Presentation of Data

Presentation of Data-Introduction and its Types, Textual Presentation

Objective

In this lesson, we will understand the meaning of presentation of data. Also, we will study about one of the ways of presenting the data, i.e. textual presentation.

Presentation of Data

In the previous two lessons, we studied about the collection and organisation of data. After the raw data is collected, it is organised so as to facilitate comparison and further analysis of data. The next step is the presentation of data. The demonstration of data should be done in a clear and attractive manner so that it can be easily understood and analysed by various statistical users. This is known as presentation of data. The following are the three broad ways of presenting the data.

- Textual Presentation of Data
- Tabular Presentation of Data
- Diagrammatic Presentation of Data

In this lesson, we deal with textual presentation of data. The other two are dealt with in the subsequent lessons.

Textual Presentation of Data

The presentation of the data in the form of text is known as the textual presentation of data. In other words, under textual presentation, the data is summarised paragraphs forms. It is the simplest and the most common form of data presentation. This method is generally used when the data is not very large.

A textual description of the data supports the quantitative description and makes the data more understandable. While going through the Indian Economic Development class you must have come across, plenty of textual data.

For example, the statement "the current account deficit rose from 1.35% to 3.69% of GDP from 1980-81 to 1990-91" is a textual presentation of data. Similarly, the statement for rural areas "the participation rate for men is 53% while that for women is 30%" presents a textual form of data.

However, the textual presentation of data involves certain drawbacks. One of the major drawbacks is that in order to draw meaningful conclusion, the reader has to go through

the entire text. In case of large and voluminous data, this proves to be a cumbersome task. In other words, the textual presentation does not provide information at a glance. Thus, it becomes necessary to supplement the textual presentation with the tabular and diagrammatic presentation of data.

Tabular Presentation of Data

Objective

After going through this lesson, you shall be able to understand the following concepts.

- Meaning of Tabular Presentation of Data
- Objectives of Tabular Presentation of Data
- Components of a Table
- Types of Tables
  - On the Basis of Purpose- General Purpose Table and Specific Purpose Table
  - On the Basis of Originality- Original Table and Derivative Table
  - On the Basis of Construction- Simple Table and Complex Table

Meaning of Tabular Presentation of Data

In your study of Indian Economic Development, you might have come across various tables providing a summary of the data on various topics. For example, the following table presents the data for growth of GDP in the three major sectors.

Sector	1980-91	1992-2001	2002-07 *(Tenth Plan Projected)*
Agriculture	3.6	3.3	4.0
Industry	7.1	6.5	9.5
Services	6.7	8.2	9.1
GDP	**5.6**	**6.4**	**8.0**

Clearly, a table is a more systematic presentation of data in the form of rows and columns. The rows are read horizontally whereas, the columns are read vertically. Thus, tabular presentation of data (tabulation) refers to the systematic presentation of data in the form of rows and columns.

Objective of Tabular Presentation of Data

Tabular presentation of data is done with the following broad objectives.

(i) *Simplification of data*: With the help of a table, complex and large data can be easily presented.

(ii) *Helpful in making comparison*: With tabular presentation of data, the comparison among two or more variables can be easily made just by looking at the figures in the table.

(iii) *Facilitate further computation*: It facilitates further mathematical and statistical calculations such as computation of averages, correlation etc.

(iv) *Helpful is summarising information*: The data can be presented in a concise and summarised form with the help of a table.

(v) *Avoids explanation*: A table presents the data in minimum possible space. Thus, it avoids repetitive and unnecessary explanation.

(vi) *Helpful in interpreting the data*: Looking at the data from a table, meaningful conclusions can be easily drawn.

Parts of Table

A table can be divided into different parts. These are:

(i) *Table number*: It denotes the number of the table in a chronological order. In the above table the table number is 3.1. Assigning a number to a table proves more useful when more than one table is prepared for a given information. By denoting each table with a unique number, one table can be easily differentiated from the other.

(ii) *Title*: Title denotes the specific information depicted in the table. In other words, it describes the contents of the table. The title of the table should be brief and comprehensive and provide a clear explanation of the data. In the given table, the title is Educational Attainment in India.

(iii) *Stubs and captions*: Stubs are the titles given to the rows of a table and captions are the titles given to the columns of the table. The caption and stubs should be clear and brief. They must provide a clear explanation of the components of the rows and columns, respectively.

(iv) *Body of the table*: Body of the table consists of the actual information provided by the data. Based on the nature and size of the data, the body of the table summarises

the data. While preparing it, caution must be taken to avoid unnecessary and irrelevant information. Besides, relevant information should be highlighted.

(v) *Head note*: It completes the information in the title of the table. Generally, information such as the units of measurement and time period are provided in the head note. It refers to the statements mentioned above the table that highlights the important points of the table. (The above table does not have any head note).

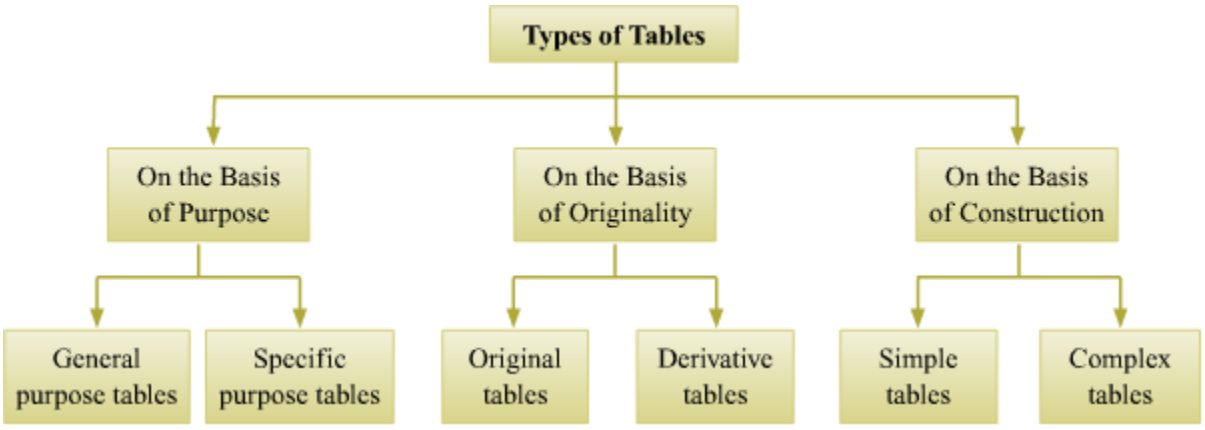
(vi) *Foot note*: Foot note refers to the statement placed at the bottom of the table that supplement certain specific information in the table. Symbols or marks such as * or # are used to identify the foot notes.

(vii) *Sources of data*: While tabulating the data, it is very necessary to provide the source of information to the readers.

The following diagram summarises the parts of a table.

<table>
<tr><td>Stub
Row heading</td><td colspan="3">Caption
(Column Heading)</td><td>Total</td></tr>
<tr><td rowspan="2">Stub
Entries
(Row entries)</td><td>Sub-Caption</td><td>Sub-Caption</td><td></td><td></td></tr>
<tr><td colspan="3">Body</td><td></td></tr>
<tr><td>Total</td><td></td><td></td><td></td><td></td></tr>
</table>

Types of Tables



Tables can be classified on the following three basis.

- On the Basis of Purpose
- On the Basis of Originality
- On the Basis of Construction

On the Basis of Purpose

Based on the purpose, the tables can be of the following two types.

(i) ***General purpose tables***: General purpose table provides information that is of general use and can be used for different purposes. These types of tables are used for reference. They are usually given in appendices and are used by those researchers who need additional information on any particular issue. For example: Data published by the government agencies

(ii) ***Specific purpose tables***: Specific purpose tables highlight a particular set of information. Such tables are generally compact and small in size. They help in analysing of the information in an effective manner.

On the Basis of Originality

On the basis of originality, the tables can be of the following two types.

