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## **UNIT III Making Graphs and Charts using SPSS**

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## **3.1 INTRODUCTION**

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SPSS have strong capabilities of depicting data in a magnificent way. It depicts high quality graphs and charts with highly enhanced and editing tools. It also helps in translating numerical information into visual presentation form for better understanding of the subject matter.

This unit will help you in preparing different types of graphs and charts that are appropriate for both the types of variables using procedures of SPSS.

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## 3.2 OBJECTIVES

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After reading this unit you will be able to:

- ❖ Learn about procedure for preparing charts and graphs.
- ❖ Conversant in using SPSS for preparing appropriate charts for categorical and numerical variables.
- ❖ Work with the functions of SPSS for editing and enriching graphics.

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## 3.3 CONSTRUCTING CHARTS AND GRAPHS

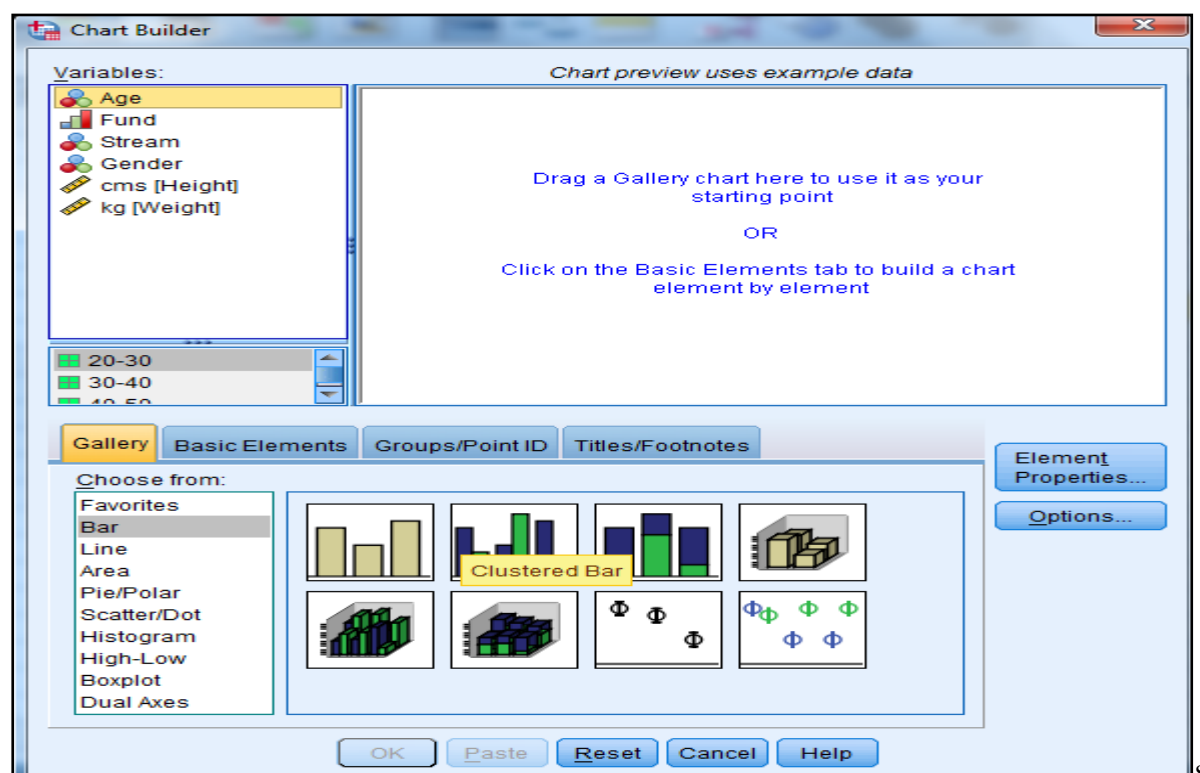
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As a researcher you have to often use graphs and charts for presenting pictorial relationship between variables and identifying the pattern of the data so collected.

The basic components of the charts and graphs are the axis, coordinates of points, notation for identifying points, fixing scales and plotting points on the graph. A chart or a graph is a right angled submission of a vertical and a horizontal axis. The horizontal axis is called as x axis i.e. abscissa and vertical axis as y axis i.e. ordinate. Accordingly independent variables are represented on the x axis and dependent variable on the y axis and the meeting point of both the axis is called as origin. A point is the basic relationship of a graph. Each point is defined by a pair of numbers containing two ordinates. Further a scale is to be fixed on the basis of the nature of the data (one cm represents what?). The scale may be linear, logarithmic or something more elaborate. Further, also remember if axis does not start with zero than a small zigzag can be inserted on the axis.

Further, choosing the right type of charts and graph according to the data is the key point to consider by the researcher. Moreover, selecting the scale of a diagram should be appropriate for a given situation.

In SPSS, graphs and charts can be created by using Legacy Dialogue or through Chart Builder. Chart builder provides one of the most professional looking graphs and a set of options that allow any edits you might desire.



### 3.4 LINE GRAPHS

Line graph is a type of graph that highlights trends by drawing connecting lines between data points. This illustrates trends and changes over continuous and long intervals. Line graph represents data that changes over the time, such as cycles, fluctuations, trends and distributions, increase or decrease in profits, employment statistics etc. In certain cases like financial profitability or changes in prices of shares etc., line graph can be used to predict future trends as well.

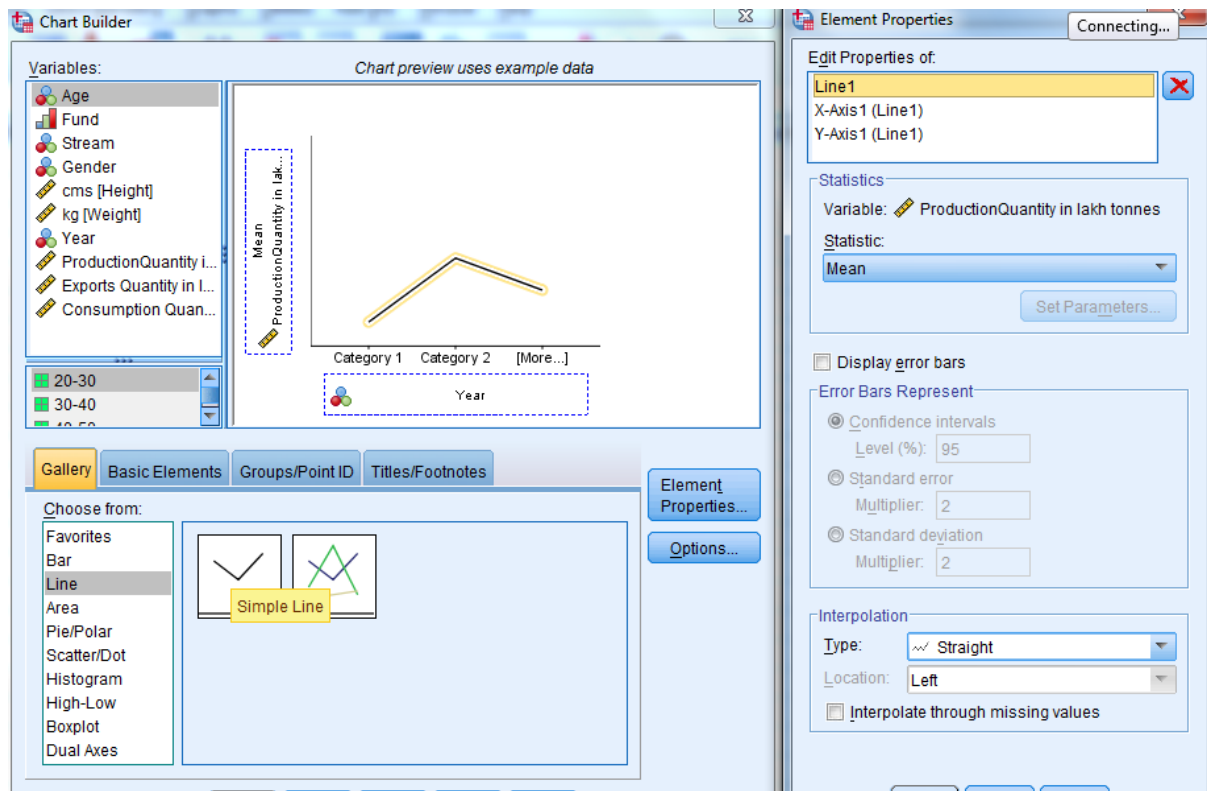
Let us study the production, exports and consumption of coffee for the period 2001 to 2012

