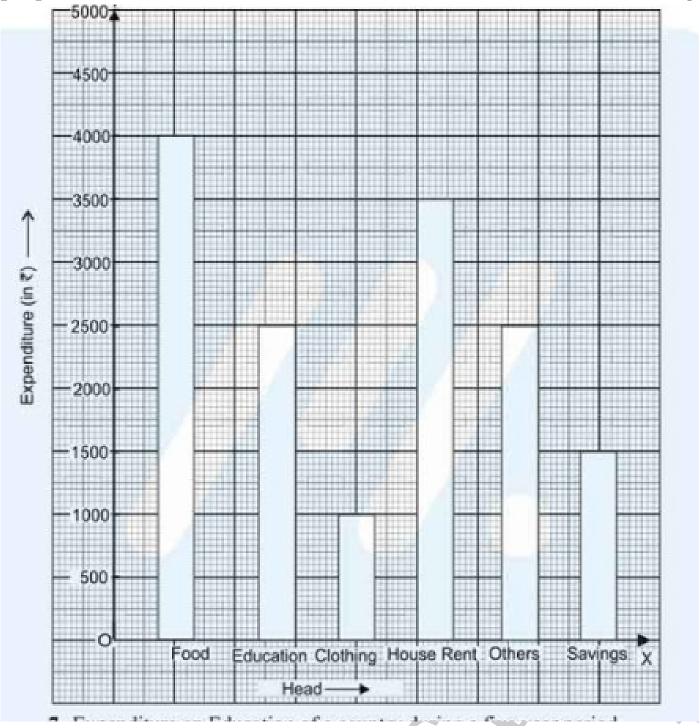
8.

(b) Area of the rectangle

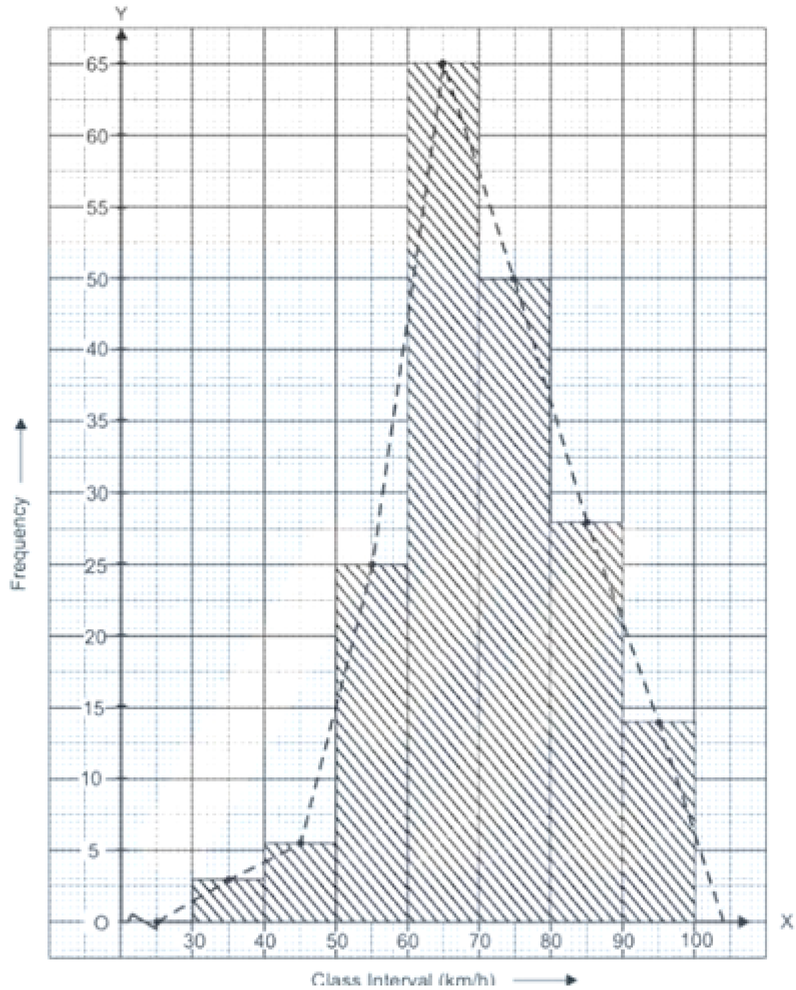
Explanation:

In, Histogram each rectangle is drawn, where width equivalent to class interval and height equivalent to the frequency of the class.

9. Here we first draw a horizontal and a vertical line. Since six values of the numerical data are given. So we mark six point on the horizontal line at equal distance and erect rectangles of the same width at these points the heights of the rectangles are proportional to the numerical values of the data as shown in the figure given below.



10. The frequency polygon is given below.



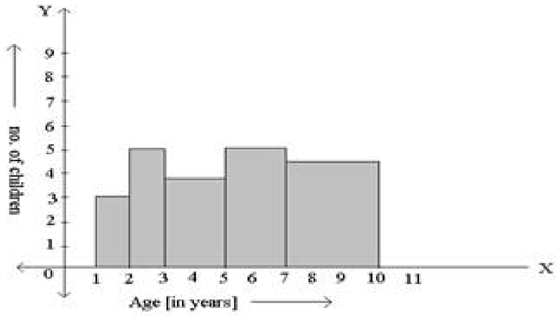
11. The first step in reading a bar graph is to Know what does it represent. For this we read the caption which is generally written at the bottom of horizontal line x -axis and adjacent to vertical line y-axis.
After reading the bar graph, one must draw conclusions from it. Drawing various conclusions from a given bar graph is referred as the interpretation of the bar graph.

Section B

12. Since the class intervals are not of equal width; we calculate the adjusted frequencies [AF] for histogram. Minimum class size [CS] = 1

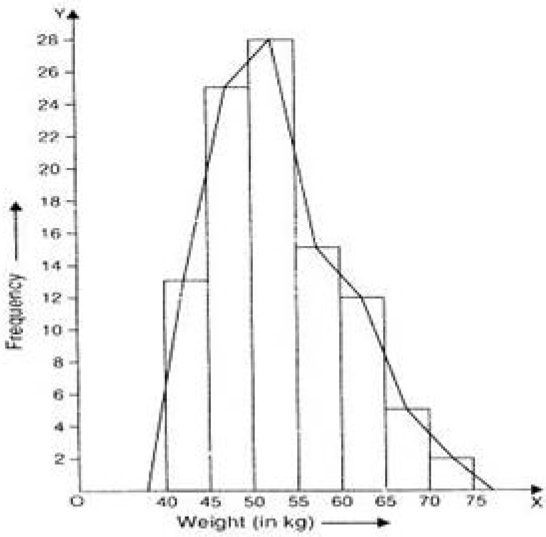
Age [in years	**Frequency**	**Class Size [CS]**	**AF** $= \frac{\text{minimum CS}}{\text{CS of this class}} \times Its$ **frequency**
1 - 2	3	1	$\frac{1}{1} \times$ 3 = 3
2 - 3	5	1	$\frac{1}{1} \times$ 5 = 5
3 - 5	7	2	$\frac{1}{2} \times$ 7 = 3.5
5 - 7	10	2	$\frac{1}{2} \times$ 10 = 5
7 - 10	13	3	$\frac{1}{3} \times$ 13 = 4.3

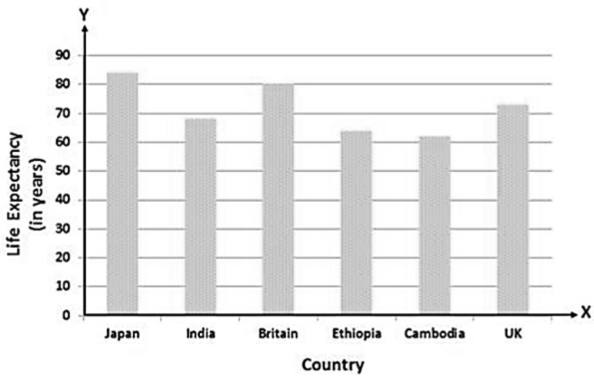
Now we draw rectangles with heights equal to the corresponding adjusted frequencies & bases equal to the given class intervals, to get the required histogram, as shown below.