(i) ***Original tables***: Original tables are the tables that contain information in the original form. In other words, they present or express data in the same manner in which it was originally collected.

(ii) ***Derivative tables***: Contrary to the original tables, derivative tables present the data after making all the necessary calculations. Generally, in these kinds of tables, the data is presented in the form of ratios, percentages and other statistical calculations.

On the Basis of Construction

On the basis of construction, tables can be classified in the following two types.

(i) *Simple tables*: It is the simplest form of table having a single characteristics. These are in the form of frequency table. Simple tables are also known as one-way tables.

Income (in '000)	Number of Persons
10-20	15
20-30	12

30-40	13
40-50	16
50-60	14
Total	80

(ii) *Complex tables*: Under such kinds of tables the data is classified on the basis of more than one characteristic. Complex tables could be 'two-way' tables 'three-way' tables or manifold tables. For example, the following is a three-fold complex table. It presents the number of students based on the age group and the locality in which they reside.

Age Group	Locality A	Locality B	Locality C
10-20	15	12	17
20-30	27	19	36
30-40	16	23	18
40-50	12	31	28
50-60	11	24	17
Total	81	109	116

As per the table, there are 15 students in the age group (10 -20) that reside in locality A, 12 students that reside in locality B and 17 students that reside in locality C.

Geometric Diagram- Bar and Pie Diagrams, Arithmetical Line Graph

Objective

After going through this lesson, you shall be able to understand the following concepts.

- Diagrammatic Presentation of Data- Meaning and Importance
- Construction of Diagrams
- Types of Diagrams
- Geometric Diagram
  - Bar Diagram- Simple Bar Diagram, Multiple Bar Diagram and Component Bar Diagram
  - Pie Diagram

- Arithmetic Line Graph

Diagrammatic Presentation of Data

In the previous two lessons, we studied about the textual and tabular presentation of data. In this lesson, we will explore another technique of presentation of data, i.e. diagrammatic presentation.

Through diagrams such as bar diagrams, histograms, pie charts, etc., the data is presented in a far more attractive and interesting way. Such diagrammatic presentation helps in analysing the data at a mere glance.
Importance of Diagrammatic Presentations

Diagrams are an important method of presenting the data. The usefulness of the diagrams is highlighted in the following points.

1. Simple and easy to understand: The data presented in the form of diagrams is simplest and easiest to understand. The entire data can be easily understood at a glance.

2. Attractive and impressive: Diagrammatic presentation makes the data more attractive and interesting. Diagrams tend to leave a long lasting impact on the mind.

3. Helpful in making comparisons: The presentation of data in the form of diagrams helps in making comparison between two or more groups, or two or more periods.

4. Helpful in making forecast: Diagrammatic presentation of data provides a benchmark through which future trends can be easily forecasted.

Construction of Diagrams

The following points must be kept in mind while constructing the diagrams.

1. Heading: Every diagram should be assigned a short and brief heading explaining the components of the diagram. This heading can be placed on the top of the diagrams or just below it.

2. Proper size: In the diagrammatic presentation, it is very necessary that the diagram has proper size. In other words, it should neither be too small or nor too large in proportion to the size of the page. Also, as far as possible, the diagram should be placed in the middle of the page.

3. Scale: The construction of the diagrams should be done with proper geometric instrument and use of a proper scale. For the sake of simplicity, generally scale of even numbers should be chosen.

4. Height and width: The width and height of the diagram should be in appropriate proportion. Also, they should be properly labelled.

5. Mentioning of scale of measurement: The scale used for the construction of diagram should also be mentioned below the diagram in order to present the different items such as 1 unit is equal to 1000 km.

6. Footnotes and notes of source: In every diagram, the footnote concerning the relevant information about the diagram should be placed below the diagram. Along with this, the note regarding the source from which the data has been collected should also be mentioned.

7. Simplicity: The diagram should be as simple as possible and easily understandable even by a layman.

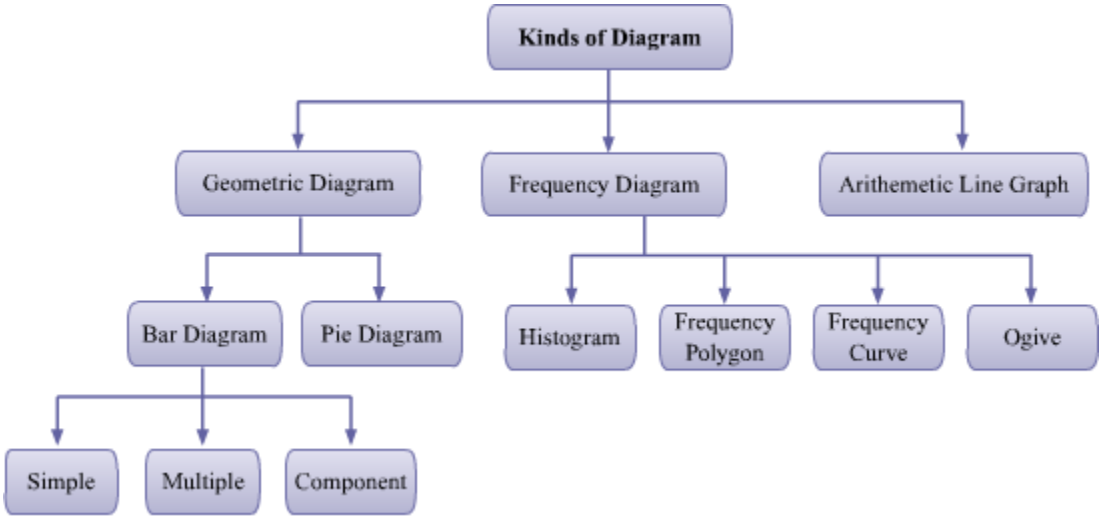
Types of Diagrams

Diagrams can be divided into the following three broad categories.

(i) Geometric Diagram

(ii) Arithmetic Line Graph

(iii) Frequency Diagram (*dealt in the next lesson*)



I. Geometric Diagram

Geometric diagram can be further classified into two categories.

- Bar Diagrams

- Pie Diagrams

1. *Bar Diagram*

Bar diagrams represent the data with the help of vertical bars. They are one-dimensional diagrams in the sense, that it is only the height of the bars that matters and not the width.

The height of the bars in the diagram differs according to the values of different variables. Higher value variables are represented by longer bars. However, it should be noted that the width of the bars remains constant. The bar diagrams can be further classified into the following three categories.

i. Simple Bar Diagram

ii. Multiple Bar Diagram

iii. Component Bar Diagram

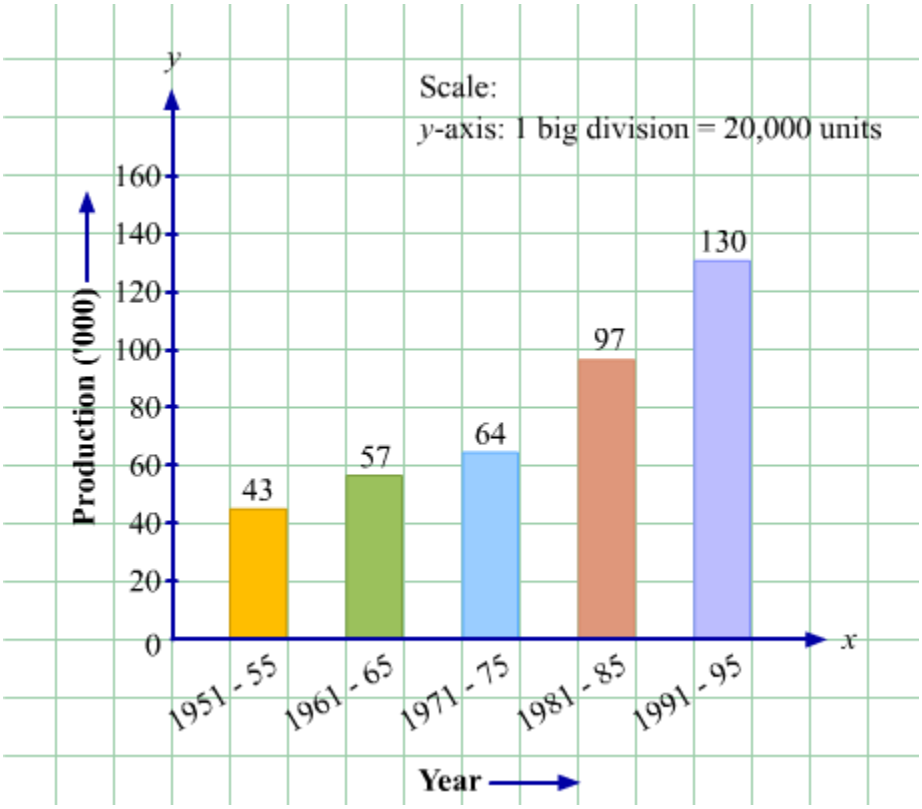
i. ***Simple bar diagram***: Simple bar diagram is the most common form of bar diagrams. They can be either drawn horizontally or vertically. However, generally, vertical bar diagrams are drawn.