Use the following procedure to draw the line graph:

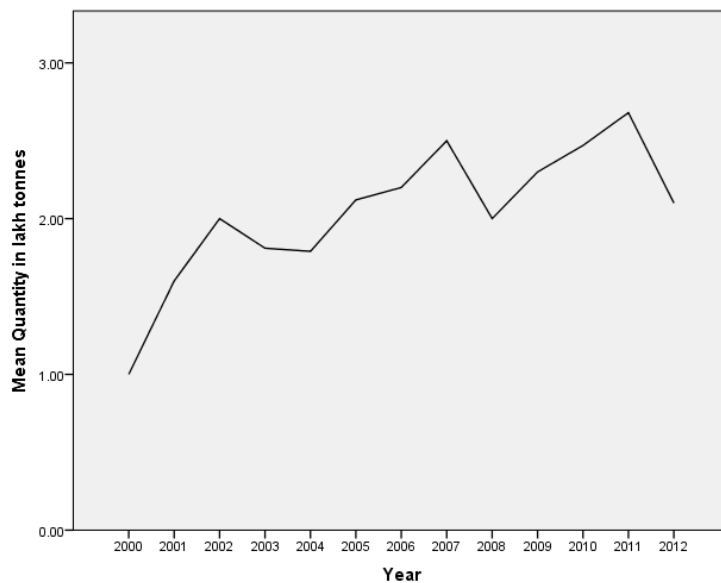
Path:

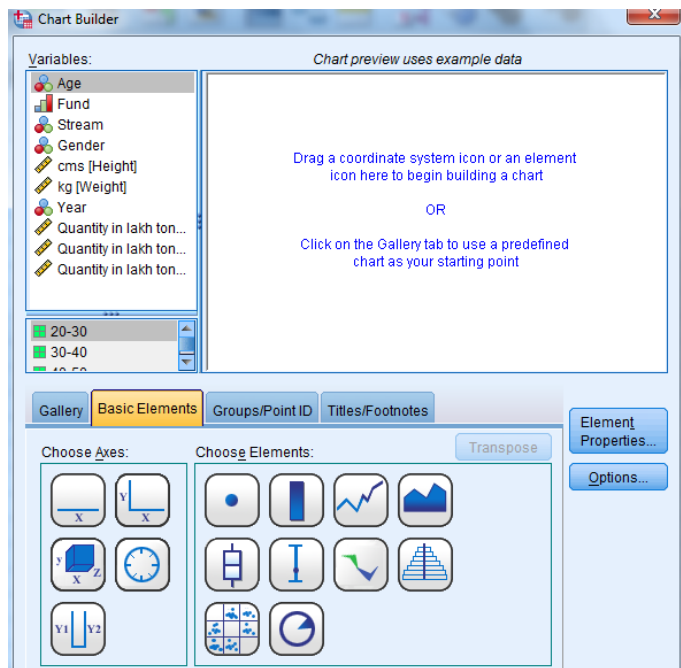


For simple line graph first drag the simple line **diagram to the panel at the top.**

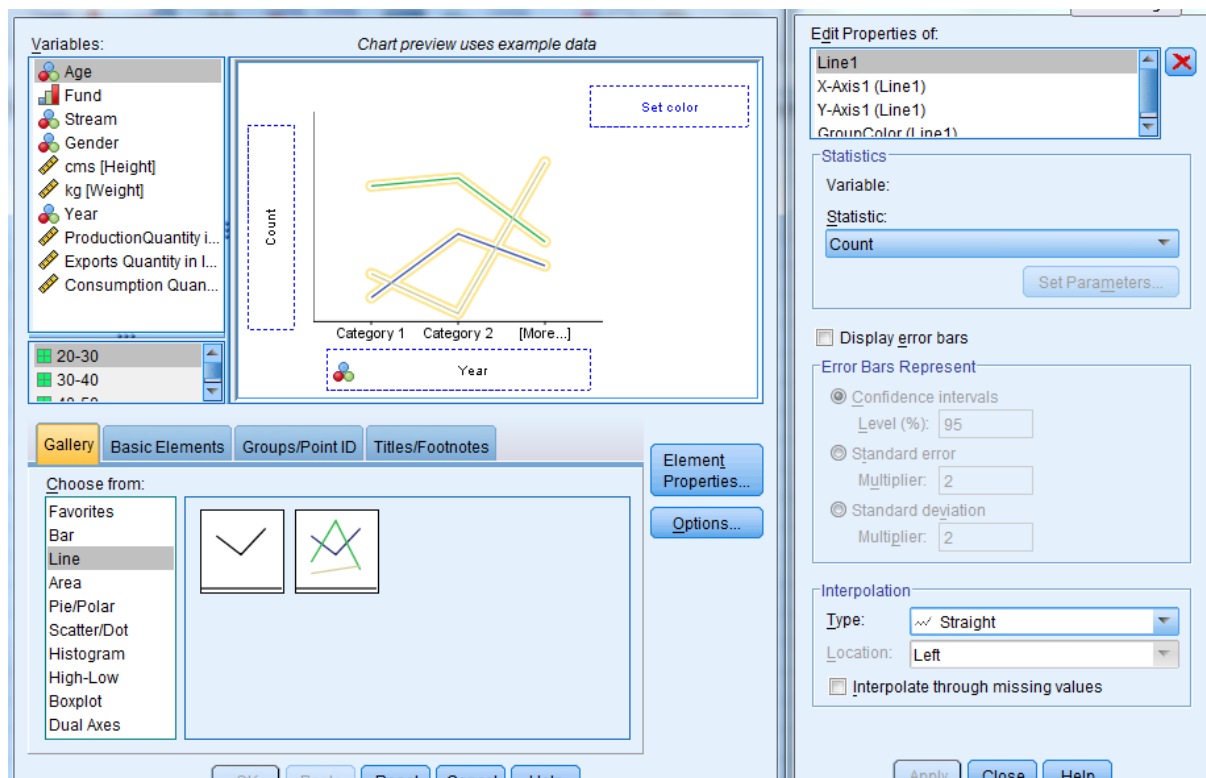


Drag the Year on x axis box and the Production and Exports on y-axis box. Click the o.k. button. The line graph would be generated in the output.