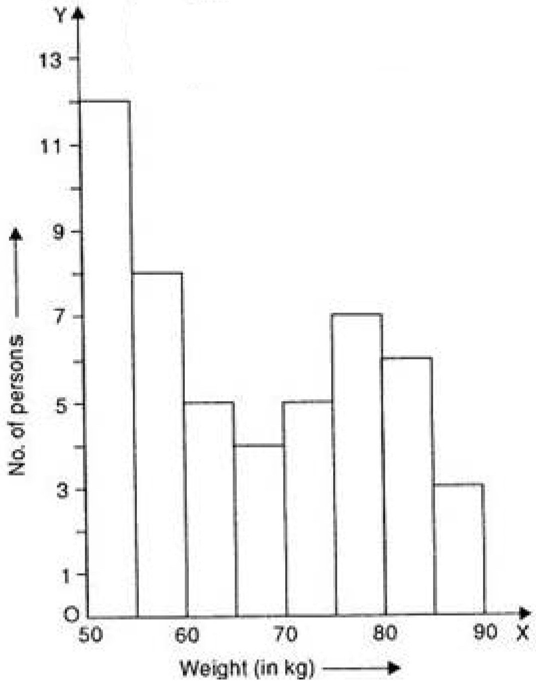


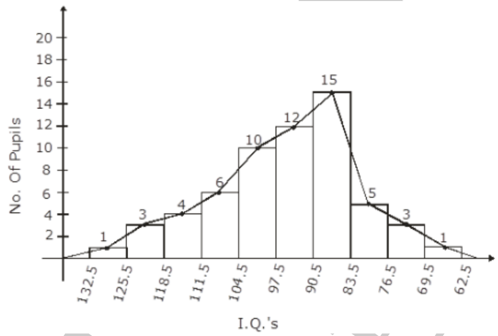
13. The pictograph is given below.
using Scale : 1  = 10 

Dealer	Cars sold
Saya	
Bagga Links	
D.D. Motors	
Bhasin Motors	
Competent	

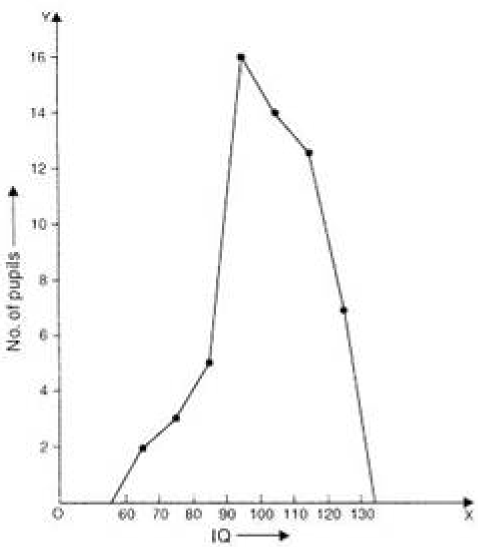
14. 

15. The bar graph for the given data is shown below: 

16. 

17. The frequency polygon is given below. 

18. i. clearly From the graph Mount Everest is the highest peak and its height is 8800 m.
ii. Height of the highest peak = 8800 m.
Height of the lowest peak = 6000 m.
$\therefore$ The ratio of the heights of the highest peak and the lowest peak = 8800 : 6000 = 22 : 15.
iii. The heights of the given peaks in ascending order are 6000 m < 6500 m < 7500 m < 8200 m < 8600 m < 8800 m.
iv. The height of Kanchenjunga is next to that of Mount Everest.
So, the second-highest peak is Kanchenjunga. Its height is 8600 m.

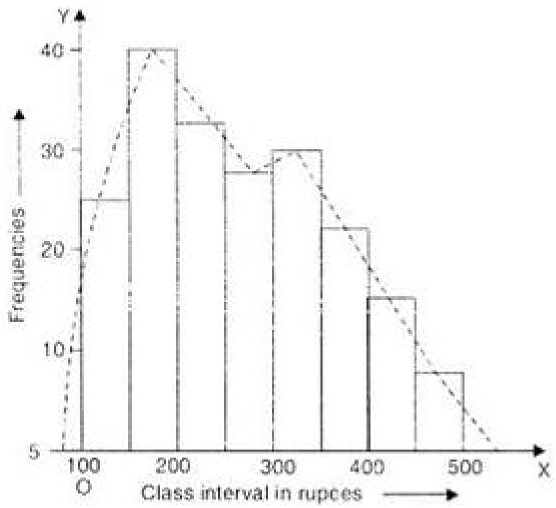
19. 

20. It is clear from figure that This represesntatation is not correct. The classes 0-20, 20-40, 40-60 and 60-100 are not of uniform width but of varying widths.

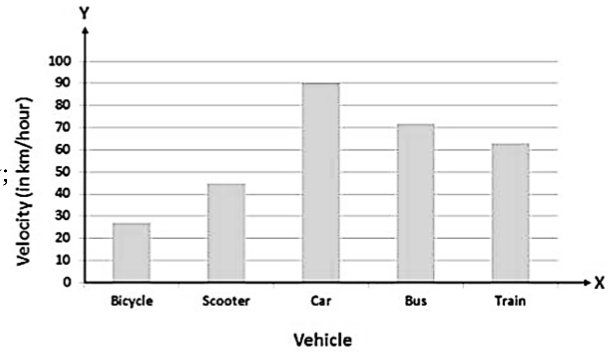
21. i. The bar graph shows the marks obtained by a student in the various subject in an examination.
ii. From the bar graph, the student is very good at mathematics.
iii. He is poor in Hindi

iv. Average marks = $\frac{(60+35+75+50+60)}{5} = \frac{280}{5}$ = 56

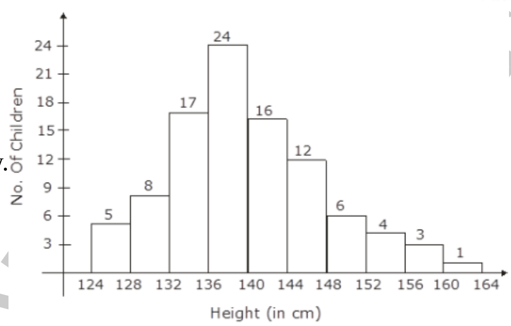
22. Histogram and frequency polygon representing the distribution of total household expenditure (in rupees) of manual workers in a city.



23. The bar graph for the given data is shown below;



24. The histogram is given below.

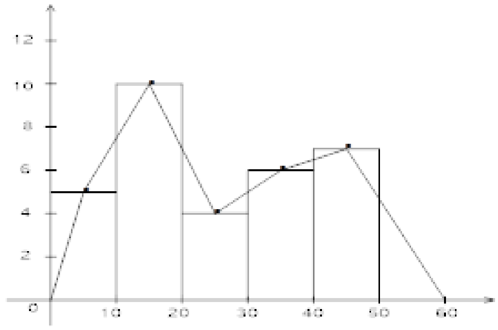


25. i.

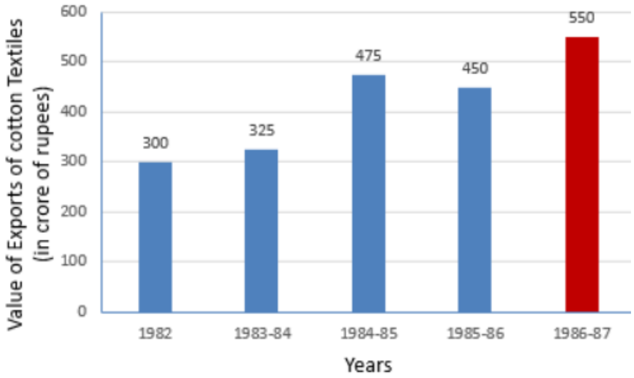
Digits	Tally Marks	Frequency
0	II	2
1	~~IIII~~	5
2	~~IIII~~	5
3	~~IIII~~ III	8
4	IIII	4
5	~~IIII~~	5
6	IIII	4
7	IIII	4
8	~~IIII~~	5
9	~~IIII~~ III	8
Total		50

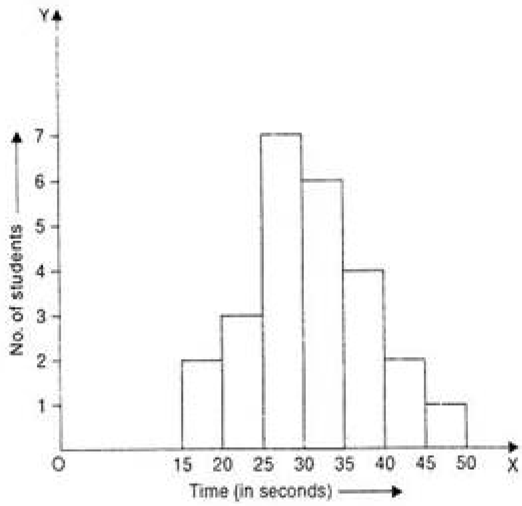
ii. The most frequently occurring digits are 3 and 9. The most least frequently occurring digit is 0.

