DIAGRAMS AND GRAPHS

Tabular presentation is the presentation of collected information in a form which is attractive and informative. But since numbers and tables have very little attraction, pictorial presentation of data has much importance. Pictures, different types of diagrams and graphs are used for this purpose. A well constructed diagram or graph will convey much more information than numbers or tables.

Diagrams:

A diagram is a visual form for presentation of statistical data, highlighting their basic facts and relationship. If we draw diagrams on the basis of the data collected they will easily be understood and appreciated by all. It is readily intelligible and save a considerable amount of time and energy.

Significance of Diagrams and Graphs:

Diagrams and graphs are extremely useful because of the following reasons.

1. They are attractive and impressive.
2. They make data simple and intelligible.
3. They make comparison possible
4. They save time and labour.
5. They have universal utility.
6. They give more information.
7. They have a great memorizing effect.

General rules for constructing diagrams:

The construction of diagrams is an art, which can be acquired through practice. However, observance of some general guidelines can help in making them more attractive and effective. The diagrammatic presentation of statistical facts will be advantageous provided the following rules are observed in drawing diagrams.

1. A diagram should be neatly drawn and attractive.
2. The measurements of geometrical figures used in diagram should be accurate and proportional.
3. The size of the diagrams should match the size of the paper.
4. Every diagram must have a suitable but short heading.
5. The scale should be mentioned in the diagram.
6. Diagrams should be neatly as well as accurately drawn with the help of drawing instruments.
7. Index must be given for identification so that the reader can easily make out the meaning of the diagram.
8. Footnote must be given at the bottom of the diagram.
9. Economy in cost and energy should be exercised in drawing diagram.

Representation of categorical data

Data which fall into different categories or qualitative classes is called categorical data. The diagrams that are used to represent categorical data are

1. One dimensional diagram like bar diagrams.
2. Two dimensional diagrams like rectangles, squares and circles.
3. Three dimensional diagrams like cubes, cylinders and spheres.
4. Pictograms and cartograms

(1) *One dimensional diagrams*

These are the most commonly used diagrams. Usually horizontal or vertical lines or bars with their lengths proportional to the magnitudes of the observations corresponding to each category constitute this diagram.

Bar diagrams are of various types

1. Simple bar diagrams
2. Subdivided bar diagrams
3. Percentage bar diagrams
4. Multiple bar diagrams
5. Deviation bar diagrams

Simple bar diagrams

Horizontal or vertical bars (fully shaded rectangles) with the same width, drawn with their bases on the same horizontal or vertical line with equal gaps in between and lengths proportional to the magnitudes of the observations constitute a bar diagram.

Subdivided bar diagram or component bar diagrams

This type of diagram is used when the observations corresponding to the various categories have different components and it is felt that a comparison of the component parts is important. Here a simple bar diagram is first drawn with the length of the bars proportional to the totals of the component parts and then it is sub divided into parts of length proportional to the component magnitudes and each part given a different colour or shading.

Percentage bar diagrams

In this the component parts are expressed as the percentages of the total and a component bar diagram is drawn with all bars having equal length.

Multiple bar diagrams

These diagrams are used for representing two or more interrelated data, for facilitating comparison.

Deviation bar diagrams

This diagram is usually used to represent net quantities like net profit, balance payable, deficit or excess etc. as the observations may be positive or negative, the base line is usually drawn in the middle of the paper horizontally and positive values are

indicated by bars of proportional length, drawn above the horizontal line and negative values by bars of proportional length drawn below the horizontal line.

(2) Two dimensional diagrams

In two dimensional diagrams areas of the diagrams are used to represent the magnitudes. Rectangles, squares and circles with area proportional to the observations are used to represent each category. Of these, circles are most commonly used. Such diagrams are called **pie-diagrams.** Circles drawn with areas proportional to the magnitudes of the observations constitute a pie-diagram.