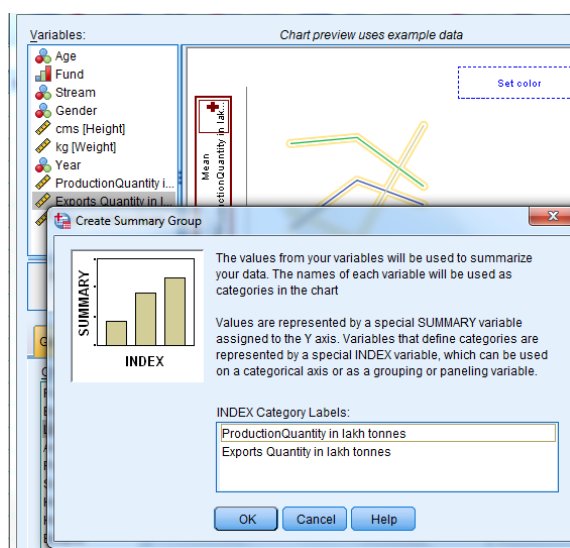




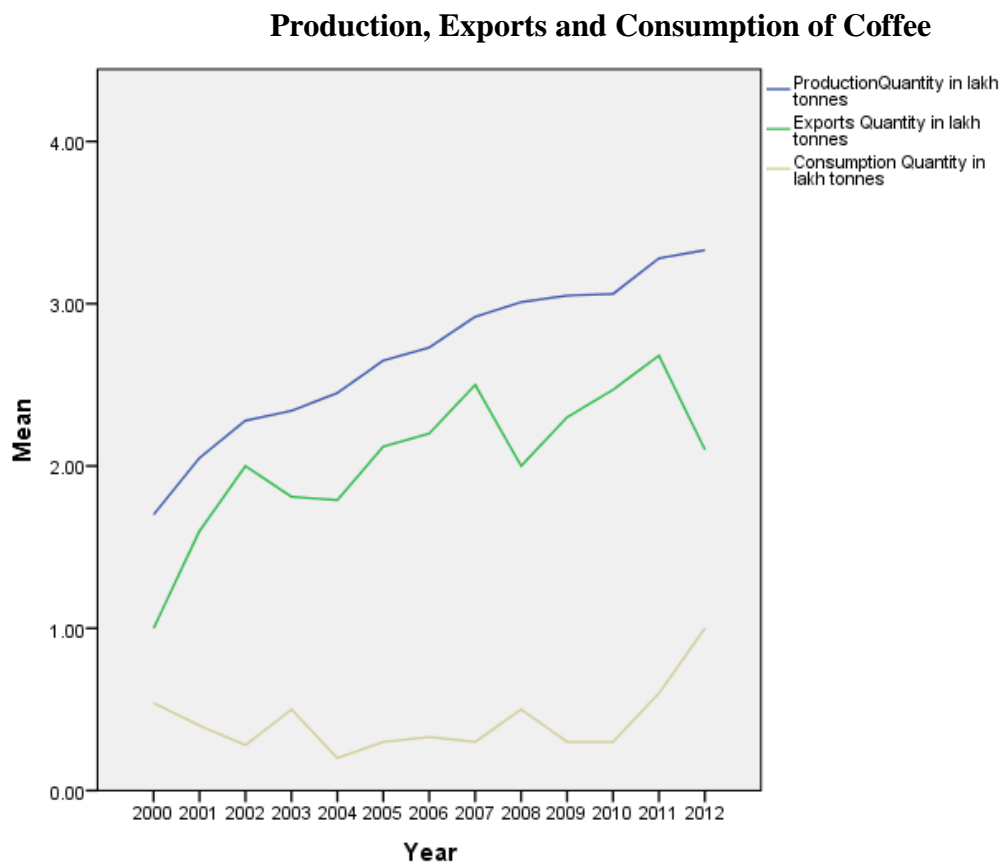
If you want to depict the pattern of change in two or more variables in the line graph then multiple lines can be selected. The following steps would be followed to create graph with multiple lines; first go to graphs and then to chart builder. Drag the multiple line diagram in the plot. Select the variable which you want to represent on x axis from the variables list. The word mean would be added to the marginal note because the mean values would be considered for the graph.



In the variables list select the variable Production and drag it to the y axis. Further add the variable Consumption and Exports in the y axis box where + sign is displayed otherwise these variables will replace each other. After this, the Create Summary Group dialogue box will appear, there by instructing you that the SPSS is combining the two variables along the Y-axis, after the message click the OK button.



Then after returning to the main dialogue box click the OK button. After clicking, the output would be generated as displayed in the image



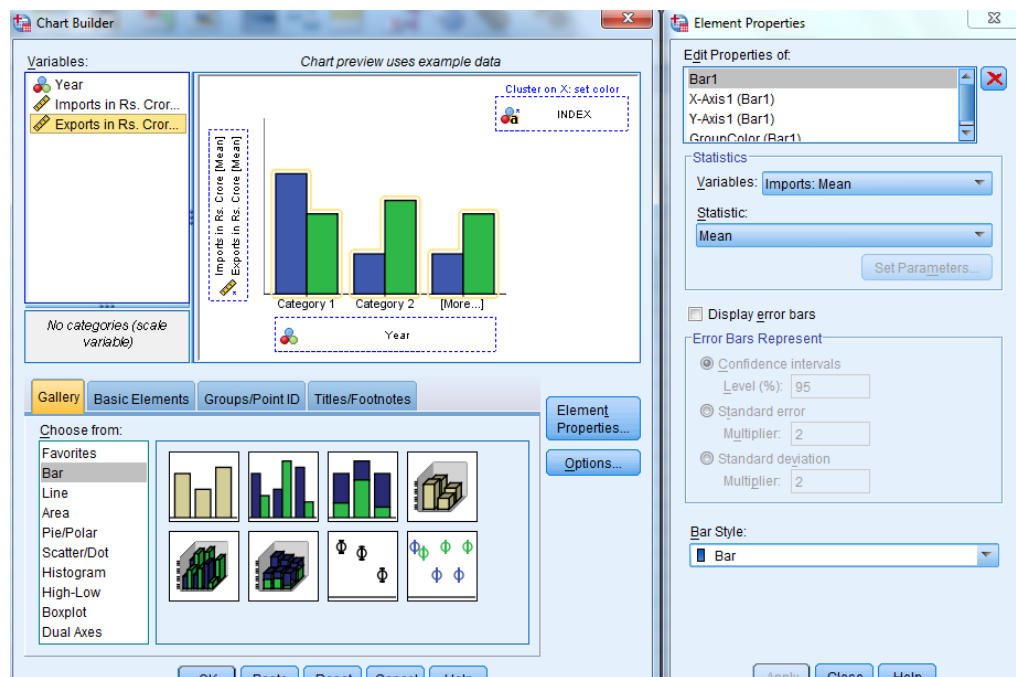
You may double click the graph in the output for changing colour, scale, title etc.

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### 3.5 BAR CHARTS

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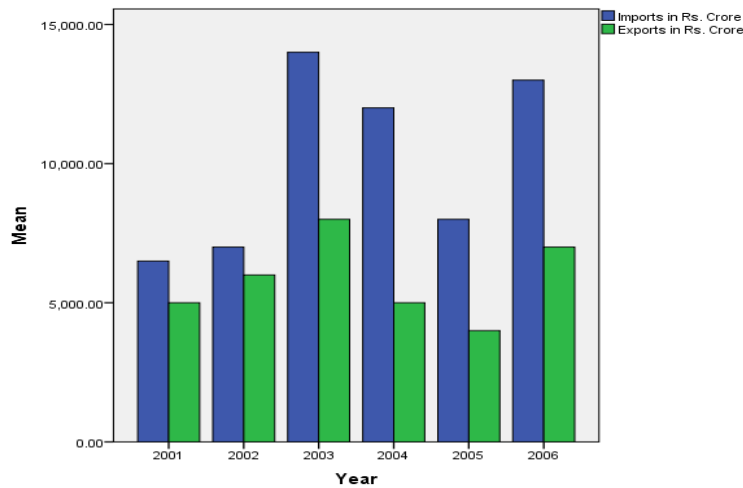
A bar graph or charts depicts the magnitude, sizes or the differences at equal intervals of time. Each bar represents separate item and collectively multiple bars are displayed horizontally or vertically. It depicts the changes in the value of the dependent variable plotted on Y-axis at discrete intervals of the independent variable on x axis. This means that on x axis of the bar diagram is a discrete variable while the other axis represents a scale for one of continuous variable. Bars are vertical lines where the lengths of the bars are proportional to their numeric values.



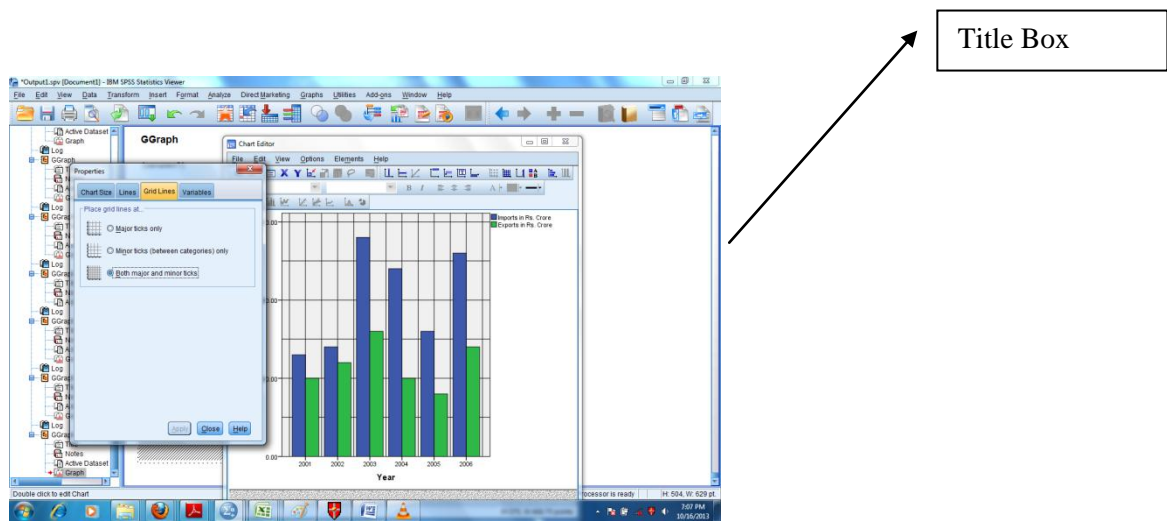
Bars can also be created as two dimensional or as percentage components bars in SPSS. When the components length represents the percentages of each component then percentage component chart is obtained and when each bar represents two or more components, then the bar chart is called as two dimensional bar chart.