Example: Present the following data in a bar diagram.

Years	Production (in '000)
1951-55	43
1961-65	57
1971-75	64
1981-85	97
1991-95	130

Solution

The following is the bar diagram for the given data.



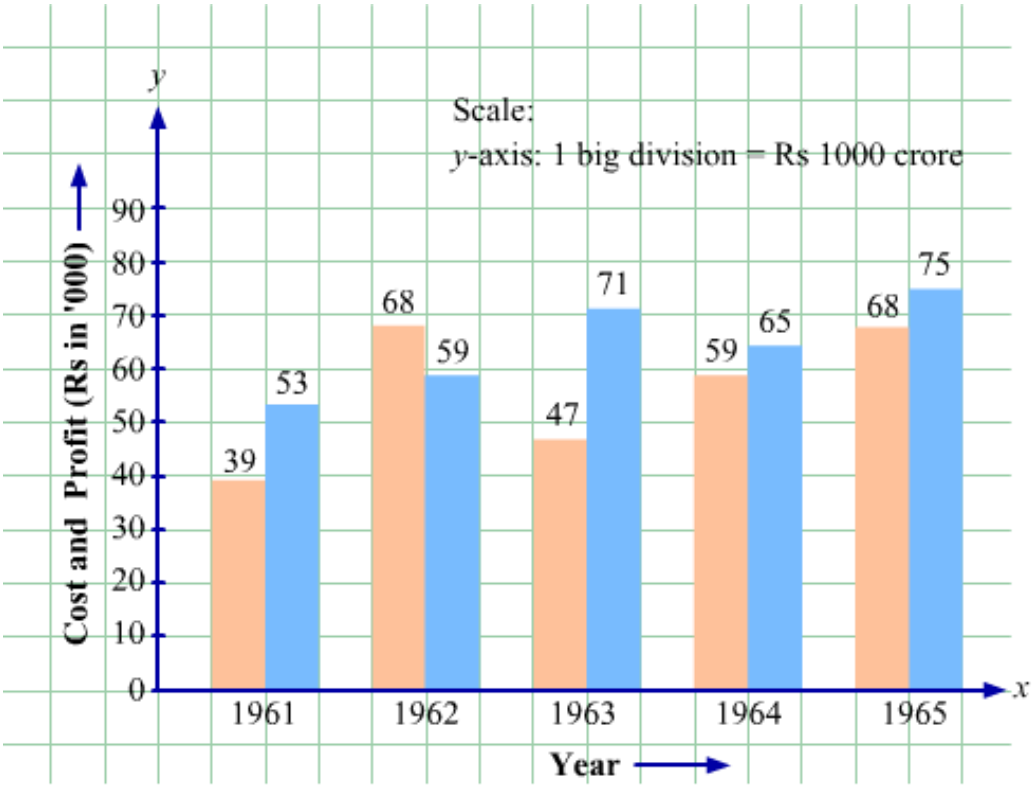
ii. ***Multiple Bar Diagram***: In multiple bar diagram two or more related variables are represented on a single diagram. They facilitate comparison between the variables. Bars for different variables are distinguished from each other by shading them in different colours. These types of bar diagrams are also termed as double bar graphs.

Example: Represent the given information in a bar diagram.

Year	Cost (in '000 crore)	Profit (in '000 crore)
1961	39	53
1962	68	59
1963	47	71
1964	59	65
1965	68	75

Solution

Since, two variables are to be represented simultaneously, we use a multiple bar diagram.



iii. ***Component bar diagram***: Under a component bar diagram, we represent different components of a variable in a single bar. In other words, various sub-components of a single value are represented in a single diagram.

The area of a bar occupied by each component denotes its share in the total variable. They are also known as ***staked charts.***

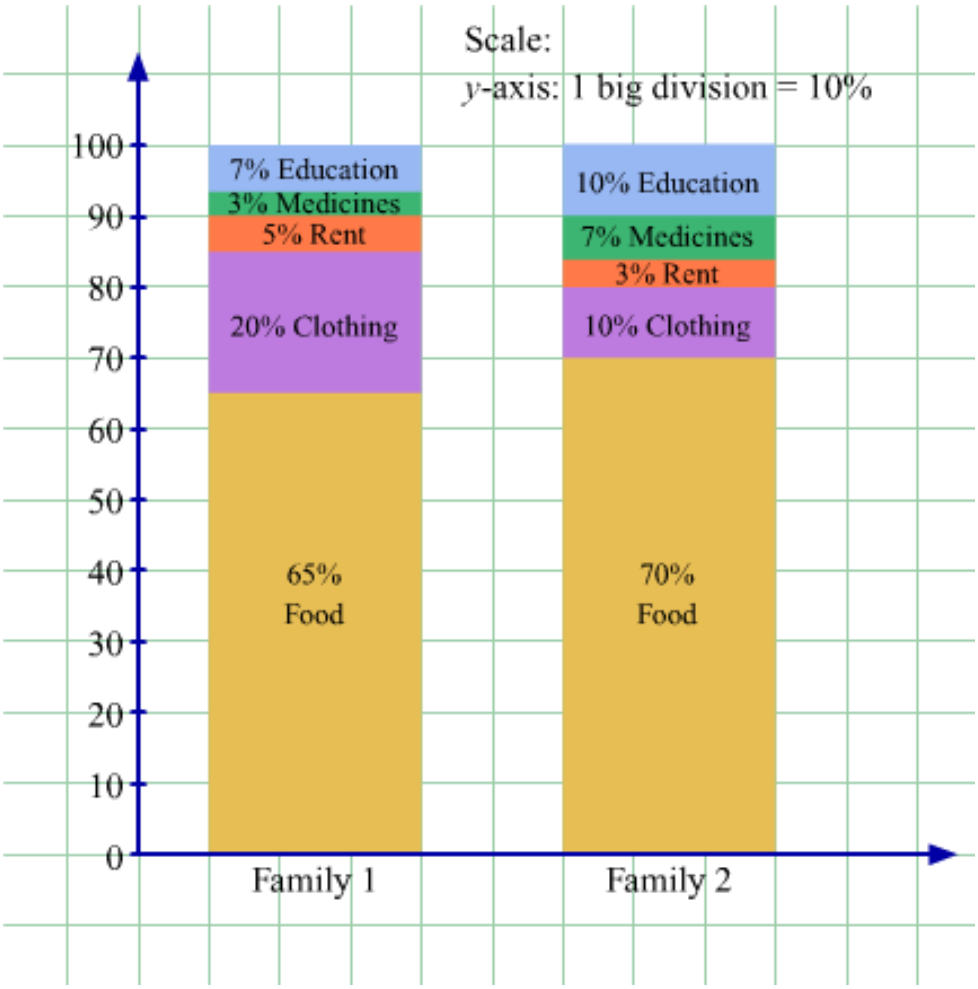
Example: The following table presents information regarding the expenditure of two families on various items. Present the information in the form of a bar diagram.