Pie Diagram or Circular Diagram:

Another way of preparing a two-dimensional diagram is in the form of circles. In such diagrams, both the total and the component parts or sectors can be shown. The area of a circle is proportional to the square of its radius. While making comparisons, pie diagrams should be used on a percentage basis and not on an absolute basis. In constructing a pie diagram the first step is to prepare the data so that various components values can be transposed into corresponding degrees on the circle.

The second step is to draw a circle of appropriate size with a compass. The size of the radius depends upon the available space and is proportional to the square root of total frequency. The third step is to measure points on the circle and representing the size of each sector with the help of a protractor. Since there are 360 degrees in a circle, a class with a relative frequency of .25 would consume .25(360) = 90 degrees of the circle.

(3) Three dimensional diagrams.

Cubes, cylinders, blocks etc. with volumes proportional to the magnitudes of the observations are drawn in this case to represent them.

(4) Pictograms and cartograms

Cartograms are used to give quantitative information on a geographical basis. The map of a country with regions receiving the same annual rainfall shaded in the same manner is a cartogram. The magnitude in this case is the annual rainfall and it can be indicated by a foot note giving the rainfall corresponding to each type of shading.

Graphs:

A graph is a visual form of presentation of statistical data. A graph is more attractive than a table of figure. Even a common man can understand the message of data from the graph. Comparisons can be made between two or more phenomena very easily with the help of a graph. Most important types of graphs are

1.Histogram 2. Frequency Polygon 3.Frequency Curve 4. Ogive

Histogram:

A histogram is a bar chart or graph showing the frequency of occurrence of each value of the variable being analysed. In histogram, data are plotted as a series of rectangles. Class intervals are shown on the 'X-axis' and the frequencies on the 'Y-axis'if the classes are of equal width and frequency density (f/c) on 'Y-axis' if the classes are of un equal width. The height of each rectangle represents the frequency or frequency density of the class interval. Each rectangle is formed with the other so as to give a continuous picture. Such a graph is also called staircase or block diagram. However, we cannot construct a histogram for distribution with open-end classes.

Frequency Polygon:

If we mark the midpoints of the top horizontal sides of the rectangles in a histogram and join them by a straight line, the figure so formed is called a Frequency Polygon. This is done under the assumption that the frequencies in a class interval are evenly distributed throughout the class. The area of the polygon is equal to the area of the histogram, because the area left outside is just equal to the area included in it. Another method of drawing frequency polygon is on the X axis draw the mid points and on the Y axis the frequency density (f/c) join the points by straight line to obtain frequency polygon.

Frequency Curve:

If the middle point of the upper boundaries of the rectangles of a histogram is corrected by a smooth freehand curve, then that diagram is called frequency curve. The curve should begin and end at the base line.

Ogives:

The cumulative frequency gives the cumulative frequency of each of the class. The curve table is obtained by plotting cumulative frequencies is called a cumulative frequency curve or an ogive.
There are two type of ogive namely:

1. The 'less than ogive'
2. The 'more than ogive'.

In less than ogive method we start with the upper limits of the classes and go adding the frequencies. When these frequencies are plotted, we get a rising curve. In more than ogive method, we start with the lower limits of the classes and from the total frequencies we subtract the frequency of each class. When these frequencies are plotted we get a declining curve.

Difference between Diagram and Graph

Diagram	Graph
➢ Ordinary paper can be used	➢ Graph paper is needed
➢ It is attractive and is easily understandable.	➢ It needs some effort to understand
➢ It is appropriate and effective to represent one or more variables	➢ It creates problem
➢ It cannot be used for interpolation and extrapolation technique	➢ It is helpful in intrapolation and extrapolation techniques.
➢ Median and mode cannot be estimated	➢ The value of median and mode can be estimated
➢ It is used for comparison only	➢ It represents a mathematical relationship between the two variables.
➢ Data are presented by bars, rectangles	➢ Data are presented by points or lines of different kinds – dots, dashes, etc.
➢ Diagrams are used for publicity as they are attractive. They give only approximate information. To a statistician or a researcher, diagrams are not helpful in analysis	➢ Graphs are very much useful to statistician or researchers in analysis.