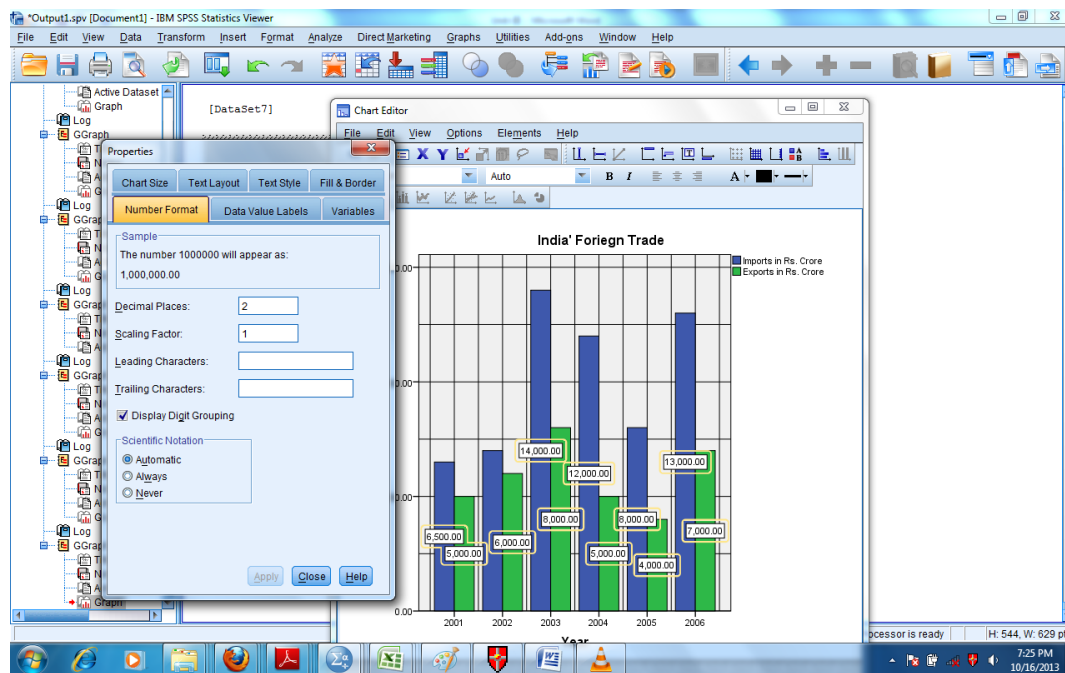
For creating bar charts you have to follow the same procedure as used for line graphs, first go to Chart Builder and then choose Bar Charts from the graphing options and then drag it to the chart preview box. Let us take the example of plotting the data of the imports and exports of India for a period from Year 2001 to 2006. First drag variable Year to x axis and imports and exports on y axis and click ok. The bar graph would appear as the chart below;





Further, you can add grid lines to the chart by double clicking the graph in the outputs and add lines from the grid option. Similarly, you can include actual values in the bars by adding to the number format by clicking bar chart option. Similarly, you can add title to the bar chart.

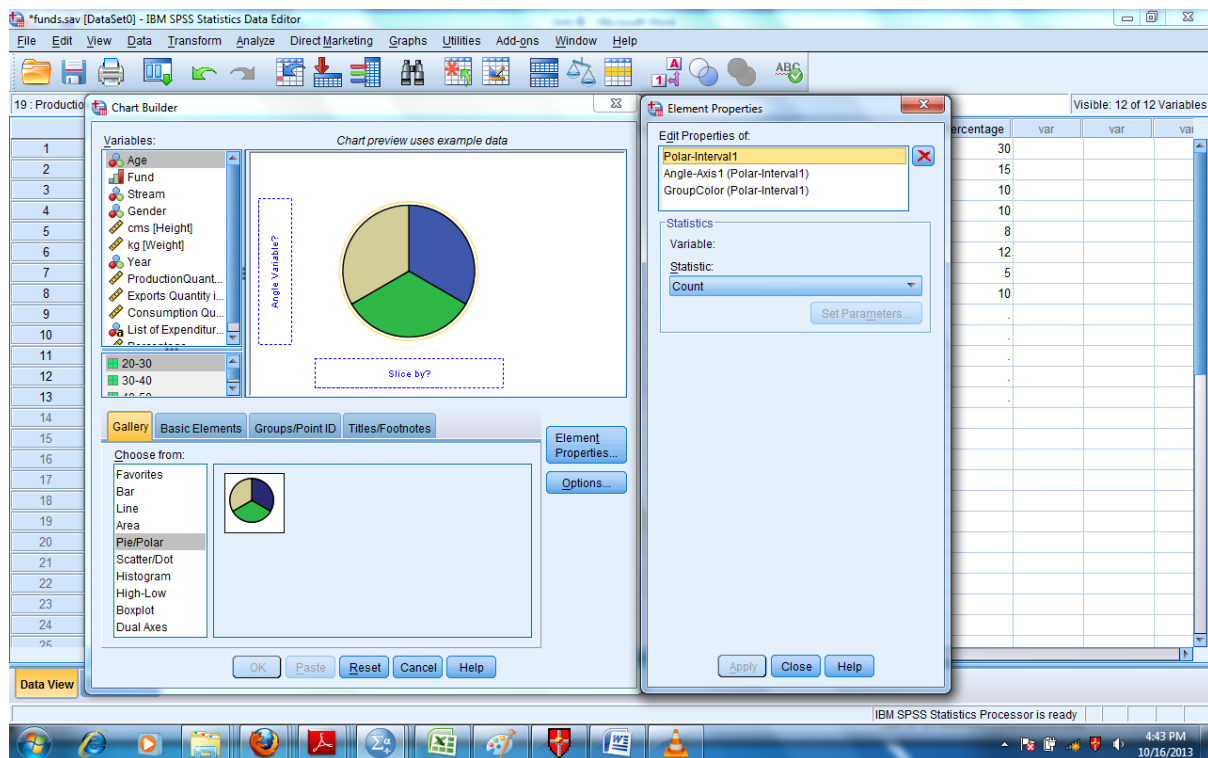




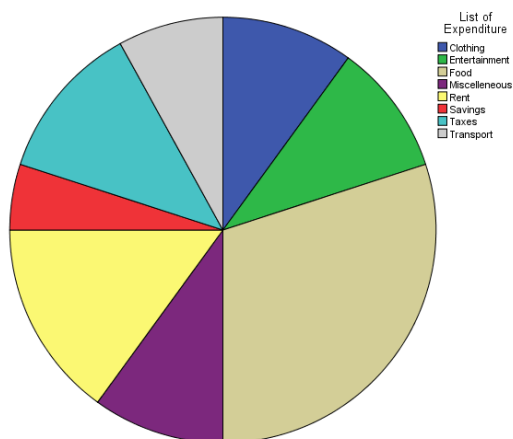
### 3.6 PIE CHARTS

Pie chart as the term itself reveals it shows the portion of the entire pie allocated to a category. In Pie chart the total quantity is distributed in  $360^{\circ}$ . Pie charts are useful for representing portions or percentages of various elements with respect to the total quantity and data. However, they represents only for one parameter. Hence in a pie, 'slice' represents the proportion of the component out of the whole.

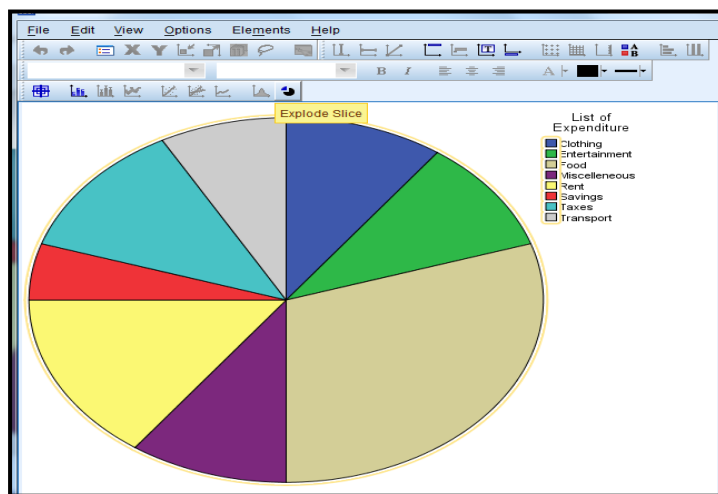
For creating a pie diagram first choose chart builder from the graph then drag pie/polar to the graphing plot.