Item	Family 1 (in %)	Family 2 (in %)
Food	65	70
Clothing	20	10
Rent	5	3
Medicines	3	7

Education	7	10
	100	100

Solution

Here, we are given the expenditure pattern of two families. The total expenditure of each family is divided into various sub-components. Thus, to present the data, we use a component a bar diagram.



2. Pie-Diagram: Pie diagram depicts a circle that is divided into various segments showing the values of different items (components) in percentage terms. Just like, different slices are cut from a pie, similarly, in a pie chart the entire data is divided into different components.

Steps for the Construction of Pie Diagram

The following are the steps involved in the construction of a pie-diagram.

***Step*1**: Convert the different values of the data in the percentage of the total.

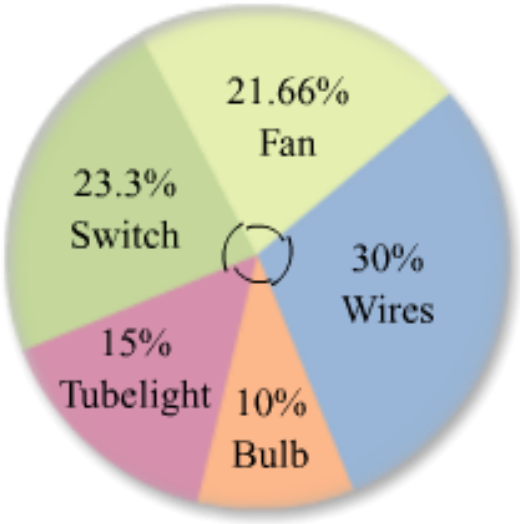
***Step*2**: The percentage values are then converted into degrees (as part of the total 360degrees of a circle). Since, the total angle of the circle is 360º. This implies that 100 % is equal to 360º. Accordingly, 1% is equal to 3.6º. Thus degree of any value is computed as follows.

Degree Value = Component Value × 3.6

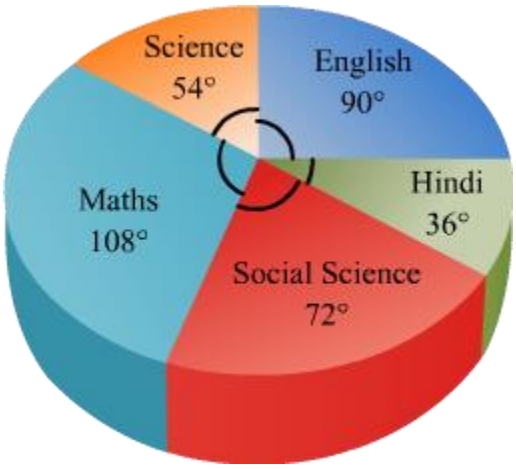
***Step* 3**: Different degree values are then represented on the circle with the help of a protractor.

Example: The following table presents the cost of five electrical items. Prepare a pie chart representing the given information.

Products	**Cost (in '000 crores)**	**% Share**	**Degrees Share**
Bulb	30	10	36
Tube light	45	15	54
Switch	70	23.3	83.88
Fan	65	21.66	77.976
Wires	90	30	108
	300	100	360°



Example: The following pie diagram presents the preference for different subjects among students. Calculate the percentage of students that prefer each of the subject.



Solution

The percentage value is calculated using the following formula.

$$\text{Percentage Value} = \text{Component Value} \times \frac{100}{360}$$

For the given pie diagram, the following are the percentage value for various subjects.

Subject	Degree Share	Percentage
English	90°	$90 \times \frac{100}{360} = 25$

Hindi	36°	$36\times\frac{100}{360}=10$
Maths	108°	$144\times\frac{100}{360}=30$
Science	54°	$54\times\frac{100}{360}=15$
Social Science	72°	$72\times\frac{100}{360}=20$

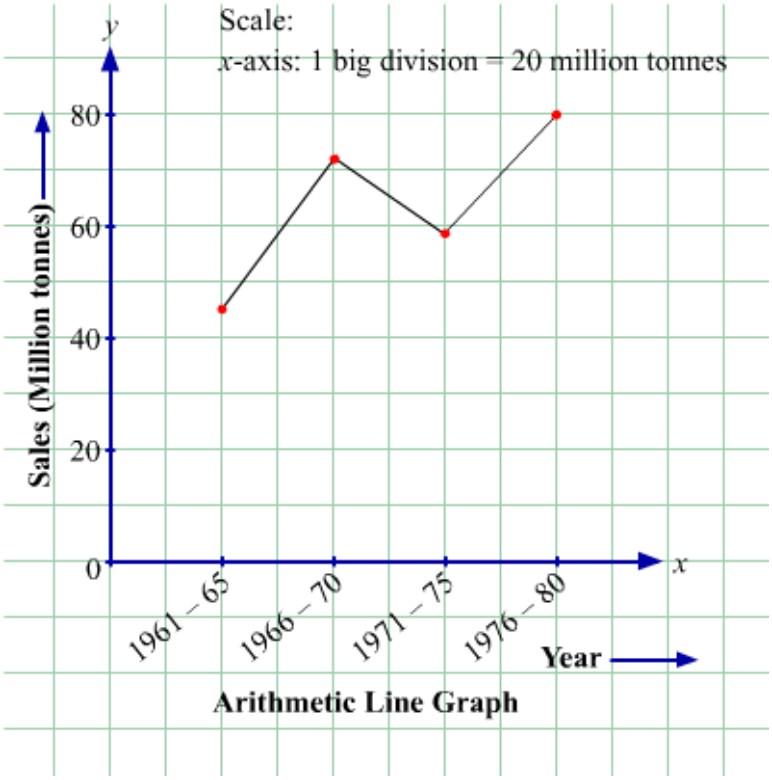
II Arithmetic line graph

1. ***Arithmetic Line Graph for one Variable***

Arithmetic line graph is the graph formed by joining the points of data with straight lines which are called line graph. This graph is usually used to denote changes in the variable over a period of time. The horizontal axis depicts time factor such as weeks, months or years. Every graph should have a suitable title. Moreover, the scale of the graph should also be mentioned.

Example: Following table presents the sales of a firm for different years. Represent the data by an arithmetic line graph.

Year	**Sales (in million tonnes)**
1961 – 65	45
1966 – 70	72
1971 – 75	59
1076 – 80	80



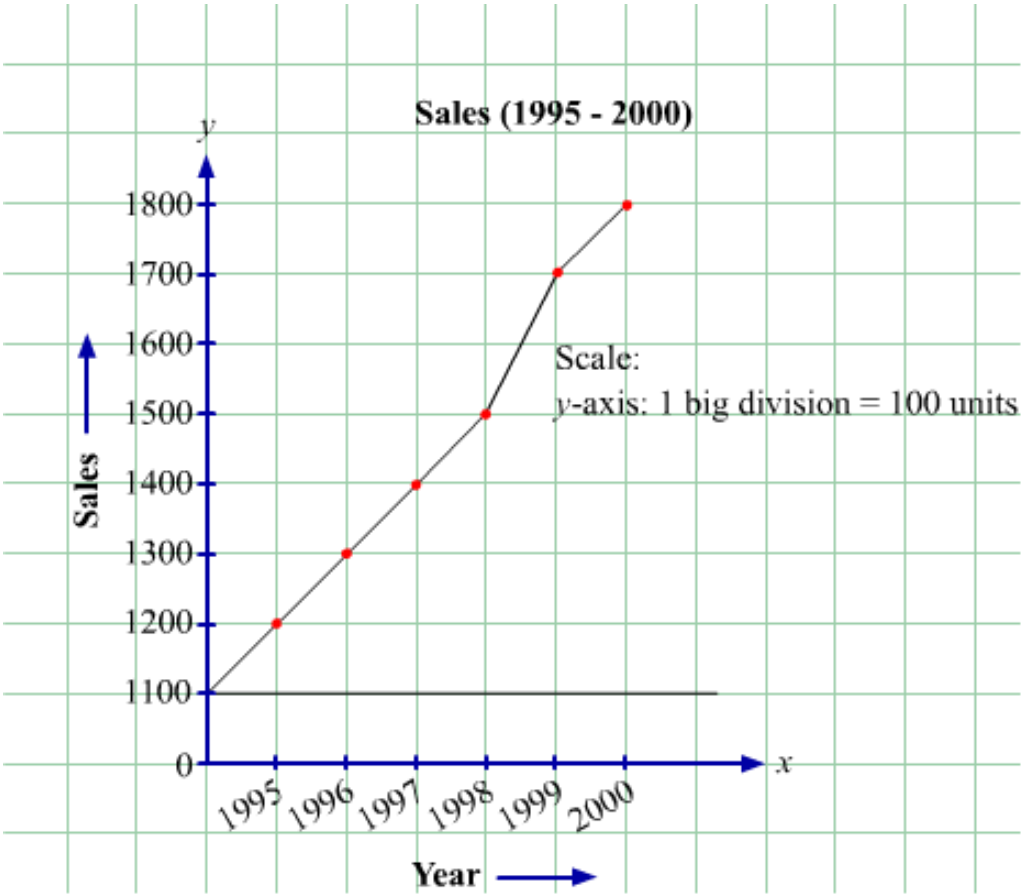
Note: Sometimes the difference between the smallest value of the y-series and zero is very large. In such cases, the difference is broken drawn by using a false base line on the y-axis. The following example illustrates the use of a false base line.

