

DIAGRAMMATIC REPRESENTATION OF DATA

- Column Graphs/Bar Charts
- Pie Charts
- Histograms
- Choosing a Diagrammatic Representation



Introduction

We have seen data being represented by various graphical or diagrammatic forms since primary school. Beginning with pictographs we saw data displayed in column graphs, bar charts, pie charts, and line graphs. We have learnt how to interpret information from such representations as well as how to construct them, given the relevant data. Having learnt about frequency distributions, let us now construct column graphs, pie charts, and histograms, given a frequency distribution.

Column Graphs/Bar Charts

The method of construction for column graphs and bar charts is the same, drawing rectangles whose lengths correspond to the frequency of observations.

However, in column graphs, the rectangles are tall and interpretations are made by comparing the heights of columns. In bar charts, the rectangles are horizontally extended to the extent of their frequencies and interpretations are made by comparing the lengths of the bars.

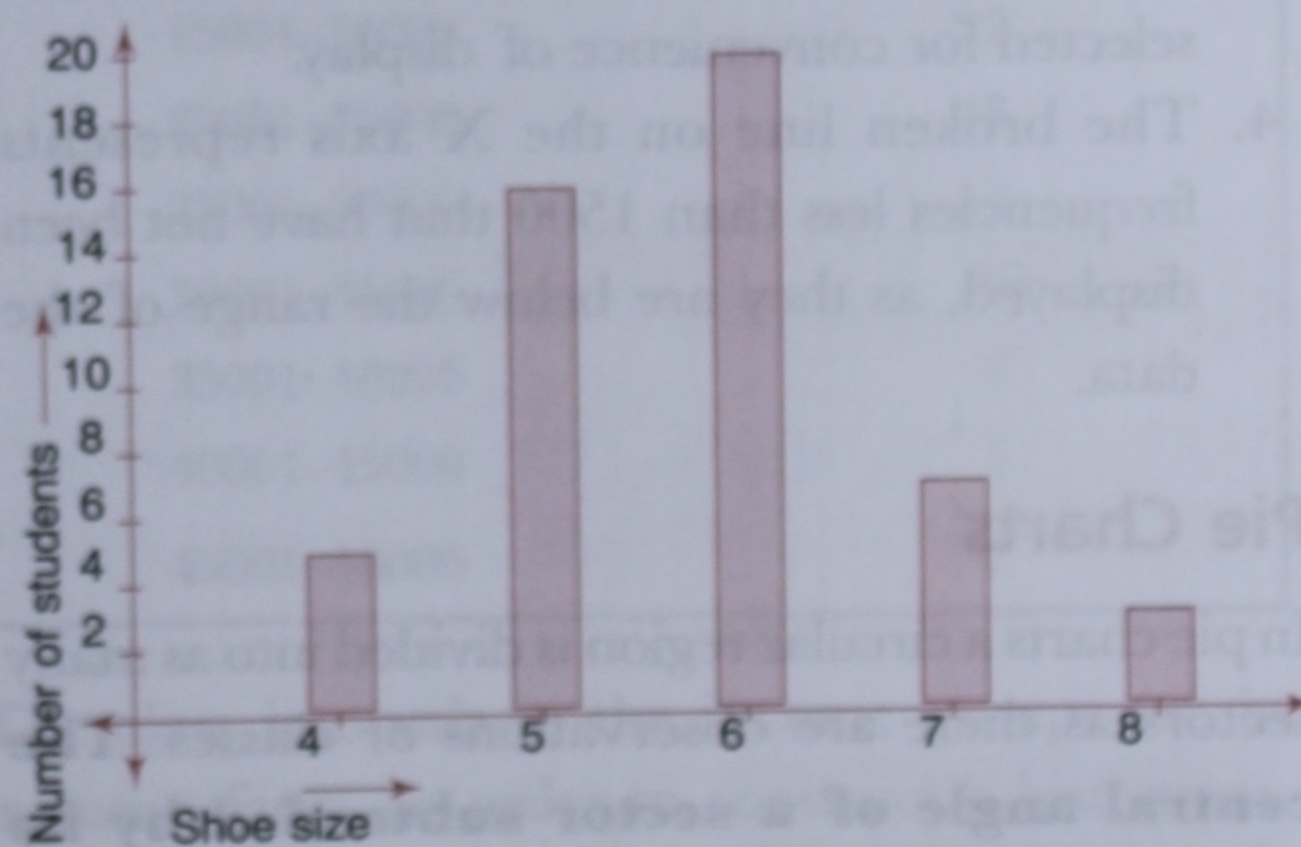
Each column or bar is of equal width and the space between the columns or bars is equal.