26. i. The bar graph shows the number of members in each of the 85 families of a colony.
ii. From the bar graph, 40 families have 3 members each.
iii. From the bar graph, 5 couples, i.e., 10 people live alone. '
iv. Most common is the family having 3 members.

27. 

28. The bar graph is shown in figure and red colour shows max. increase.



29. 

30. Since the difference between the second and first mid-point is 160 - 150 = 10.

$\therefore h = 10 \Rightarrow \frac{h}{2} = 5$

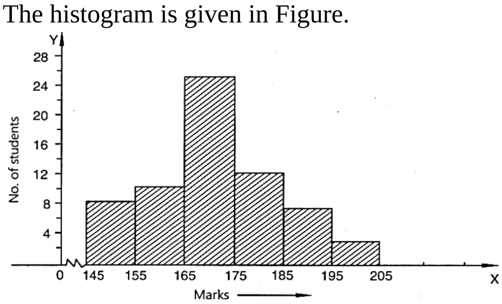
So, lower and upper limits of the first class are 150 - 5 and 150 + 5 i.e. 145 and 155 respectively

$\therefore$ First classs interval is 145 - 155.

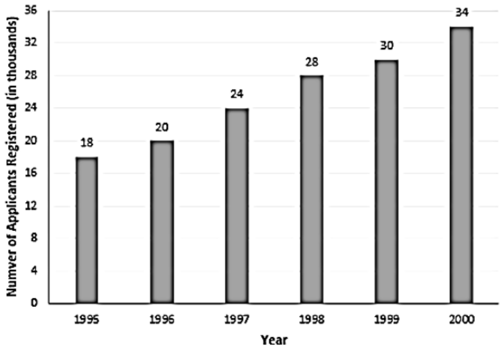
Using the same procedure, we get the classes of other mid-points as under:

Marks:	145-155	155-165	165-175	175-185	185-195	195-205
No. of Students:	8	10	25	12	7	3

The histogram is given in Figure.

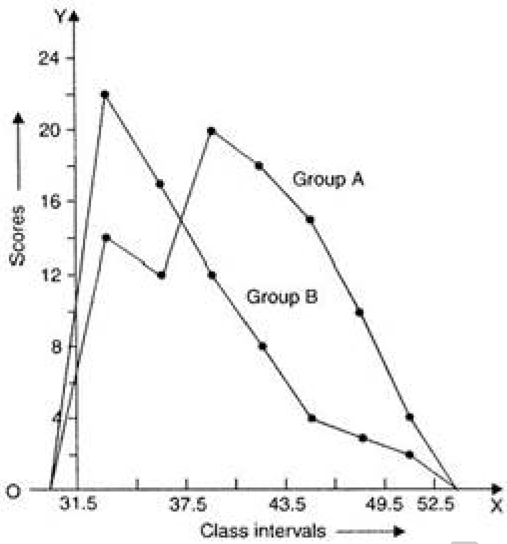


31. The graphical representation of the above data is given below;



Section C

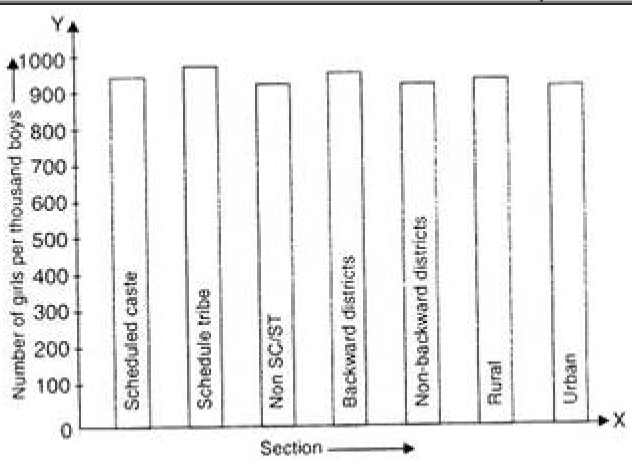
32. Frequency polygon for group A and B representing the scores of two groups of Class IV students in a test of reading ability.



Let us convert the given distributions in such a manner that the intervals are continuous. It is shown below

Class interval	Group A	Group B
49.5-52.5	4	2
46.5-49.5	10	3
43.5-46.5	15	4
40.5-43.5	18	8
37.5-40.5	20	12
34.5-37.5	12	17
31.5-34.5	13	22
Total	92	68

33. i.



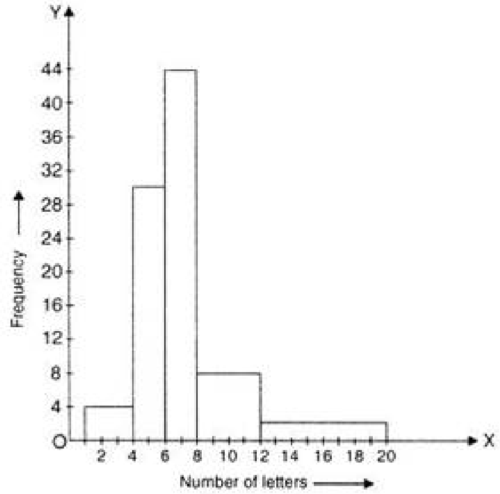
ii. The two conclusions we can arrive at from the graph are as follows:

iii. The numbers of girls to the nearest ten per thousand boys is maximum in Scheduled Tribe section of the society and minimum in Urban section of the society.

iv. The number of girls to the nearest ten per thousand boys is the same for 'Non SC/ST' and 'Non-backward Districts' sections of the society.

34. i.

Number of letters	Number of surnames	Width of the class	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	$\frac{4}{8} \times 2 = 1$

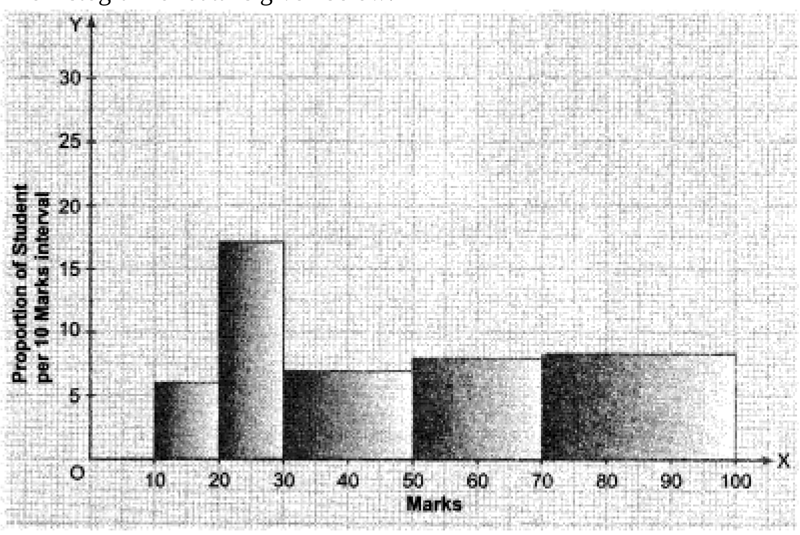


ii. The class interval in which the maximum number of surnames lie is 6-8.