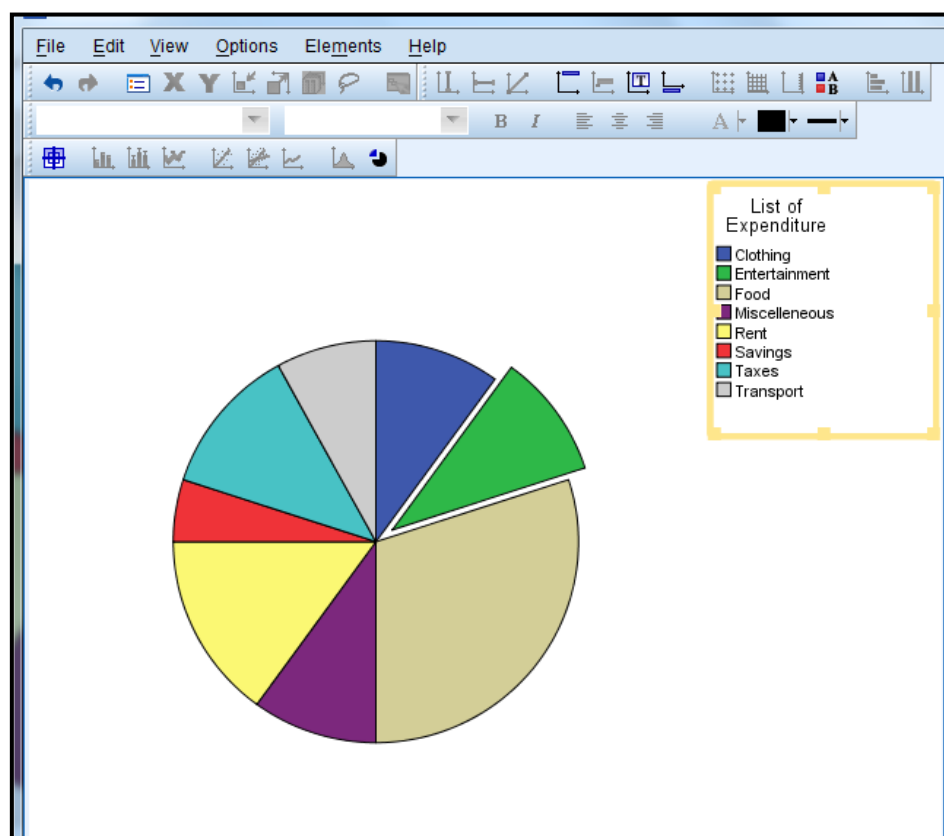
In the Variables list, drag Educational Level to the 'Slice By' box at the bottom of the panel. Then Click the OK button. The pie chart shown in the figure appears as below:



Double clicking the chart in the output viewer window will open a chart editor window as depicted below.



You can use Explode pie icon to show a slice separately and you can click show labels icon to show percentages in each of the slice.





**Check Your Progress-A**

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**Q1. How line graph is created using SPSS?**

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**Q2. Explain the steps required to prepare a bar diagram in SPSS.**

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**Q3. Distinguish between a Histogram and a Bar Chart.**

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**Q4. Fill in the Blanks with appropriate word or words.**

- a) ..... diagram is used to compare the relative amount of some traits or attributes.
- b) In Pie chart the total quantity is distributed in .....

**Q5. Which of the following statements are true or false?**

- a) Charts and graphs can be created using Chart builder as well as through Legacy Dialogs.
- b) A frequency distribution can be either grouped or ungrouped.
- c) In a line graph the independent variable is placed on the y axis and dependent variable should be placed on x-axis.

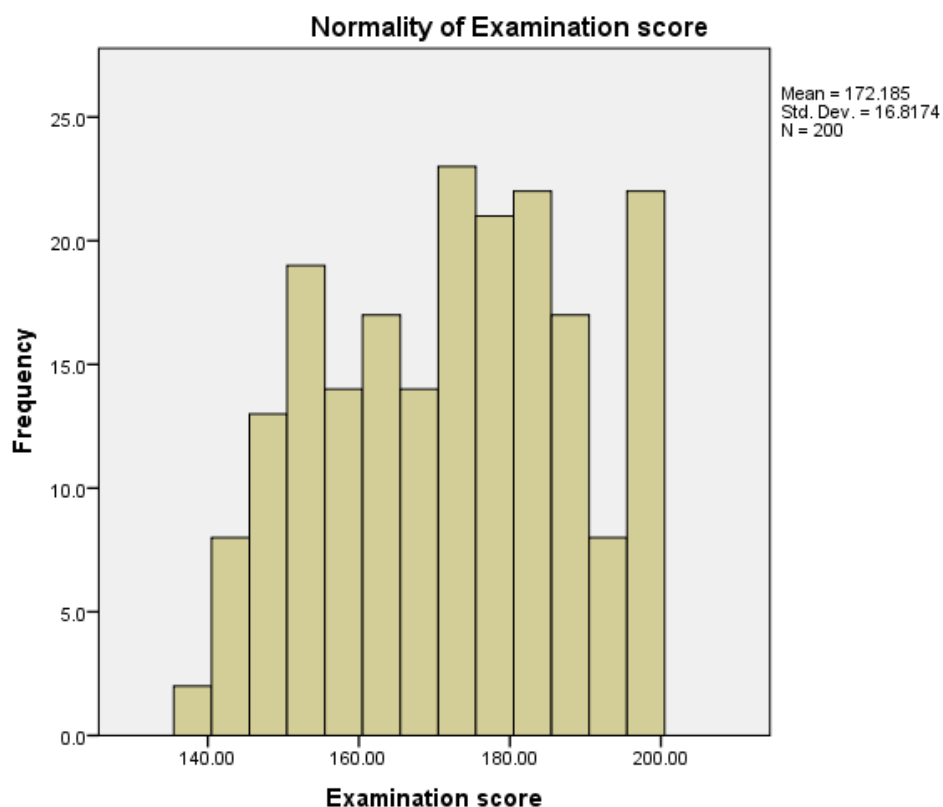
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### **3.7 HISTOGRAMS**