Example 1: This simple frequency distribution shows the number of students in a particular class who wear a certain shoe size.

Shoe Size	Number of Students
4	5
5	16
6	20
7	7
8	3

Construct a column graph to display the given information.

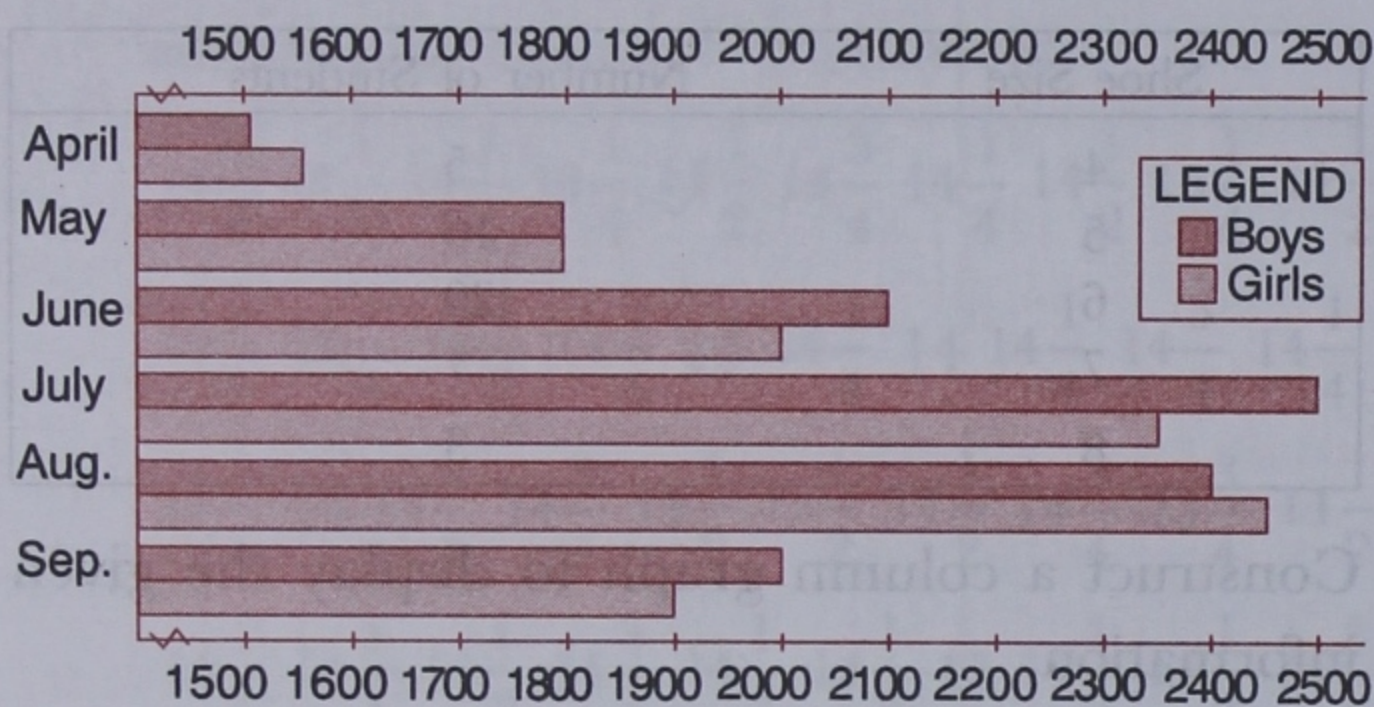
The observations are placed at equal distance to each other on the X axis while the frequencies are displayed with rectangles whose heights can be measured off on the Y axis.