35. In the given frequency distribution, the class intervals are not of equal width. $\therefore$ we would make modification in the lengths of the rectangle in the histogram so that the areas of the rectangle are proportional to the frequencies.

Marks	Frequency	Width of the class	Length of the rectangle
$10-20$	6	10	$\frac{10}{10} \times 6=6$
$20-30$	17	10	$\frac{10}{10} \times 17=17$
$30-50$	15	20	$\frac{10}{20} \times 15=7.5$
$50-70$	16	20	$\frac{10}{20} \times 16=8$
$70-100$	26	30	$\frac{10}{30} \times 26=8.67$

The histogram of data is given below:



36. i. It gives the information about the areas (in lakh hectors) under sugarcane crop during different years in India.

ii. The areas under the sugarcane crops were the maximum and minimum in 1982-83 and 1950-51 respectively.

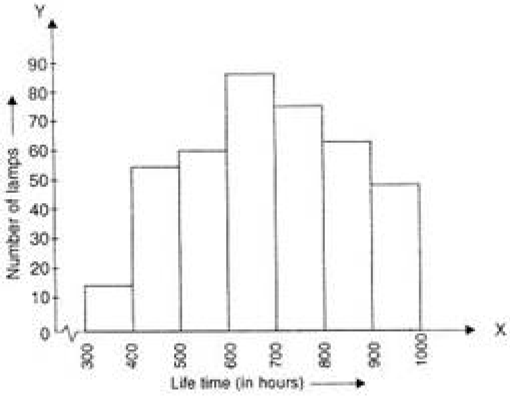
iii. The area under sugarcane crop in the year 1982-83= 34 lakh hectares.

The area under sugarcane crop in the year 1950-51= 17 lakh hectares.

Clearly, the area under sugarcane crop in the year 1982-83 is not 3 times that of the year 1950-51

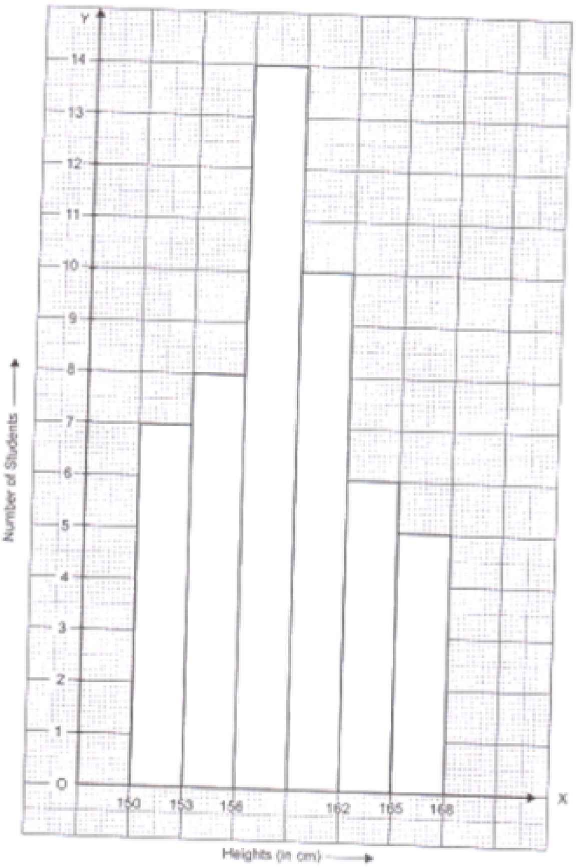
So, the given statement is false.

37. i.

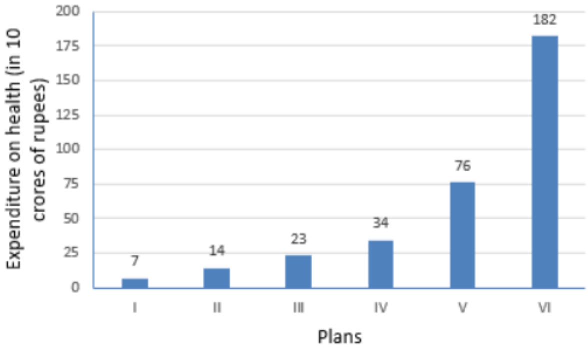


ii. 74 + 62 + 48 = 184 lamps have a life time of more than 700 hours.

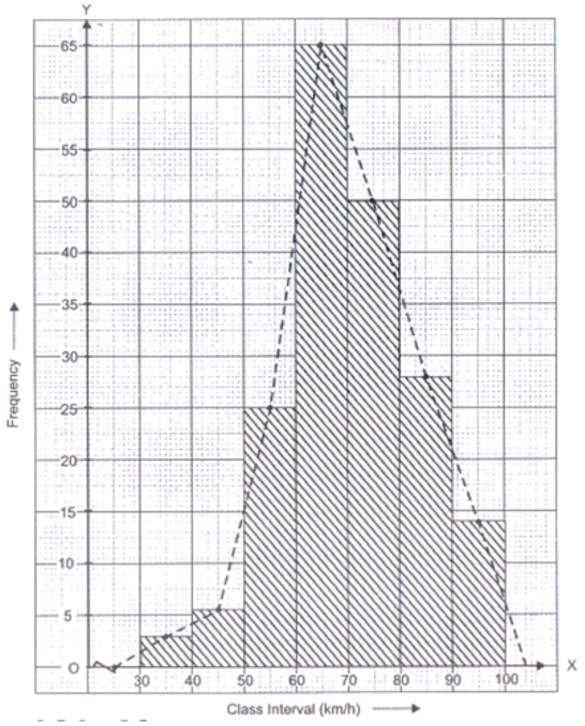
38. Histogram which represent the given frequency distribution is shown below:



39. The expenditure (in 10 crores of rupees) on health by the Government of India during the various five year plans



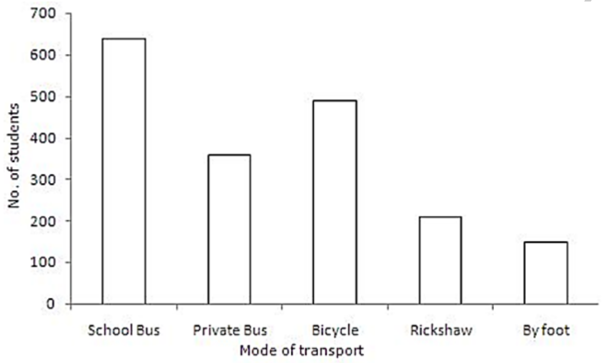
40. In the figure given below, a histogram and a frequency polygon (in dotted lines) are drawn on the same scale.



41. Take themode of transport along the x-axis and the number of students along the y-axis.

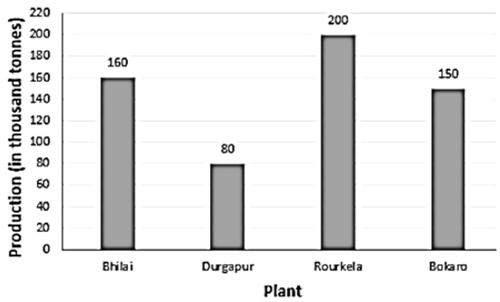
Along the y-axis, take 1 big division = 100 units.