Example- Present the given data on a graph.

Year	Sales (Units)
1995	1,200
1996	1,300
1997	1,300
1998	1,500
1999	1,700
2000	1,800

Solution

Here, the smallest value on the *y*-series (Sales) is 1,200 which is far higher than zero. Therefore, in this case we use a false base line starting from 1,100.



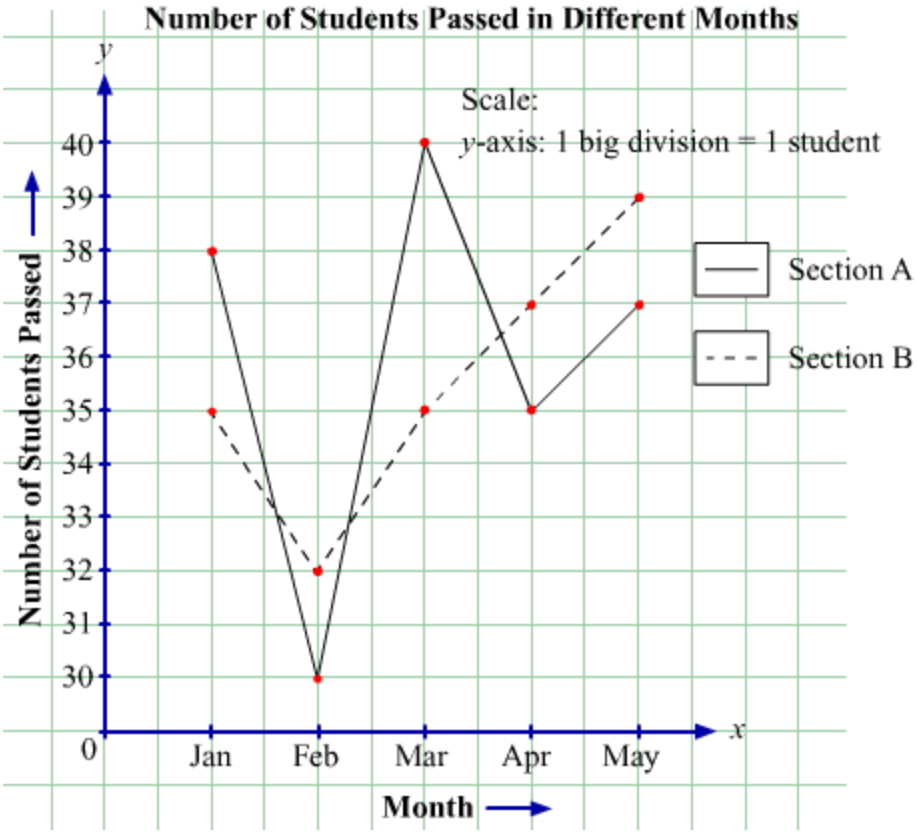
2. ***Arithmetic line graph for more than variable***

We can also represent more than one variable simultaneously on a single graph paper. In this case, different line graphs for different variables are distinguished by using different colours or different patterns (simple line, broken line, etc.) for the graphs.

Example- The following table presents the number of students who passed the exams in different month in two sections A and B. Prepare an arithmetic line graph for the data.

Month	Section A	Section B
January	38	35
February	30	32
March	40	35
April	35	37
May	37	39

Solution



Frequency Diagrams and its Types

Objective

After going through this lesson, you shall be able to understand the following concepts.

- Frequency Diagram- Meaning
- Types of Frequency Diagram- Histogram, Frequency Polygon, Frequency Curve and Ogive

Introduction

In the previous lesson, we studied about the geometric diagrams and the arithmetic line graph. In this lesson, we will study another method of diagrammatic presentation namely, frequency diagrams.

Frequency Diagram

Frequency diagram refers to the diagrammatic presentation of frequency distributions. Such diagrams depict values of the variables and their frequencies. The following are the four common types of frequency diagrams

- Histogram
- Frequency polygon
- Frequency Curve
- Ogive

I. Histogram

Histogram is a form of representing the frequency distribution of any attribute or variables. It is a two dimensional figure where *x*-axis represents the class intervals and *y*-axis represent the frequencies. In other words, the two-dimensional diagrams that depict the frequency distribution of a continuous series by the means of rectangles are called histograms.

Here, adjacent rectangles are prepared consisting of length as well as breadth. The width and height of the rectangles determine the class interval and class frequency, respectively.

Construction of Histograms

The following can be the four cases for the construction of a histogram.

- When equal class intervals are given
- When unequal class intervals are given
- When mid-values are given
- When class intervals given are of the inclusive form

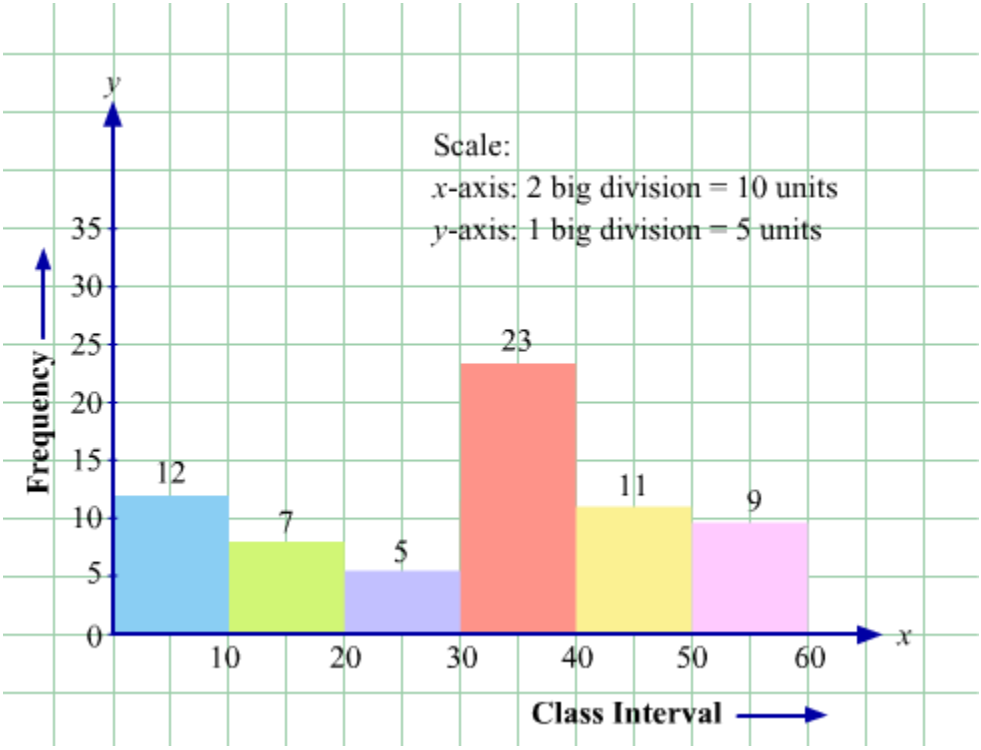
1. *Histogram with equal class-interval*

The following example illustrates the construction of a histogram when the class intervals are of equal size.

x	f
0-10	12
10-20	7
20-30	5
30-40	23

40-50	11
50-60	9

Solution: Here, we represent the class intervals on the x-axis and frequencies on the y-axis. The first bar is drawn of the height 12 and width equal to the class size, that is 10. The next class bar is drawn adjacent to this with the same width and height equal to 7 and so on. The histogram for the given data is as follows.