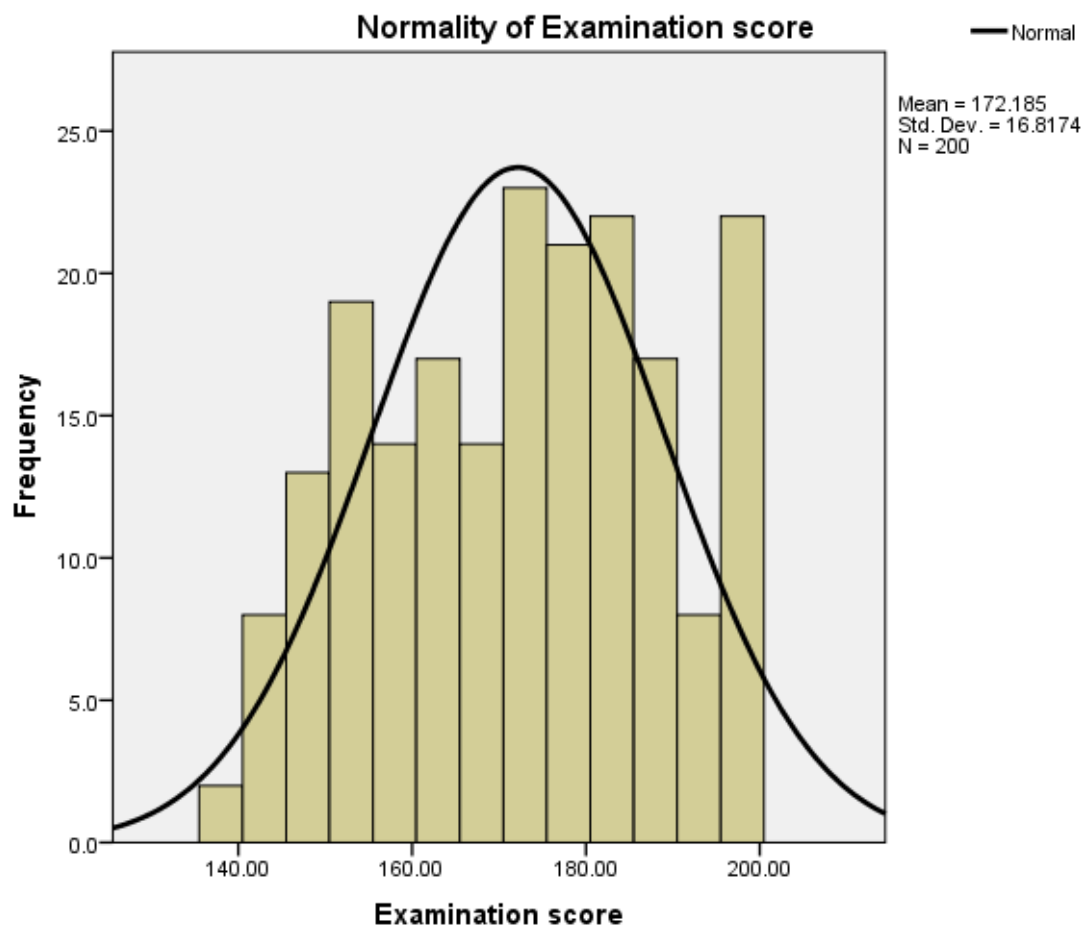
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Histograms are the presentation of a given data by plotting the data in the form of a series of rectangles. It displays the distribution method of a data set and is used for statistical and mathematical calculations. Class intervals are marked along the x-axis and the frequencies along the y axis. Histogram differs from bar chart on the grounds that the bar chart depicts the data in terms of the length of the bar whereas the Histogram is two dimensional in which both the length and width represents the data.

Histogram along with the standard normal curve is used to determine normality of the data. It is a variant of bar chart where the y- axis variable is measured on interval or ratio scale. Therefore, it is drawn to represent relevant frequency size of different groups. In a histogram, the variable is always taken on X axis and the frequencies are on y-axis.



If you want to assess whether the data is normal or not then we can find by superimposing a standard normal curve on the histogram. For the same double click histogram, an output chart editor will open then click to the Normal Distribution Curve . After this choose the ‘normal’ in Show Distribution Curve. The chart would be created as under-



Since, the distribution does not fit the standard normal curve we can say that the distribution is not normal.

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### ***3.8 SCATTER PLOTS***

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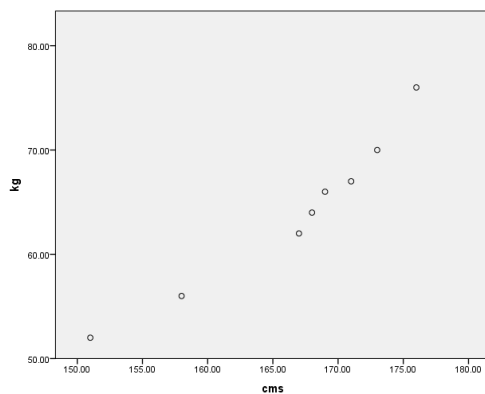
Scatter Plots are generally used to examine the relationship between two variables or two sets of attributes.

The shape of scatter diagram explains what type of relationship exists between the two variables. The magnitude of relationship can be known by computing the regression coefficient for the two sets of data.

Here, let us take an example that you want analyse the relationship between Height and Weight of the students. So first go to the Chart Builder, Choose scatter / Dot from the list and drag the Simple Scatter to the Chart Builder View:

	Age	Fund	Stream
1	2.00	1.00	1.00
2	2.00	1.00	2.00
3	1.00	1.00	2.00
4	1.00	2.00	1.00
5	2.00	2.00	1.00
6	1.00	3.00	2.00
7	3.00	3.00	3.00
8	3.00	4.00	1.00
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Drag Height on Y-axis and Weight X-axis and Click O.K. The output would be produced as under-



The scatter shows that the as the height of student increases, weight also increases. Although there are some variations but still scatter plot depicts increasing positive relationship between the height and weight.

**If you want to further explore about the scatter plots then refer to the links given below:  
For exploring more on scatter plots, please refer to these links-**

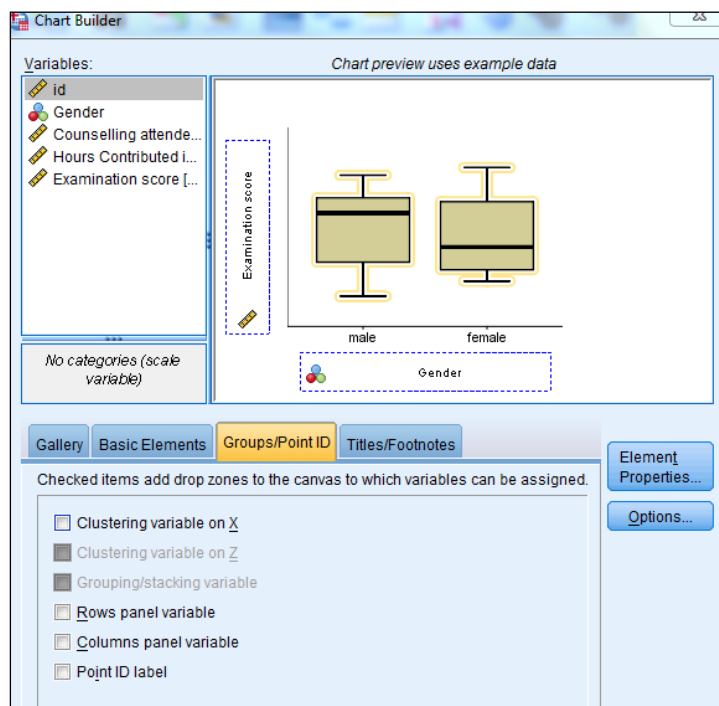


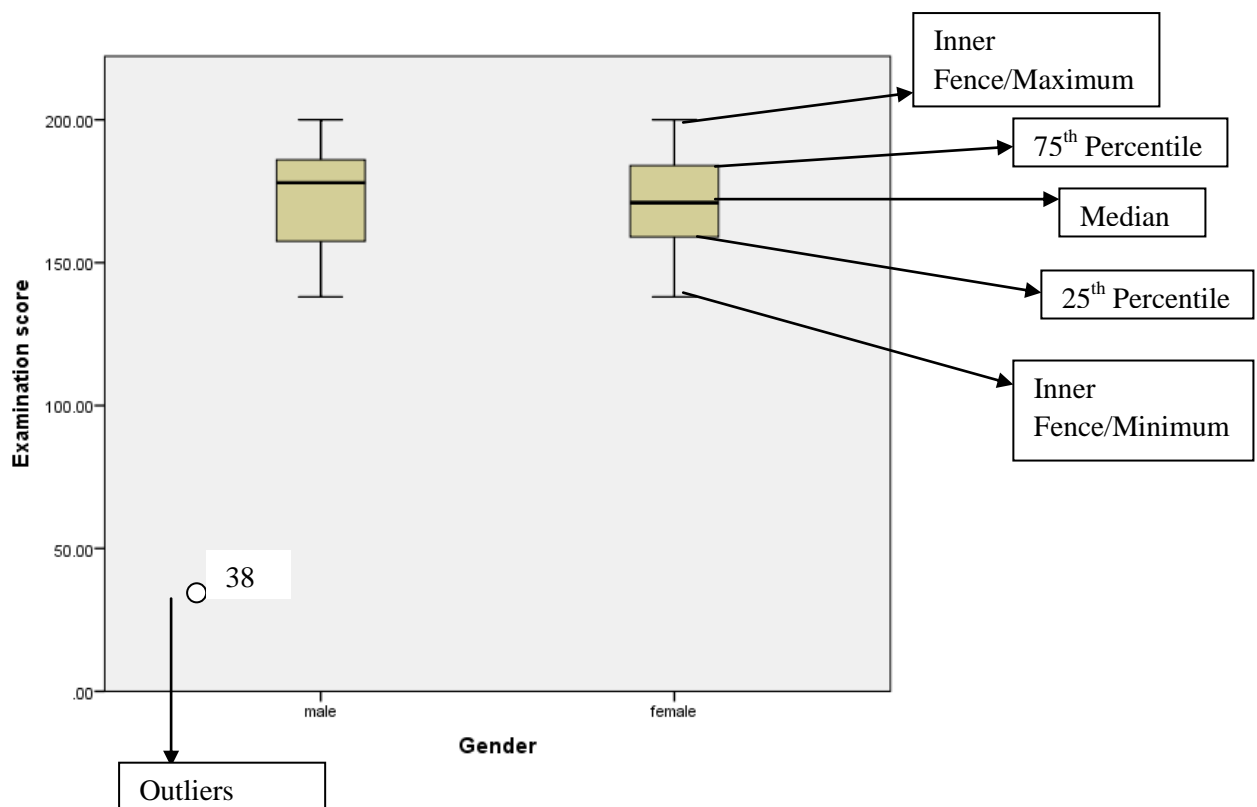
[http://en.wikipedia.org/wiki/Scatter\\_plot](http://en.wikipedia.org/wiki/Scatter_plot)