Now we shall draw the bar chart, as shown below:

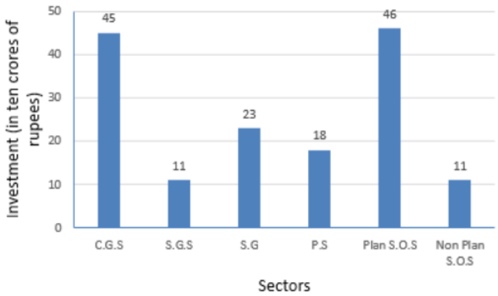


42. Bar graph of the income and expenditure for 5 years of a family

43. Required Bar graph

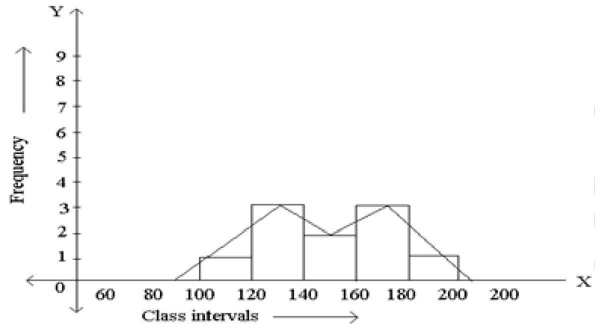


44. **The investment (in ten crores of rupees) of Life Insurance Corporation of India in different sectors:-**

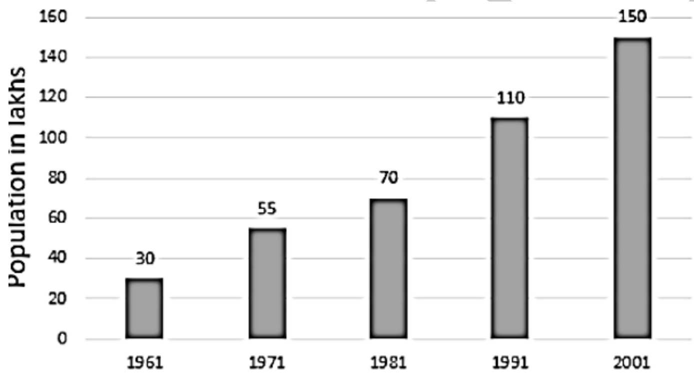


45.

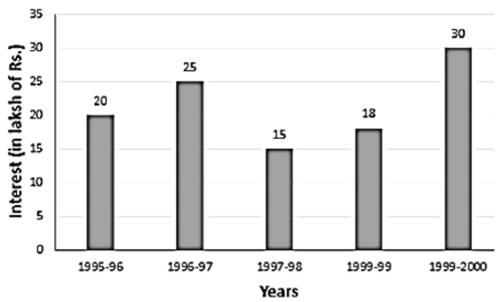
Frequency Distribution		
Class intervals	Tally Marks	Frequency
100-120	I	1
120-140	III	3
140-160	II	2
160-180	III	3
180-120	I	1
Total		10



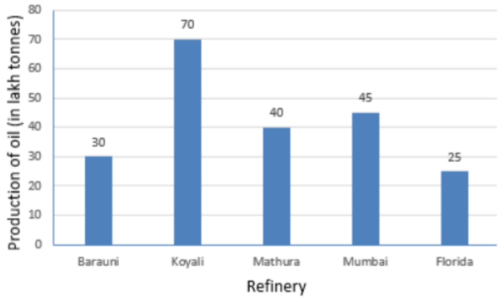
46. the population of Delhi State in different census years



47. The interest paid by a company (in lakhs) in different years



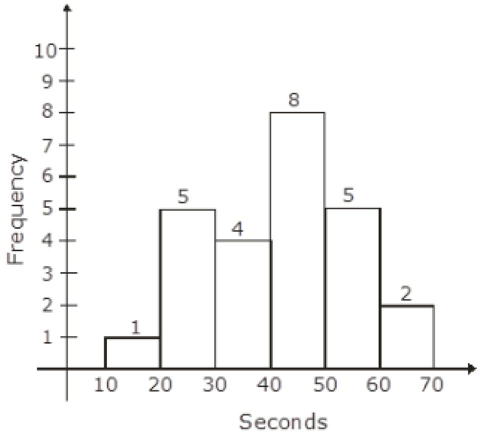
48. The production of oil (in lakh tonnes) in some of the refineries in India during 1982



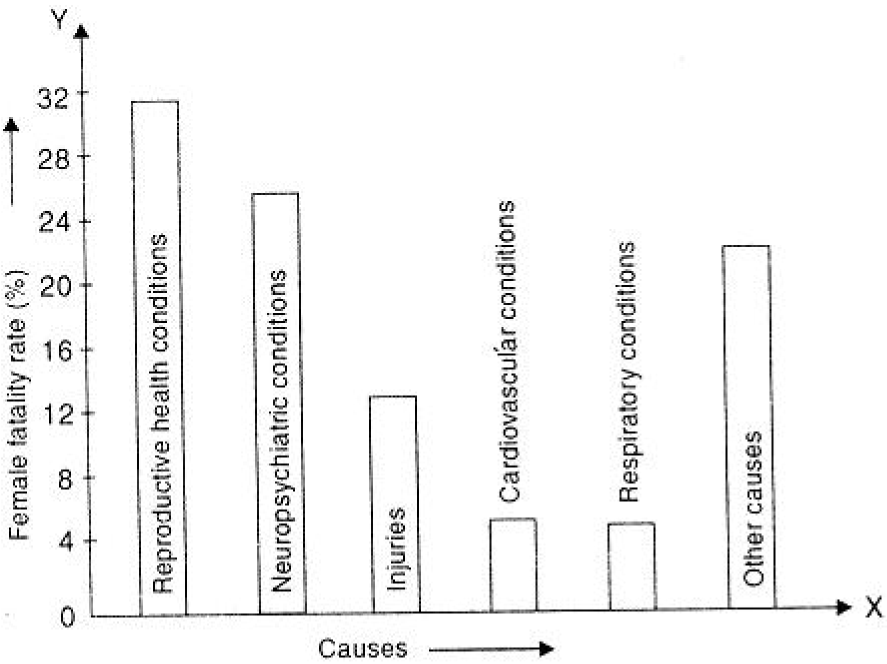
49. i. The frequency table for given data is given as.

Seconds	Frequency
10-20	1
2030	5
30-40	4
40-50	8
50-60	5
60-70	2

ii. The histogram for given data is given below.



50. i.



ii. Reproductive health conditions is the major cause of women's ill health and death worldwide.

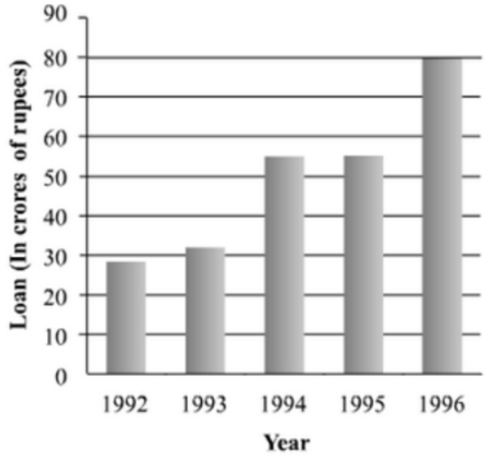
iii. Lack of proper diet, lack of advised exercises.

51. To represent the given data by a vertical bar graph, we first draw horizontal and vertical axes. Let us consider that the horizontal and vertical axes represent the years and the amount of loan in Crores of rupees respectively. We have to draw 5 bars of different

lengths given in the table.

At first, we mark 5 points in the horizontal axis at equal distances and erect rectangles of the same width at these points. The heights of the rectangles are proportional to the amount of loan disbursed by the bank.

(1) The vertical bar graph of the average age of men in various countries in a certain year is



Section D

52. i. No of teachers in the age-group 15-20 years = 10
No of teachers in the age-group 20-25 years = 30
No of teachers in the age-group 25-30 years = 50
No of teachers in the age-group 30-35 years = 50
No of teachers in the age-group 35-40 years = 30
No of teachers in the age-group 40-45 years = 5
No of teachers in the age-group 45-50 years = 2
Thus the total no of teachers
= 10 + 30 + 50 + 50 + 30 + 5 + 2
=177

ii. Class Mark of class 15 - 20 =
= $\frac{15+20}{2}$ = 17.5
Class Mark of class 25 - 30 =
= $\frac{25+30}{2}$ = 27.5
Class Mark of class 45 - 50 =
= $\frac{45+50}{2}$ = 47.5

iii. No of teachers in the age-group 25 - 30 years = 50
No of teachers in the age-group 30 - 35 years = 50
No of teachers in the age-group 35 - 40 years = 30
Thus the no of teachers in the age range 25 - 40 years
= 50 + 50 + 30 = 130
OR
From the observation of the bar chart we find that :
No of teachers in the age-group 25-30 years = 50
No of teachers in the age-group 30-35 years = 50
Thus the no of teacher in the class 25-30 and 30-35 is equal.