Example 2: The attendance recorded in a swimming pool during a swimming season is given in the table below. Construct a bar chart to display the given information.

Month	Attendance	
	Boys	Girls
April	1500	1550
May	1800	1800
June	2100	2000
July	2500	2350
Aug.	2400	2450
Sep.	2000	1900

The bar chart is required to display the data in two simple frequency distributions. The sets of frequencies that represent boys and girls are shown by bars shaded differently.



Note that:

1. The months are placed on the Y axis.
2. The length of the bars correspond to the frequencies represented on the X axis.
3. A scale of 100 children = 0.7 cm has been selected for convenience of display.
4. The broken line on the X axis represents frequencies less than 1500 that have not been displayed, as they are below the range of the data.

Pie Charts

In pie charts a circular region is divided into as many sectors as there are observations or classes. **The central angle of a sector subtended by its arc is proportional to the frequency.** Pie charts may be used to display data from a simple as well as a grouped frequency distribution.

Example 3: Jayant received Rs 1800 as a gift and kept a record of how he spent every rupee.

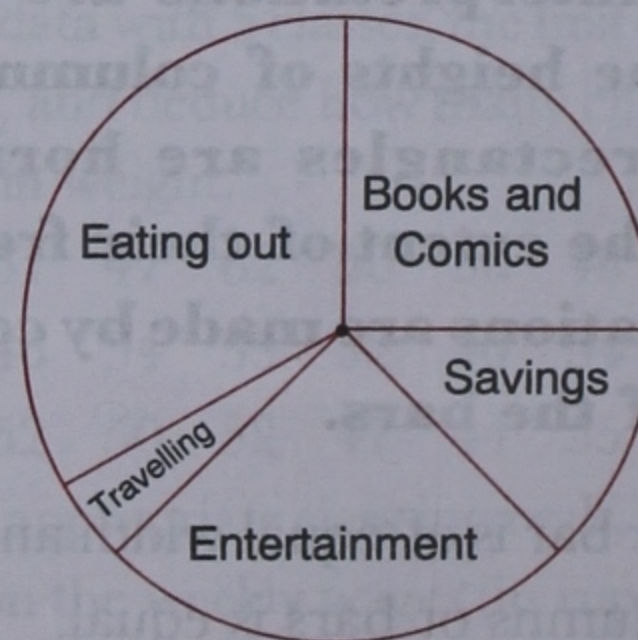
Expense Heads	Money Spent
Books and Comics	450
Eating out	600
Travelling	75
Entertainment	450
Savings	225
Total	1800

Construct a pie chart to display how Jayant spent his money.

The total money spent will represent a complete angle or 360° in the pie chart. Each expense head will be represented by a sector. First, the central angle subtended by the arc of each sector is calculated as shown below:

Expense Heads	Amount	Conversion	Central Angle
Books and Comics	450	$\frac{450}{1800} \times 360^\circ$	90°
Eating out	600	$\frac{600}{1800} \times 360^\circ$	120°
Travelling	75	$\frac{75}{1800} \times 360^\circ$	15°
Entertainment	450	$\frac{450}{1800} \times 360^\circ$	90°
Savings	225	$\frac{225}{1800} \times 360^\circ$	45°
Total	1800		360°

Break-up of Rs 1800 spent by Jayant:



Example 4: The grouped frequency distribution that follows, gives the age profile of audience in a

cinema hall screening an animated film. Construct a pie chart to display the given information.