### 3.9 BOX PLOTS

A box plot is used to state five statistics at one time within each categorical value in graphic mode. The statistics are the minimum value, first quartile, median value, third quartile, and maximum value. It will help you to find the values that fall out the normal distribution. Box plots also label outliers farther than 1.5 times the interquartile range way from the median.

For preparing box plot choose the box plot directly from the graphing list and drag it to chart builder. Then select Gender on the X axis and Exam score on the y axis. Then Click O.K button. The box plot would be generated as under:





The vertical axis shows the examination score and the horizontal axis shows gender i.e. male and female. The box plot depicts that the variances of Male and Female in 'Examination Score' are unequal. Further, the distribution of examination score of males is positively skewed from the position of median and that of female, the distribution is slightly negatively skewed from the median (broadly towards normal distribution).

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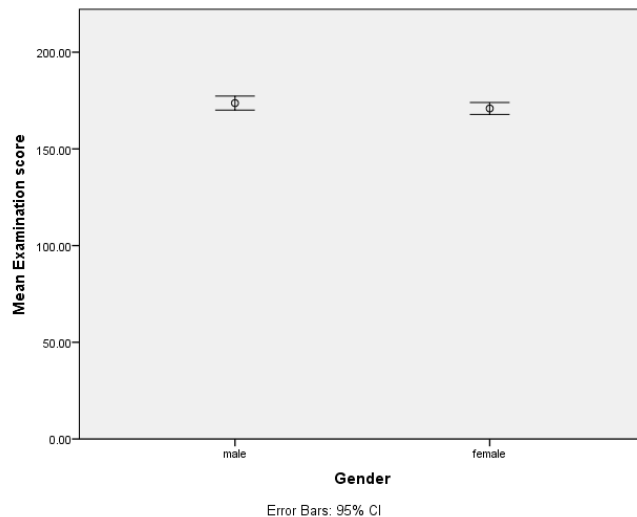
### 3.10 ERROR BARS

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Error bars indicate the confidence interval, the standard deviation, or the standard error of the mean. Error charts try to depict which errors are significant and which are insignificant.

To create it first go to Graphs then to Chart Builder. Go to the Bar option in the list provided. Drag Simple Error Char in Chart Builder Box then specify the confidence level of mean, you want error chart to display. Let us take Gender on X axis and Mean Examination Score on the Y axis to know the steps for making error bars.

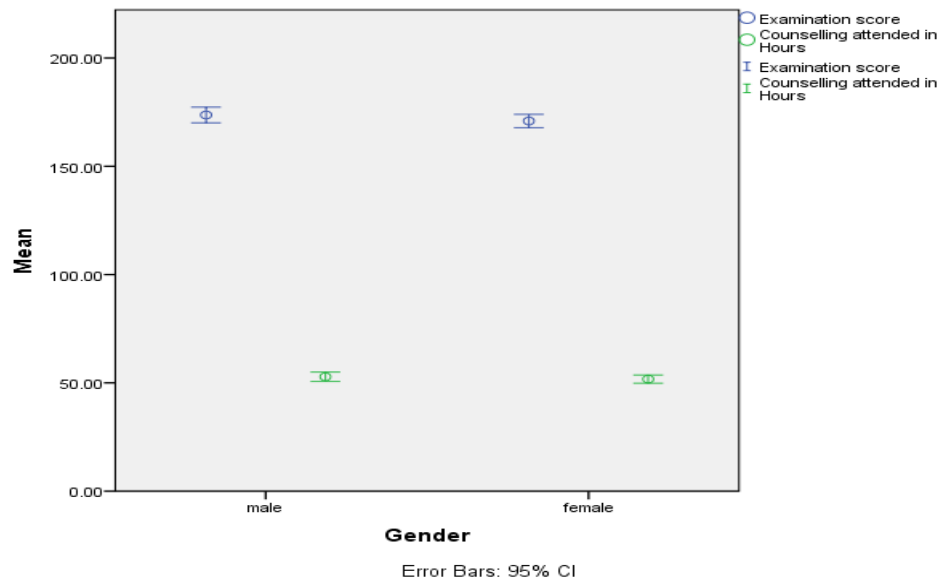
The simple error chart would be created as under:



The output represents the result of one way of making error calculations: The magnitude of the error is based on 95 percent of all values being within the upper and lower error bounds. If you prefer, you can base the error on the bell curve and mark the upper and lower errors at some multiple of the standard error or standard deviation.

Similarly, you can prepare the multiple error charts. You can also add counseling attended by the learners in Y axis using the add option.

id	Gender	Counseling	Examination score
1	1.00	1.00	34.00
2	2.00	1.00	39.00
3	3.00	0.00	63.00
4	4.00	1.00	44.00
5	5.00	0.00	47.00
6	6.00	1.00	47.00
7	7.00	0.00	57.00
8	8.00	1.00	39.00
9	9.00	0.00	48.00
10	10.00	1.00	47.00
11	11.00	0.00	34.00
12	12.00	0.00	37.00
13	13.00	1.00	47.00
14	14.00	0.00	47.00
15	15.00	0.00	39.00
16	16.00	0.00	47.00
17	17.00	1.00	47.00
18	18.00	0.00	50.00
19	19.00	1.00	28.00
20	20.00	0.00	60.00
21	21.00	0.00	44.00
22	22.00	0.00	42.00
23	23.00	1.00	65.00
24	24.00	0.00	52.00
25	25.00	1.00	47.00



This will generate a clustered error chart which can depict the relationship among a cluster of error ranges by presenting a summary of categorical values. Clustering results into several error bar charts into one.

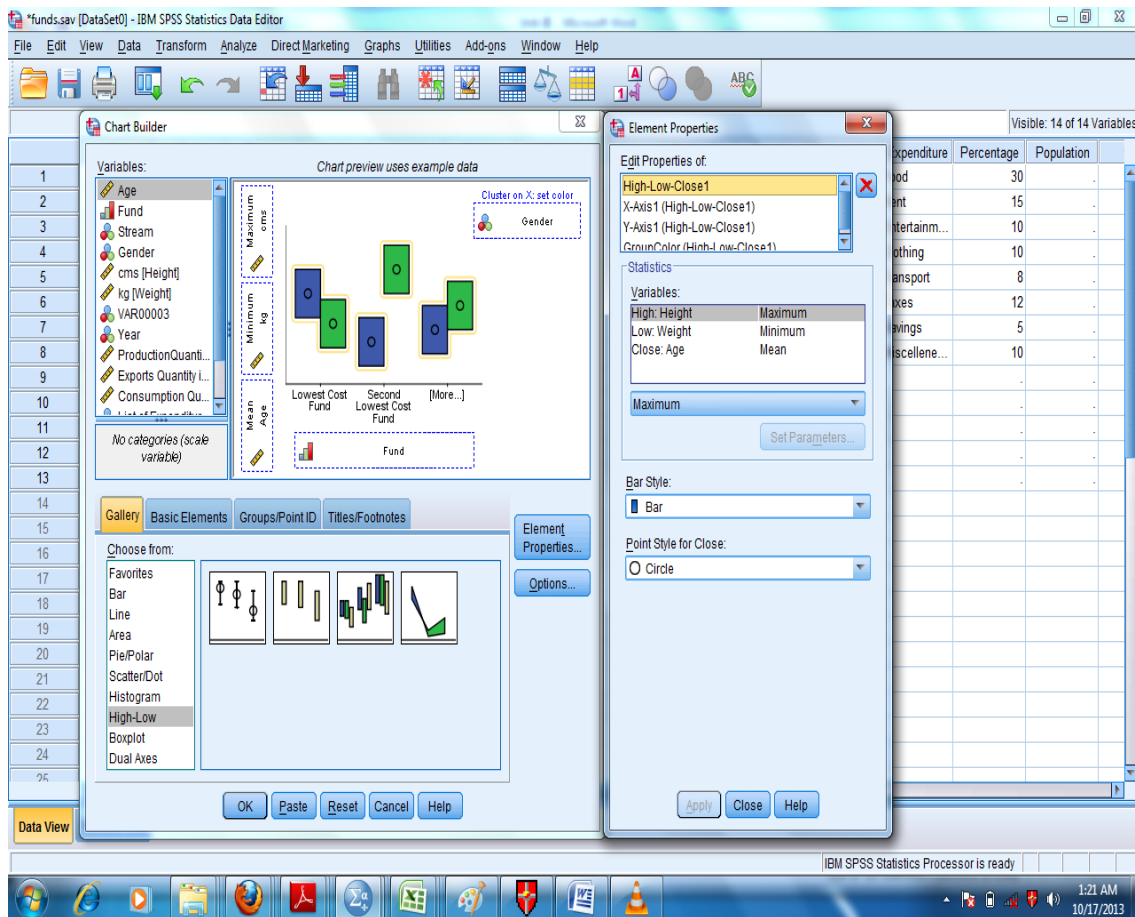
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### 3.11 HIGH LOW BARS