53. i. The highest no child labor are in India and the lowest no child labor are in United states
No of child labor in India = 20,000,000
No of child labor in United states = 8,00,000
The difference = 20,000,000 - 8,00,000
= 19,200,000

ii. No. of child labor in Peru = 4,000,000
No. of child labor in India = 20,00,000
The percentage = $\frac{4000000}{20000000} \times 100$ = 20%

iii. The countries having child labor more than 2 million are
Egypt = 3 Million
Brazil = 3.5 million
Peru = 4 million
Bangladesh = 4.4 million
India = 20 million
Total no of these labor child = 3 + 3.5 + 4 + 4.4 + 20 = 34.9 Million.
OR
The countries having child labor more than Mexico are:
Philippines = 1.8 Million
Egypt = 3 Million
Brazil = 3.5 million
Peru = 4 million
Bangladesh = 4.4 million
India = 20 million
Thus 6 countries are having child labor more than Mexico.

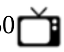
54. i. Expenses in 2009-10 = 9160 Million
Expenses in 2010-11 = 10300 Million
Total expenses from 2009 to 2011
= 9160 + 10300
= 19460 Million

ii. Expenses in 2009-10 = 9160 Million
Expenses in 2010-11 = 10300 Million
Thus percentage of no of expenses in 2009-10 over the expenses in 2010-11
$= \frac{9160}{10300} \times 100$
= 88.93%

iii. The minimum expenses (in 2007-08) = 5.4 Million
The maximum expenses (in 2010-11) = 10300 Million
Thus percentage of no of minimum expenses over the maximum expenses
$= \frac{5.4}{10300} \times 100$
= 0.052%
OR
The expenses in 2010-11 = 10300 Million
The expenses in 2006-09 = 9060 Million
The difference = 10300 - 9060 Million
= 1240 Million

Section E

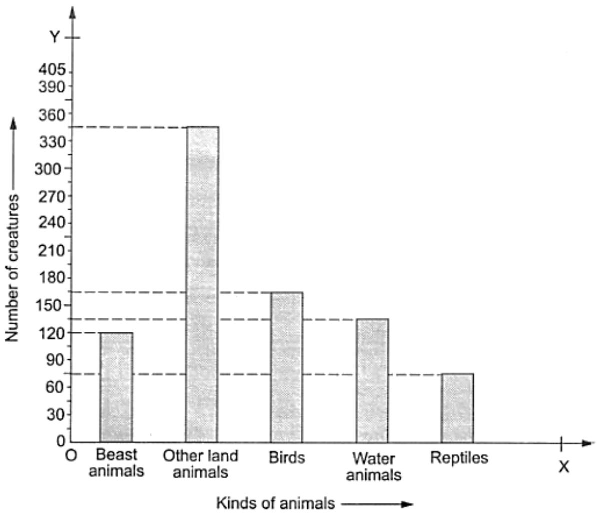
55. From the bar diagram,we have the following observations:
i. The bar graph shows the number of books sold by a bookseller during the period from April 2000 to August 2000.
ii. The sale of the book was maximum in the month of April as the height of the rectangle corresponding to April month is maximum.
iii. The sale of the book was minimum in the month of August as the height of the corresponding rectangle is minimum.
iv. Total sale of the book during 5 months. (900 + 800 + 500 + 350 + 300) = 2850 copies.

56. The pictograph of above data is given below, Here we use Scale : 1 = 50

Day	No. of T.V. sets
Monday	
Tuesday	
Wednesday	

Thursday	
Friday	
Saturday	
Sunday	

57. Draw the bars of the same width and the same space should be left between the consecutive bars.
The heights of these bars should be proportional to their number, as shown below.

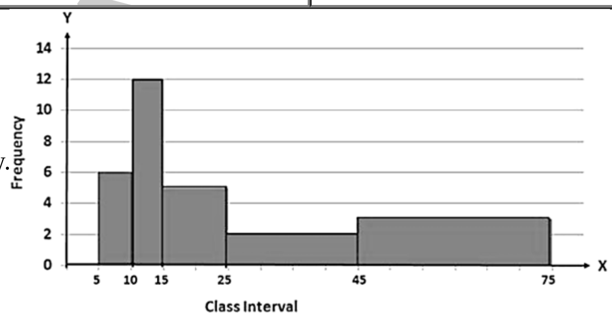


58. Minimum class size = 10 - 5 = 5

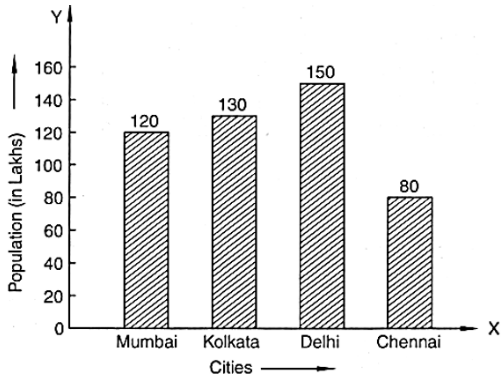
Adjusted frequency of a class = $\frac{\text{Minimum dass size}}{\text{dass size}} \times$ Frequency of the class

Class Interval	Frequency	Adjusted Frequency
5-10	6	$\frac{5}{5} \times 6 = 6$
10-15	12	$\frac{5}{5} \times 12 = 12$
15-25	10	$\frac{5}{10} \times 10 = 5$
25-45	8	$\frac{5}{20} \times 8 = 2$
45-75	18	$\frac{5}{30} \times 18 = 3$

Thus the required histogram is given below.



59. To construct the bar graph representing the given data, we follow the following steps:
STEP I: We take a graph paper and draw two mutually perpendicular lines OX and OY.
STEP II: Along the horizontal line OX, we mark 'cities' and along the vertical line, we mark the 'population'.
STEP III: Along the axis OX, we choose equal suitable width of each bar. The gap between the bars is chosen same.
STEP IV: Choose a suitable scale to determine the heights of the bars, according to the availability of space.



Here, we choose 1 big division to represent 20 lakhs population.

Calculate the height of various bars as follows:

The height of the bar for Mumbai $=\frac{120}{20}$ = 6 big divisions.

The height of the bar for Kolkata $=\frac{130}{20}$ = 6.5 big divisions.

The height of the bar for Delhi $=\frac{150}{20}$ = 7.5 big divisions.

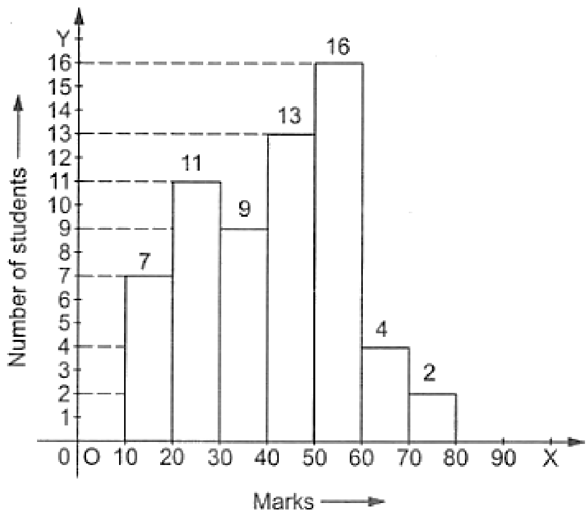
The height of the bar for Chennai $=\frac{0}{20}$ = 4 big divisions.

In this way, we have represented the given date in the form of a bar diagram.

60. Clearly, the given frequency distribution is in exclusive form.

We represent the class intervals along the x-axis on a suitable scale and the corresponding frequencies along the y-axis on another suitable scale.

Thus, we obtain a histogram as shown below.



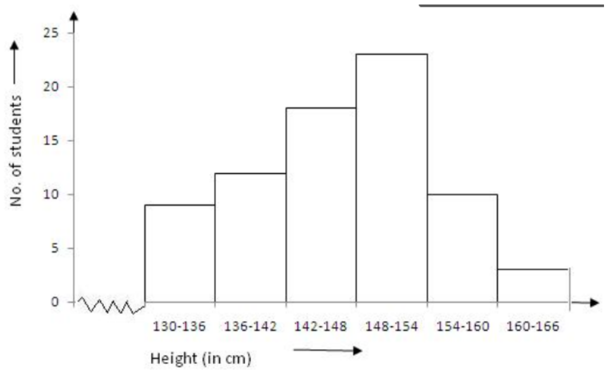
61.