(ii) *Histogram with unequal class-intervals*

While preparing the histograms, if the given class-intervals are of unequal size then, we are first required to convert them into equal size. Accordingly, an adjustment is made in the frequencies of each class interval. The general formula for the adjustment of the frequency is as follows.

$$\text{Adjusted Frequency} = \frac{\text{Required Cass Interval} \times \text{Frequency}}{\text{Actual Class Interval}}$$

Example- Represent the following information using a histogram.

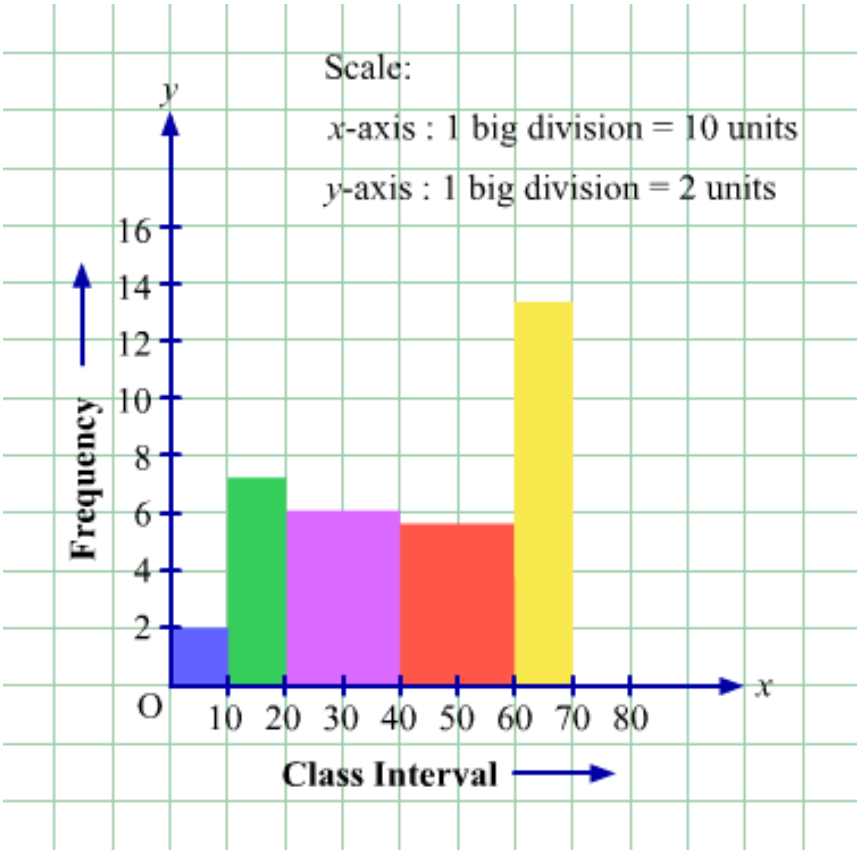
Class Interval	Frequency
0-10	2

10-20	7
20-40	12
40-60	11
60-70	13

Solution

Here the data is in the form of unequal class interval. So, we will first make appropriate adjustment in the frequencies to make the class intervals equal.

Class Interval	Frequency	Adjusted Frequency
0-10	2	–
10-20	7	–
20-40	12	$\frac{12\times10}{20}=6$
40-60	11	$\frac{10\times11}{20}=5.5$
60-70	13	–



(iii) *Histograms when mid-values are given*

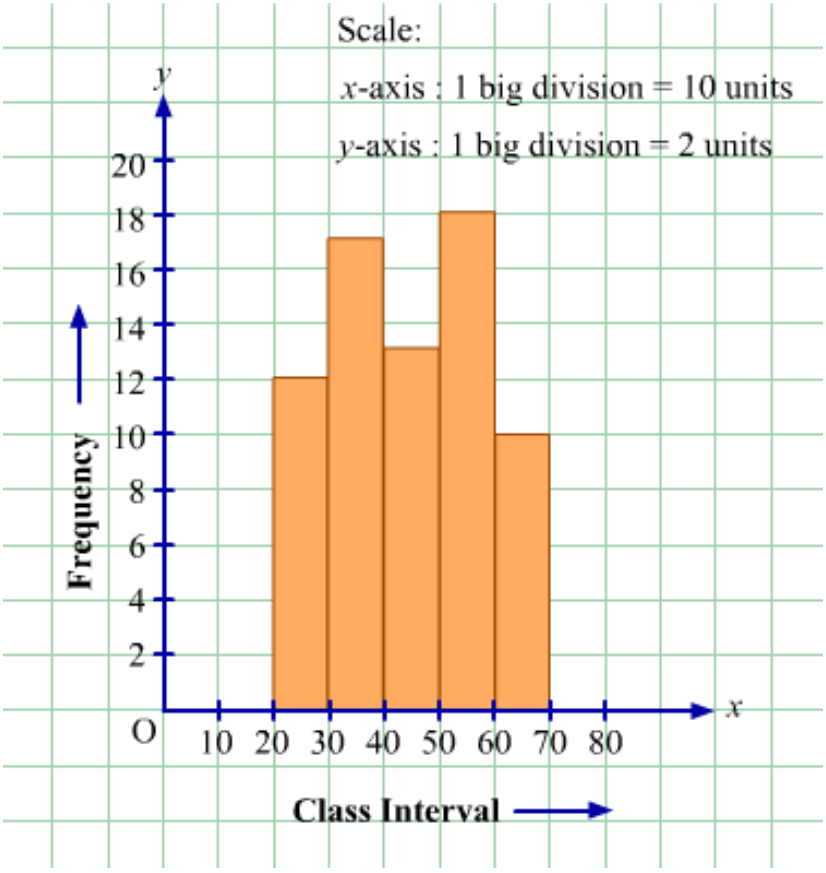
When the mid-values are given, they are first converted into class intervals for the construction of histogram.

Example: Present the following information by the means of histogram.

X (mid-point)	Frequency	Class-Intervals
25	12	20-30
35	17	30-40
45	13	40-50
55	18	50-60

65	10	60-70

In the given mid-point, ascertain the difference between the second and the first class interval (35-25) = 10. Divide this difference by 2, 10 ÷ 2 = 5. Now, the resultant is subtracted as well as added to each mid-point.



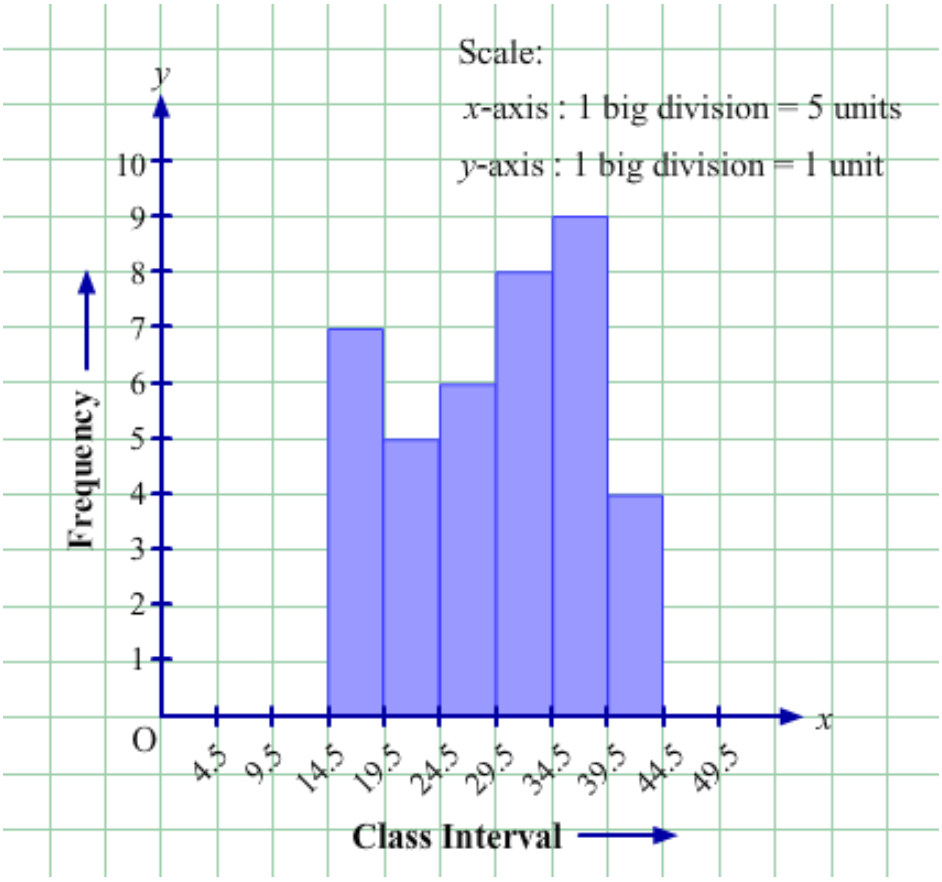
(iv) *Histogram When Class Interval are Given in Inclusive Form*

When the class intervals are given in inclusive form they are first converted in exclusive form. Then the histogram is drawn in the same manner as described above.

Example: Represent the following information with the hep of a histogram.

(C.I)	*f*	Adjusted C.I
15-19	7	14.5-19.5

20-24	5	19.5-24.5
25-29	6	24.5-29.5
30-34	8	29.5-34.5
35-39	9	34.5-39.5
40-44	4	39.5-44.5



II. Frequency Polygon

A frequency polygon is a closed figure that is formed by joining the top midpoints of all the rectangles of histograms using a straight line. It can also be created without the help of histograms, wherein the midpoints of class intervals are directly plotted and are

joined by a straight line. Let us understand the construction of the two types of frequency polygon.

(i) Frequency polygon with histogram

The following steps are involved in the construction of a frequency polygon with a histogram.

***Step* 1**: Construct a histogram from the given data.

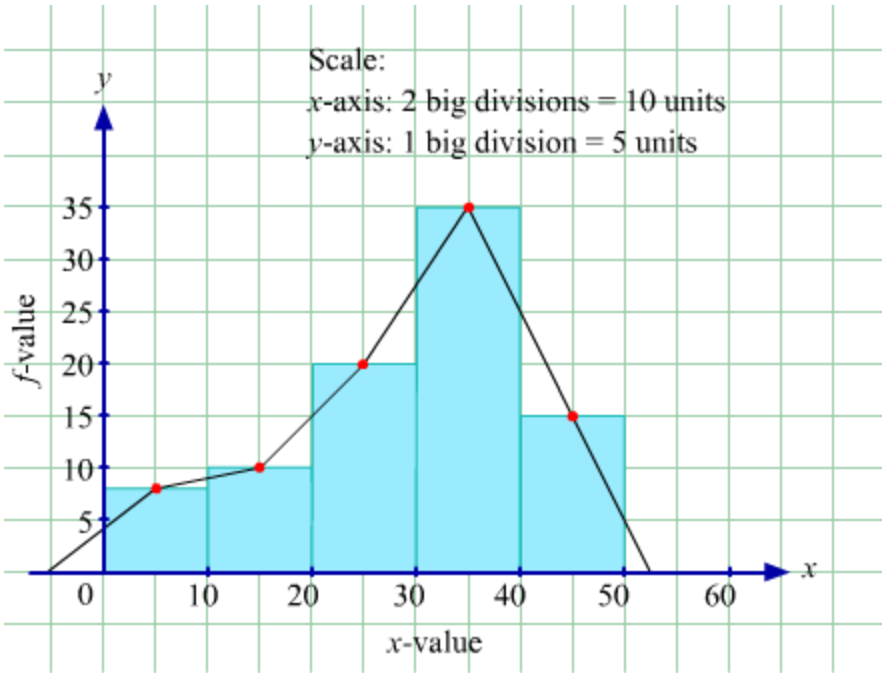
***Step* 2**: For each bar diagram, obtain the mid-points.

***Step* 3**: Join the mid-points with a straight line.

***Step* 4**: The curve obtained is the frequency polygon.

Example: For the following data, draw a frequency polygon using a histogram.

x	f
0-10	7
10-20	10
20-30	20
30-40	35
40-50	15



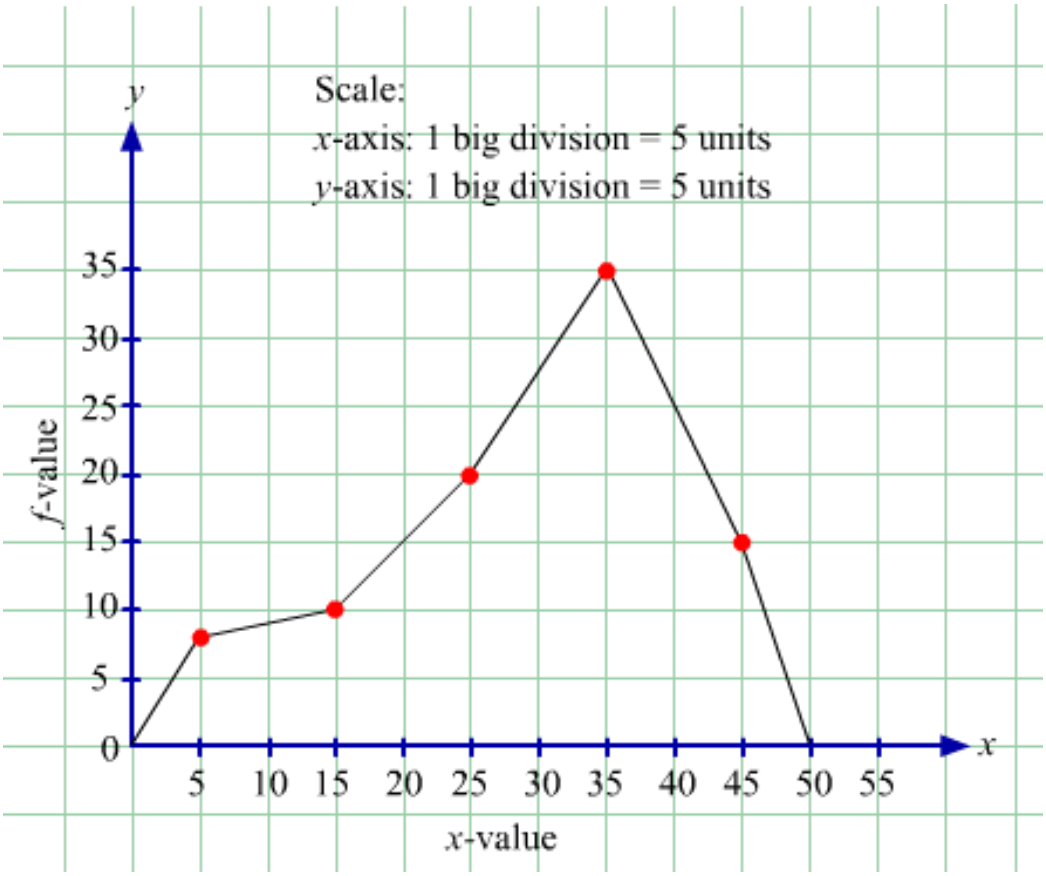
(ii) Frequency polygon without histogram

When frequency polygon is to be drawn without a histogram then, we simply plot the mid-points of the class intervals with their respective frequencies. The curve obtained on joining the points is the frequency polygon.