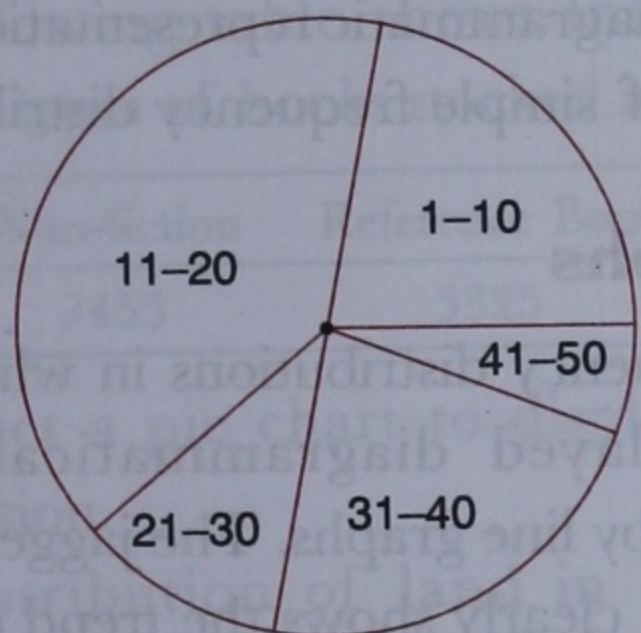
Age Group	Number of People
1-10	80
11-20	140
21-30	40
31-40	80
41-50	20

Find the magnitudes of the central angles of different classes.

Class Interval	Frequency	Conversion	Central Angle
1-10	80	— *	80°
11-20	140	—	140°
21-30	40	—	40°
31-40	80	—	80°
41-50	20	—	20°
Total	360		360°

* As the total audience is 360, $\frac{80}{360} \times 360 = 80^\circ$

Age profile of audience watching animated film:



Histograms

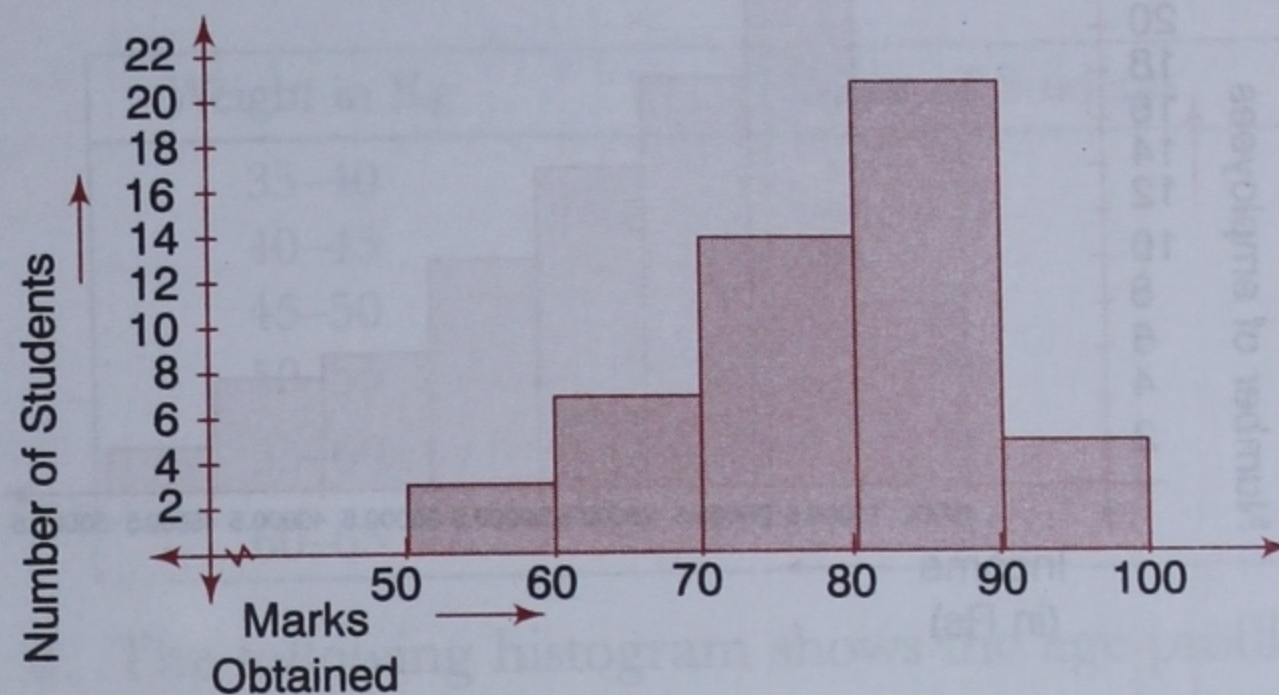
Grouped frequency distributions are generally represented diagrammatically by **histograms**.

The construction of histograms is similar to that of column graphs. The difference between the two is that instead of the rectangles being placed on the observations along the X axis in a column graph; in a histogram the rectangles are placed between the class limits that are represented along the X axis, thus leaving no space between the rectangles. This is why the class limits need to be 'true class limits' in exclusive forms of class intervals.

Example 5: The marks obtained by 50 students in an examination are shown in the grouped frequency

distribution below. Construct a histogram to display the given information.

Marks Obtained	Number of Students
50-60	3
60-70	7
70-80	14
80-90	21
90-100	5



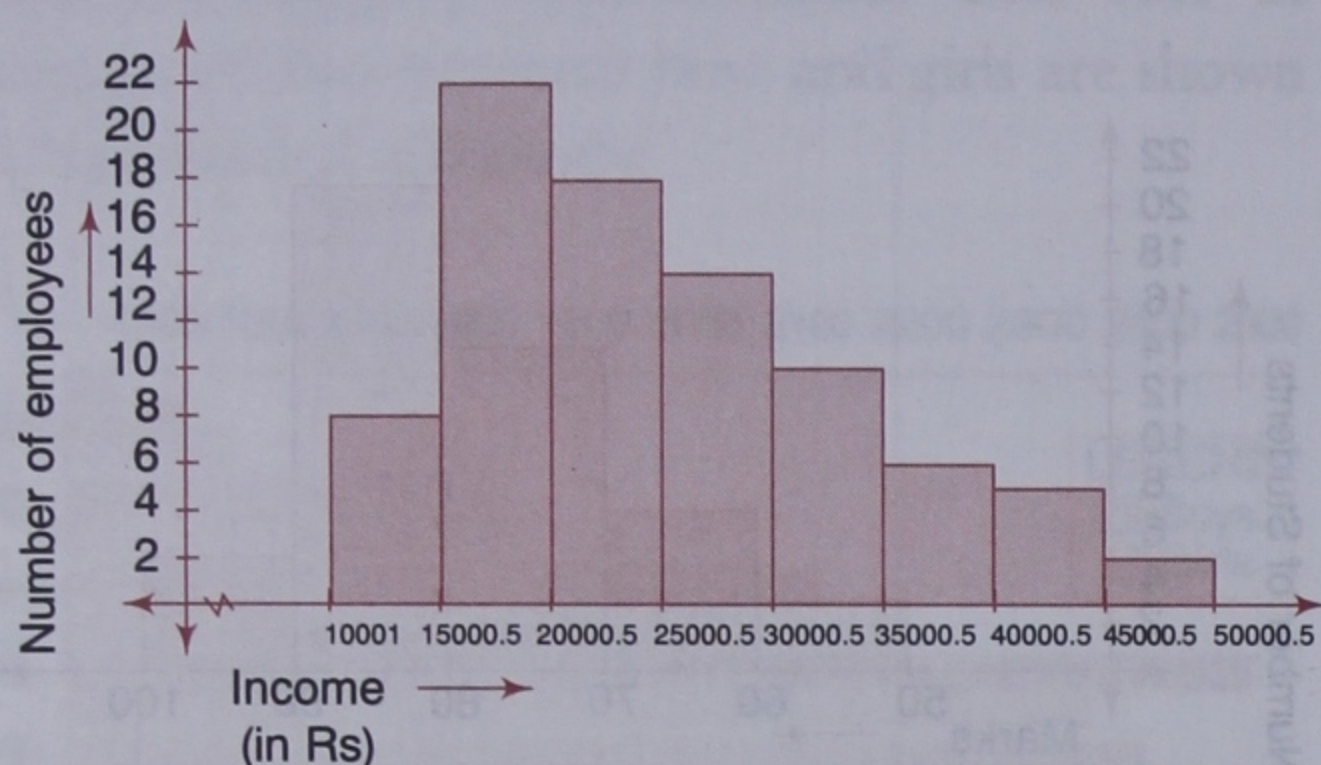
Example 6: The income profile of 85 employees in a factory is shown in the grouped frequency distribution below. Construct a histogram to display the given information.

Income Group (in Rs)	Number of Employees
10001-15000	8
15001-20000	22
20001-25000	18
25001-30000	14
30001-35000	10
35001-40000	6
40001-45000	5
45001-50000	2

The class intervals in the income groups are in inclusive form. In order to construct a histogram, the class intervals need to be first converted into exclusive form.

$15001-15000 = 1$ and half of $1 = 0.5$. Thus the new frequency distribution with continuous data will be as follows:

Income Group (in Rs)	Number of Employees
10001–15000.5	8
15000.5–20000.5	22
20000.5–25000.5	18
25000.5–30000.5	14
30000.5–35000.5	10
35000.5–40000.5	6
40000.5–45000.5	5
45000.5–50000	2

**Note:**

The broken line on the X axis indicates that no employee earns below Rs 10001.

Try this!

Collect data regarding the hobbies of your classmates or neighbours. Prepare a histogram to represent that data.

Choosing a Diagrammatic Representation

Given raw data, we can now decide on whether a simple frequency distribution will be more suitable

Exercise 35.1

- The following table shows how 60 students of a class came to school on a particular day.

Walking	By School Bus	Cycling	By Car	By Public Bus	By Rickshaw
7	18	22	3	6	4

for its presentation or a grouped frequency distribution.

Similarly, the various forms of diagrammatic representation are suitable for different types of data.

Pie charts

Although pie charts can be constructed for a simple as well as a grouped frequency distribution, they are generally used for data in which there is variety in the frequency. As the viewer cannot be expected to measure each central angle of a sector with a protractor, only such classes, the frequencies of which are clearly comparable, are suitable to be shown in a pie chart.

Column graphs/bar charts

The fine differences in frequencies which are not suitable to be shown in a pie chart can be shown in a column graph. As the difference in vertical heights of rectangles are distinct and clearly visible, this method of diagrammatic representation is preferred for display of simple frequency distributions.

Line graphs

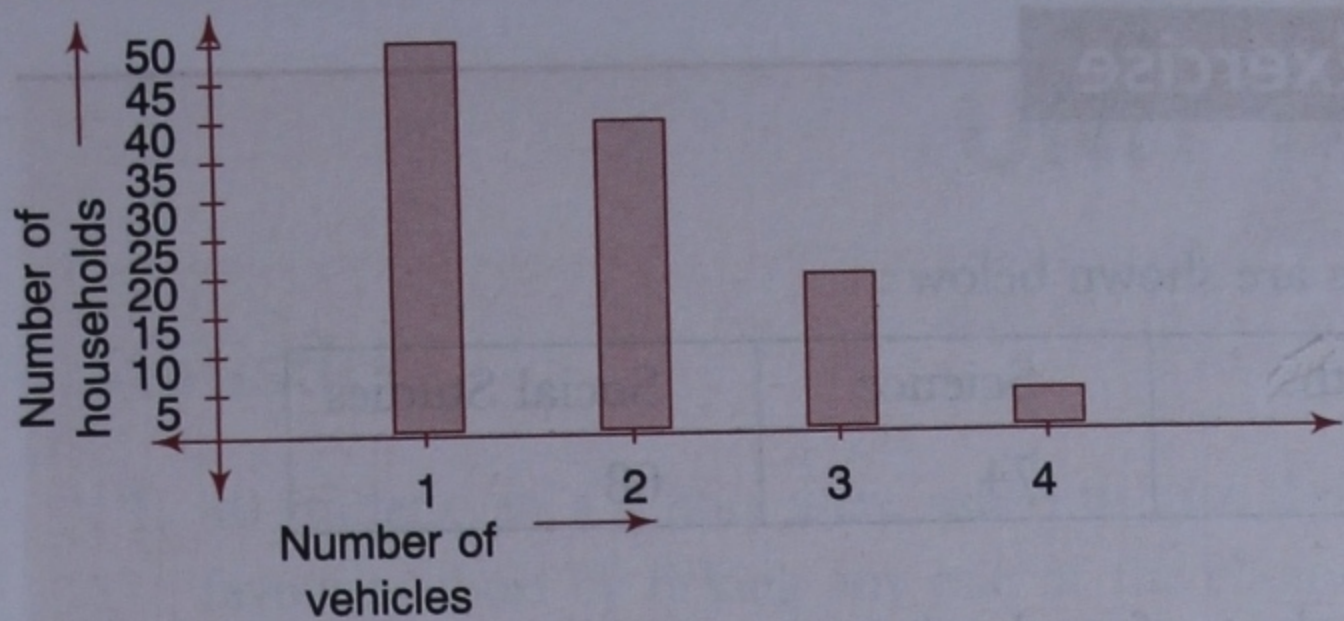
Simple frequency distributions in which a trend is to be displayed diagrammatically are best represented by line graphs. The jagged rise and fall of the graph clearly shows the trend of fluctuating data like prices or temperatures.