Height (in cm)	130-136	136-142	142-148	148-154	154-160	160-166
Number of students	9	12	18	23	10	3

Clearly, the given frequency distribution is in the exclusive form.

We take class intervals, i.e. height (in cm) along x-axis and frequencies i.e. number of student s along y-axis . So we get the required histogram.

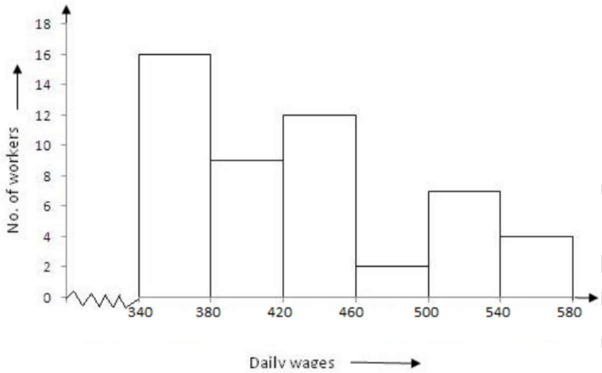
Since the scale on X-axis starts at 130, a kink(break) is indicated near the origin to show that the graph is drawn to scale beginning at 130.



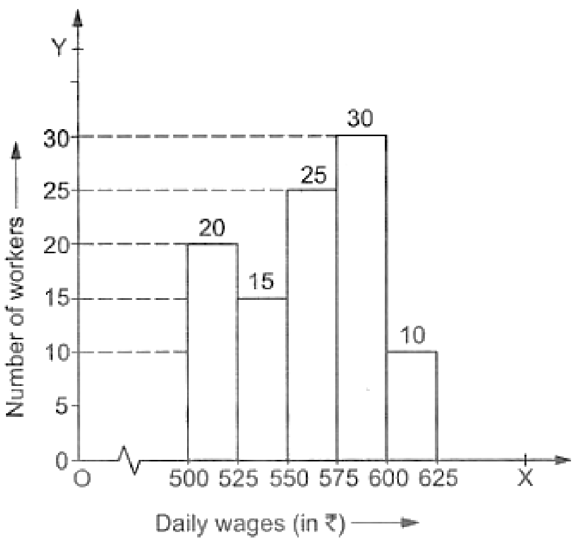
62. From the bar diagram,we have the following observations:
   i. It gives the information about the overage of some Doordarshan centres of India.
   ii. Kolkata Doordarshan centre covers maximum area which is 36000 square km.
   iii. The difference between the areas covered by the centres of Delhi and Bombay:
   33000 - 19000 = 14000 square km
   iv. Kanpur and Lucknow Doordarshan centres are in U.P state. The area covered by Kanpur Doordarshan centre and Lucknow Doordarshan centre are 32000 sq. km and 25000 sq.km.
63. Given frequency distribution is as below:

Daily wages (in ₹)	340-380	380-420	420-460	460-500	500-540	540-580
Number of workers	16	9	12	2	7	4

Clearly, the given frequency distribution is in the exclusive form.
To draw the required histogram , take class intervals , i.e. daily wages (in ₹) along x-axis and frequencies i.e.no.of workers alongy-axisand draw rectangles . So, we get the requiredhistogram.
Since the scale on X-axis starts at 340, a kink(break) is indicated near the origin to show that the graph is drawn to scale beginning at 340.



64. Clearly, the given frequency distribution is in exclusive form.
Here, the class intervals represent the daily wages in rupees and the corresponding frequencies represent the number of workers.
We represent the class intervals along the x-axis on a suitable scale and the corresponding frequencies along the y-axis on another suitable scale.
Since the scale along the x-axis starts at ₹ 500, so a kink, i.e. a break (), is indicated at the origin.
Thus, we obtain a histogram, as shown below.



65. From the bar diagram,we have the following observations:
   i. It gives the information regarding import and export from 1982 - 83 to 1986-87
   ii. The export is minimum in the year 1982-83
   iii. The import is maximum in the year 1986-87
   iv. The difference of the values of export and import is maximum in the year 1986-87

66. We take two imagined classes, namely 40-50 and 120-130, each with frequency 0.

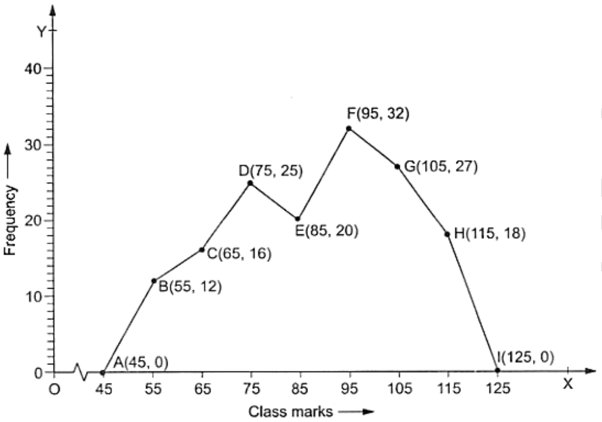
Now, we have the following frequency table:

Class interval (in ₹)	Class mark	Frequency
40-50	45	0
50-60	55	12
60-70	65	16
70-80	75	25
80-90	85	20
90-100	95	32
100-110	105	27
110-120	115	18
120-130	125	0

we plot the following points:

A(45, 0), B(55,12), C(65,16), D(75, 25), E(85, 20), E(95,32), G(105,27), H(115,18) and I(125, 0).

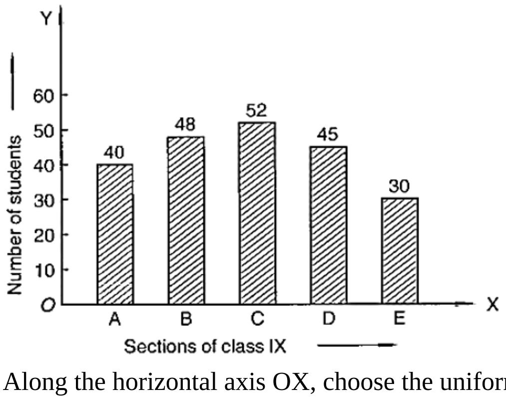
Join these points successively in pairs to get the required frequency polygon ABCDEFGHI, as shown below.



67. We go through the following steps to construct the bar graph:

STEP I Take a graph paper and draw two lines OX and OY perpendicular to each other. Call the horizontal line as OX and the vertical line as OY.

STEP II Along the horizontal axis OX, mark "sections of Class IX" and along the vertical axis OY mark "No. of students"



Along the horizontal axis OX, choose the uniform (equal) width of the bars and the uniform gap between them.

STEP IV Choose a suitable scale to determine the heights of the bars, according to the space available for the graph.

Here, we choose 1 small division to represent 1 student.

STEP V Calculate the heights of the various bars as follows:

Height of the bar for Section A = 40 $\times$ 1 = 40 small divisions = 4 big divisions

Height of the bar for Section B = 48 $\times$ 1 = 48 small divisions = 4 big divisions and 8 small divisions

Height of the bar for Section C = 52 $\times$ 1 = 52 small divisions = 5 divisions and 2 small divisions.

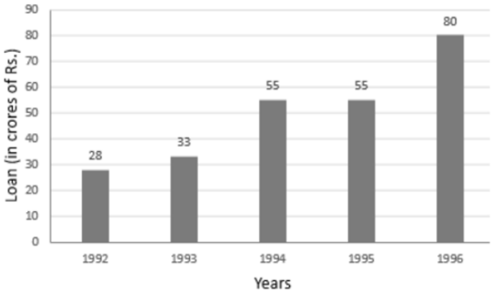
Height of the bar for Section D = 45 small divisions = 4 big divisions and 5 small divisions.

Height of the bar for Section E = 30 small divisions = 3 big divisions.

STEP VI We draw the bars as shown in Figure and on the top of each bar, we write the number of students represented by it.