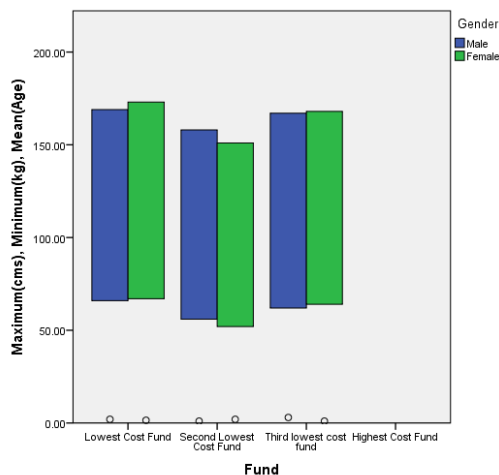
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A high low graph displays the range between specified high and low points. It is prepared to make comparison between two or three variables. This graph displays the range as a vertical line and the other graph shows it as a bar. High low graph can be prepared using the following steps. First, Go to the Graph and Chart Builder and select High Low Graph in the chart builder. Select the variables to High Variable, Low Variable, and Close variable in the panel and the base variable in x-axis box.

For example let us study the high, low and close of funds selected according to Age, Height and Weight. The variables will be selected as depicted in the panel-



Then Click the OK button, the graph would be displayed in the output depicting high and low points for the various categories of funds.

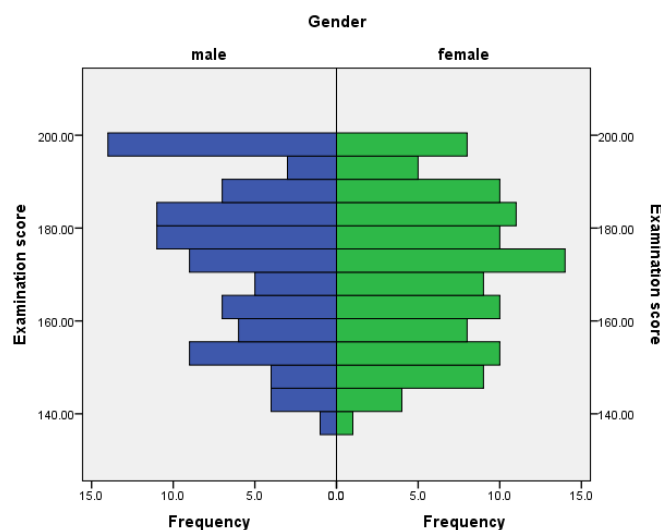


### 3.12 POPULATION PYRAMID

A population pyramid provides an immediate comparison of the number of items that fall into categories. Since the diagram is in form of triangle that is wide at the bottom and narrow at the top it is termed as pyramid.

The following steps can be followed to build a pyramid histogram chart:

First choose chart builder from graphs and from the list of graphic options select Histogram. In histogram select the sub option of population pyramid to the chart builder box. Select the Variable which have break up, in split variable box and examination score on the Distribution Variable. The population pyramid would be displayed as under-



For further reference kindly go through the link: [http://en.wikipedia.org/wiki/Population\\_pyramid](http://en.wikipedia.org/wiki/Population_pyramid)

### 3.13 SUMMARY

This unit has introduced us with the functions in SPSS which can assist in creating charts and tables. Thus, SPSS is very useful in professionally developing these depictions and helps in understanding them without any difficulty. Further, this unit also explains how SPSS provides options for editing and descriptions of graphs.



### 3.14 GLOSSARY

- **Range:** It is difference between highest and lowest points.

- **Error Bar Charts:** Error bars indicate the confidence interval, the standard deviation, or the standard error of the mean.
- **Frequency Polygon:** It is a line chart of frequency distribution in which both the values of discrete variables or midpoints of class intervals are plotted against the frequencies and these are joined by straight line.



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### ***3.15 ANSWERS TO CHECK YOUR PROGRESS***

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4.

- a) Bar
- b)  $360^0$

5.

- a) True
- b) True
- c) False

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### ***3.16 REFERENCES***

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1. Gupta S.L. and Gupta Hitesh, SPSS 17.0 for Researchers, International Book House Pvt. Ltd., New Delhi
2. Pandya Kiran, Bulsari Smruti, Sinha Sanjay(2012) , SPSS in Simple Steps, Dreamtech press, New Delhi
3. Hooda R. P(2000), Statistics for Business and Economics, Macmillan India Ltd.
4. George Darren and Mallery Paul (2011), SPSS for windows Step by Step, Dorling Kindersley Publishing
5. Research and Communications Methodology, Self Learning Material for MBA Course CP1007, Unit 9, Vikas Publications, Noida




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### 3.17 SUGGESTED READINGS

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1. Gupta S.L. and Gupta Hitesh, SPSS 17.0 for Researchers, International Book House Pvt. Ltd., New Delhi
2. Pandya Kiran, Bulsari Smruti, Sinha Sanjay(2012) , SPSS in Simple Steps, Dreamtech press, New Delhi
3. Hooda R. P(2000), Statistics for Business and Economics, Macmillan India Ltd.
4. George Darren and Mallery Paul (2011), SPSS for windows Step by Step, Dorling Kindersley Publishing
5. IBM reference guide posted on the SPSS website.
6. Landau Sabine and Everitt Brian S ‘A Hand book on statistical analysis using SPSS’, free downloadable




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### 3.18 TERMINAL QUESTIONS

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- Q1. What is the purpose of using charts and graphs in research study? What are the different types of diagrams which can present the data in a meaningful manner?
- Q2. What are scatter plots? Differentiate between scatter plot and box plots.
- Q3. Study the following table carefully.

Year	Petrol Prices per litre(Average)	Price Index - 1980	Price Index - 1995
1985	20.25	100.00	108.70
1986	25.38	110.40	120.00
1987	30.30	104.00	113.00
1988	34.24	99.20	107.80
1989	36.21	96.80	105.20
1990	38.20	96.00	104.30



1991	38.93	74.40	80.90
1992	40.95	76.00	82.60
1993	42.95	76.00	82.60
1994	46.02	81.60	88.70
1995	47.16	92.80	100.90
1996	48.14	91.20	99.10
1997	49.14	91.20	99.10
1998	55.11	88.80	96.50
1999	60.11	88.80	96.50
2000	62.15	92.00	100.00
2001	60.23	98.40	107.00
2002	63.23	98.40	107.00
2003	64.06	84.80	92.20
2004	65.17	93.60	101.70
2005	67.51	120.80	131.30
2006	68.46	116.80	127.00
2007	69.36	108.80	118.30
2008	70.59	127.20	138.30
2009	71.88	150.40	163.50
2010	72.30	184.00	200.00

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Present the data using suitable diagram.

Q4. Explain detail the procedure for preparing error charts using SPSS.