Histograms

Grouped frequency distributions are represented diagrammatically by histograms.

Construct a column graph showing the mode of transport availed by the 60 students.

- The following column graph shows the number of vehicles owned by 115 households interviewed in a survey.



Represent the data displayed in the column graph given above in a simple frequency distribution table.

3. The number of students studying in the middle classes of a school are given in the following table:

Class	Boys	Girls
VI	42	40
VII	51	52
VIII	46	44

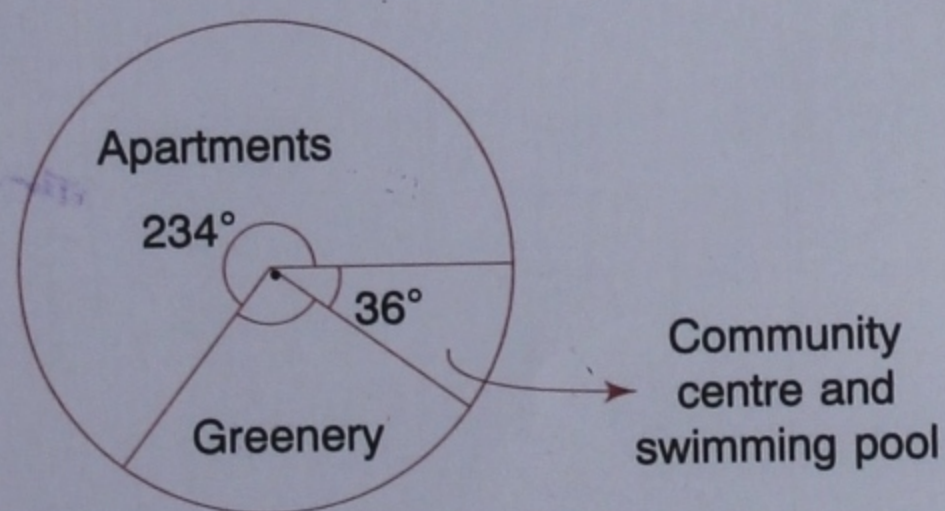
Construct a bar chart to display the given information.

4. The following table shows the number of different types of books stocked in a library.

Fiction	Non-fiction	Reference Books	Magazines
10650	7455	5325	2130

Construct a pie chart to display the given information.

5. The distribution of land in Dreamscape Housing Society is shown in the pie chart below:



Given that the total land area in the housing society is 162000 m², represent the data in tabular form.

6. The monthly sales figures recorded by a popular snack bar are listed according to products sold as given below:

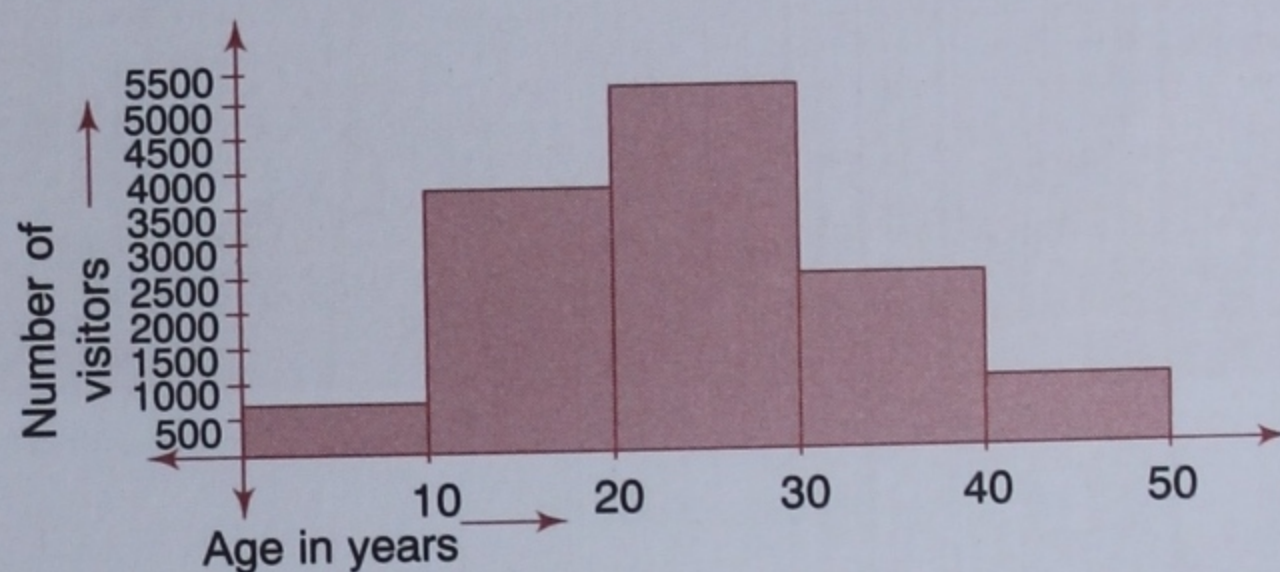
Products	Hot Beverages	Cold Drinks	Hot Snacks	Cold Snacks	Baked Food
Sales in Rs	19071	25428	38142	19071	12714

Construct a pie chart to display the product-wise sales recorded by the snack bar.

7. The weights of 60 students studying in two sections of Class VIII in a school are given in the grouped frequency distribution table below. Construct a histogram to display the given information.

Weight in Kg	Number of Students
35-40	2
40-45	7
45-50	21
50-55	18
55-60	11
60-65	1

8. The following histogram shows the age profile of visitors who viewed the Environment Club's website over a week.



Represent the data displayed in the histogram in a grouped frequency table.

9. The following grouped frequency distribution table shows the marks obtained by 50 students in a class test. Construct a histogram to display the given information.

Marks Obtained	40-50	50-60	60-70	70-80	80-90	90-100
Number of Students	2	5	9	23	8	3

Revision Exercise

1. The marks obtained by Himani in her final examination are shown below :

Subject	English	Hindi	Maths	Science	Social Studies
Marks obtained	78	60	94	74	68

Construct a column graph to represent the above data.

2. The following table shows the favourite sports of 370 students of a school.

Sports	Basket Ball	Lawn Tennis	Hand Ball	Foot Ball	Cricket	Badminton
Number of Students	60	50	55	45	85	75

Construct a bar chart to display the given information.

3. The following table shows the mode of transport used by 500 students in a school.

Mode of Transport	Van	Bus	Cycle	Scooter	On Foot
Number of Students	120	140	110	90	40

Construct a pie chart to display the given information.

4. The following table shows the number of different fruits kept in a basket.

Type of fruit	Mangoes	Bananas	Guava	Oranges	Pear
Number	30	25	22	20	18

Construct a pie chart to display the given information.