Example: For the given data draw a frequency polygon without a histogram.

x	f	mid-points
0-10	7	5
10-20	10	15
20-30	20	25
30-40	35	35
40-50	15	45

Solution

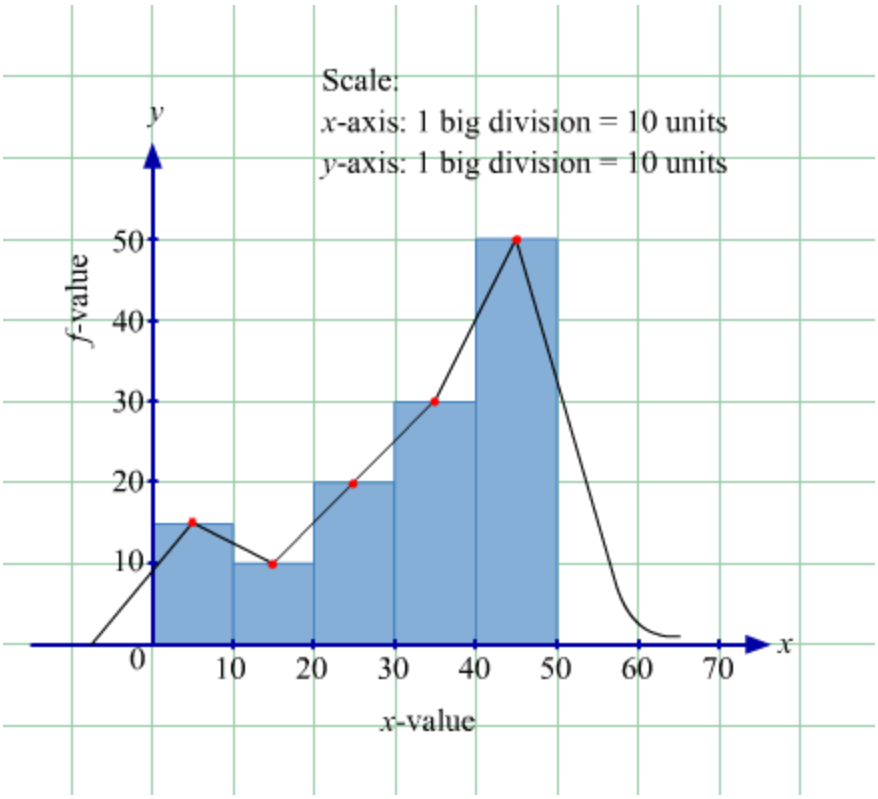


III. Frequency Curve

Frequency curve is a curve that is obtained by joining the top midpoints of all rectangles of a histogram using a free hand. The only difference between a frequency curve and a frequency polygon is that while, frequency polygon is drawn by joining the points by a straight line, frequency curve is drawn by a smooth hand. In other words, when frequency polygon is smoothed out then it is known as frequency curve. A frequency curve must be drawn such that the total area under the curve is proportional to the total frequency.

Example: For the following data, draw a frequency curve.

x	f
0-10	15
10-20	10
20-30	20
30-40	30
40-50	50



IV. Ogive

Ogives or cumulative frequency curve is a smooth distribution curve that depicts cumulative frequency data on a graph paper. An ogive can be drawn by using either of the following two methods.

- Less Than Method
- More than Method

(i) *Less than method*

In this method, first the less than cumulative frequencies are calculated. In other words, the frequencies are added starting from the upper limit of the first class interval to the upper limit of the last class interval of the frequency distribution. The cumulative frequencies are then plotted against the upper limit of the class intervals. The curve obtained on joining the points is known as the less than ogive.

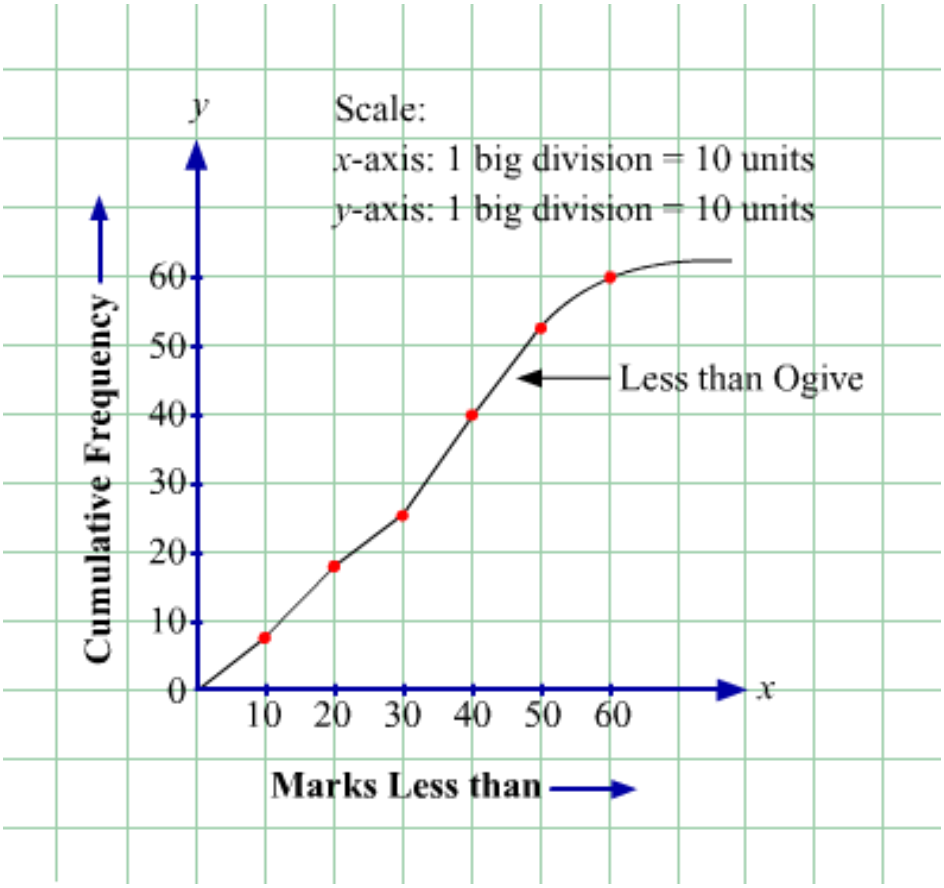
Example- Draw a less than ogive for the following data.

x	*f*
0-10	7
10-20	12
20-30	6

30-40	15
40-50	13
50-60	7

Solution

x	***f***	**Cumulative Frequency (less than)**
Less than 10	7	7
Less than 20	12	19 (7 + 12)
Less than 30	6	25 (7 + 12 + 6)
Less than 40	15	40 (7 + 12 + 6 + 15)
Less than 50	13	53 (7 + 12 + 6 + 15 + 13)
Less than 60	7	60 (7 + 12 + 6 + 15 + 13 + 7)



(ii) *More than method*

As the name suggests, in this method, more than cumulative frequencies are calculated. That is, frequencies are added starting from the lower limit of the first class interval to the lower limit of the last class interval of the frequency distribution.

The cumulative frequencies are then plotted against the lower limit of the class intervals. The curve obtained on joining the points is known as the more than ogive.

***Example*-** Draw a more than ogive for the following data.

x	***f***
10-20	7
20-30	12
30-40	6
40-50	15
50-60	13
60-70	7

Solution

x	f	Cumulative Frequency (more than)
More than 10	7	60
More than 20	12	53 (60-7)
More than 30	6	41 (53-12)
More than 40	15	35 (41-6)
More than 50	13	20 (35-15)
More than 60	7	7 (13-20)