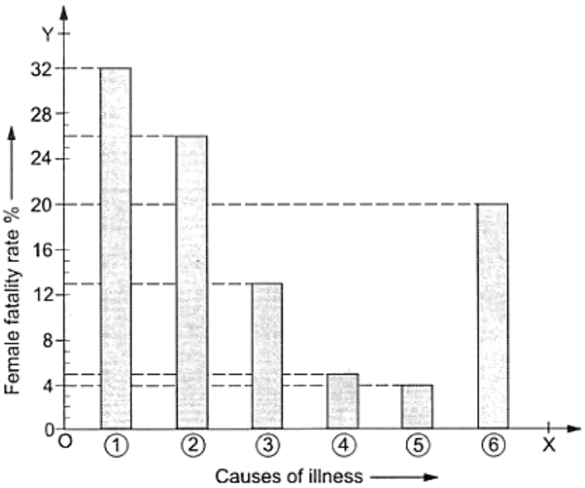
In this way,we have represented the given date in the form of bar diagram.

68. The bar diagram for the given data is:

i. 

ii. The year in which amount of loan is not increased over that of the preceding year is 1994-95.

69. Draw the bars of the same width having their heights proportional to female fatality rate %, keeping the same space between two consecutive bars, as shown below.



i. The required information has been given above graphically.
ii. Clearly, the reproductive health conditions are the major cause of women's ill health and death worldwide.

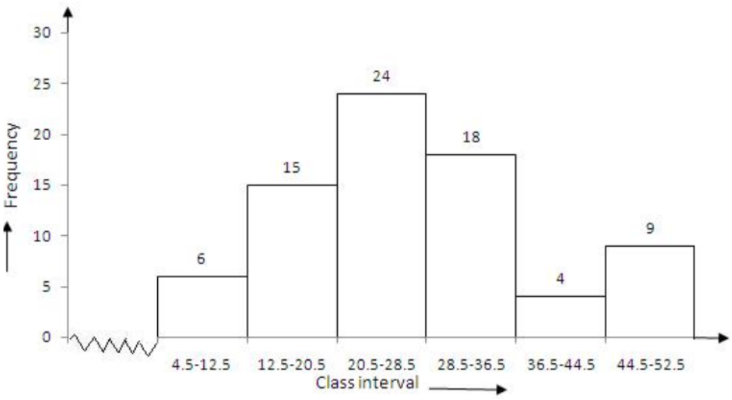
70. Clearly the given frequency distribution is in inclusive form, that is there is a gap between the upper limit of a class and the lower limit of the next class.

Therefore, we need to convert the given frequency distribution into exclusive form, as shown below:

Class interval	4.5-12.5	12.5-20.5	20.5-28.5	28.5-36.5	36.5-44.5	44.5-52.5
Frequency	6	15	24	18	4	9

To draw the required histogram , take class intervals, along x-axis and frequencies along y-axis and draw rectangles . So, we get the required histogram .

Since the scale on X-axis starts at 4.5, a kink(break) is indicated near the origin to show that the graph is drawn to scale beginning at 4.5.



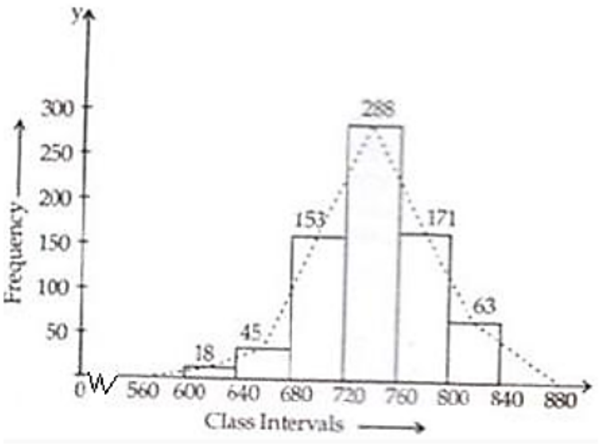
71. The given frequency distribution table is given below:

Class interval	600-640	640-680	680-720	720-760	760-800	800-840
Frequency	18	45	153	288	171	63

Take class intervals along x-axis and frequencies along y-axis and draw rectangles of width equal to to size of class intervals and height equal to their corresponding frequencies.

Thus we get the required histogram.

Now join the mid points of the top of the rectangles to get the required frequency polygon.



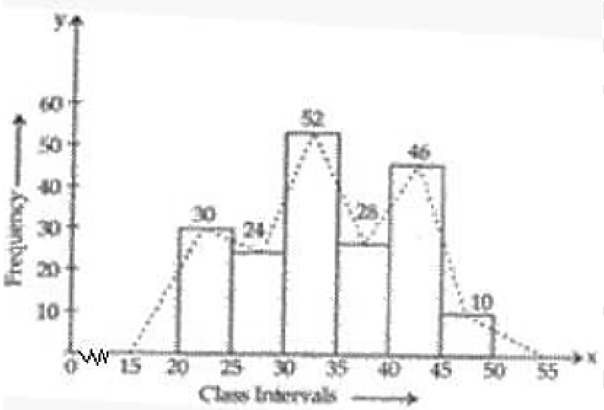
72. The given frequency distribution is as below:

Class interval	20-25	25-30	30-35	35-40	40^5	45-50
Frequency	30	24	52	28	46	10

Take class intervals along x-axis and frequencies along y-axis and draw rectangle s of width equal to the size of the class intervals and heights equal to the corresponding frequencies.

Thus we get required histogram.

Now join the mid points of top of the rectangles to get the required frequency polygon.



73. From the bar diagram,we have the following observations:
    i. The bar graph represents the number of students in Class IX of a school during academic years 1995-96 to 1999-2000.
    ii. The number of students is changing in an increasing order as the heights of bars are increasing.
    iii. The increase in the number of students is uniform as the increase in the height of bars is uniform. Hence, in this case, the increase is not maximum in any of the years.
    iv. Enrolment in 1996-97 = 200, Enrolment in 1995-96 = 150. Clearly, enrolment in 1996-97 is not double of the enrolment in 1995-96. Therefore, the statement is false.

74. Given frequency distribution is as below:

Class interval	10-14	14-20	20-32	32-52	52-80
Frequency	5	6	9	25	21

In the above table, class intervals are of unequal size, so we calculate the adjusted frequency by using the following formula :

Adjusted Frequency = $\frac{\text{Minimum class size } x \text{ its frequency}}{\text{Class size of this class}}$

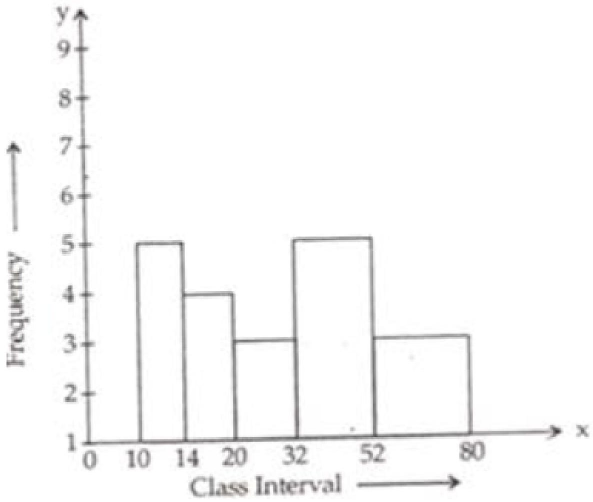
Thus, the adjusted frequency table is

Class intervals	frequency	adjusted frequency
10-14	5	$\frac{4}{4} \times 5 = 5$
14-20	6	

		$\frac{4}{6} \times 6$ = 4
20-32	9	$\frac{4}{12} \times 9$ = 3
32-52	25	$\frac{4}{20} \times 25$ = 5
52-80	21	$\frac{4}{28} \times 21$ = 3

Now take class intervals along x-axis and adjusted frequency along the y-axis.

Thus, we obtain the histogram as shown below:



75. Take city along the x-axis and distance from Delhi (in Km) along the y-axis.

Along the y-axis, take 1 big division =200 units.

Now we shall draw the bar chart, as shown below: