7

Microsoft Excel Data Analysis

FILTERING DATA

Filtering a list means hiding all the rows except those that satisfy a particular condition. For example, if you have a list of students, along with their percentages and result (pass/fail), you can filter the data to show only those who have passed the examination.

Excel provides two ways of filtering data :

- AutoFilter, for quick and simple filtering
- Advance Filter, for more complex filtering.

AutoFilter

In the following example, we will first see how to use the AutoFiltering feature, which, for most problems is sufficient.

The table below shows a list of names of students, along with their percentages and Result.

We wish to filter the list so as to view only the results of those who have passed in the examination.

	A	B	C
1	Name	Percentage	Result
2	Anita	69	Pass
3	Shweta	73	Pass
4	Mansi	82	Pass
5	Roopal	53	Pass
6	Jiten	32	Fail
7	Deep	37	Fail
8	Firdaus	40	Pass
9	Neeta	61	Pass
10	Mayuresh	29	Fail
11	Gitanjali	67	Pass

Fig. 7.1 : Unfiltered List

Fig. 7.2 : Filter button

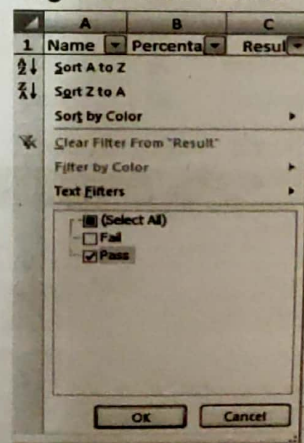|	A	B	C
1	Name	Percentage	Result
2	Anita	69	Pass
3	Shweta	73	Pass
4	Mansi	82	Pass
5	Roopal	53	Pass
8	Firdaus	40	Pass
9	Neeta	61	Pass
11	Gitanjali	67	Pass
12			

Fig. 7.3 : After Applying Filter

Fig. 7.4 : Filter Dialog Box

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To AutoFilter the list :

1. Click anywhere in the data.
2. In the Home menu, click on Sort & Filter button in Editing tab (Fig. 7.2).
3. In the menu that appears, select Filter. Arrows appear against each column heading, as shown in Fig. 7.3.
4. Click on the arrow in the Results column. The Filter Dialog box shown in Fig. 7.4 appears.
5. Under Text Filters, remove the check mark from Fail. A check mark will be shown only against Pass.
6. The list is filtered and only shows the rows for those whose result is "Pass".
7. To remove the filter and show all rows, again click on the Sort & Filter button in the Ribbon, and click on Filter.

Shortcut to Auto-Filter a list :

1. Click anywhere in the list.
2. Press CTRL + SHIFT + L keys
3. The arrows appear against each row heading.
4. Click on the arrow in the Results column. The Filter Dialog box shown in Fig. 7.4 appears.
5. Under Text Filters, remove the check mark from Fail. A check mark will be shown only against Pass.
6. The list is filtered and only shows the rows for those whose result is "Pass"
7. To remove the filter and show all rows, again press CTRL + SHIFT + L.

Example :

The worksheet shown in Fig. 7.5 below is to be filtered so as to show only those students' data whose names begin with M.

	A	B	C
1	Name	Percentage	Result
2	Anita	69	Pass
3	Shweta	73	Pass
4	Mansi	82	Pass
5	Roopal	53	Pass
6	Jiten	32	Fail
7	Deep	37	Fail
8	Firdaus	40	Pass
9	Neeta	61	Pass
10	Mayuresh	29	Fail
11	Gitanjali	67	Pass

Fig. 7.5 : Unfiltered List
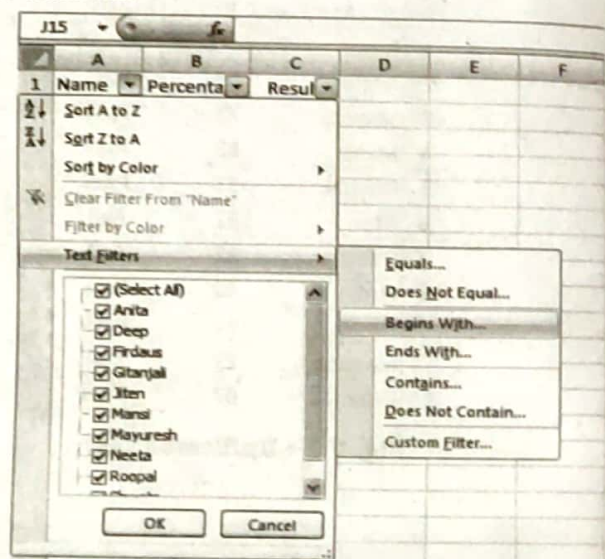
Fig. 7.6 : Text Filter Dialog Box
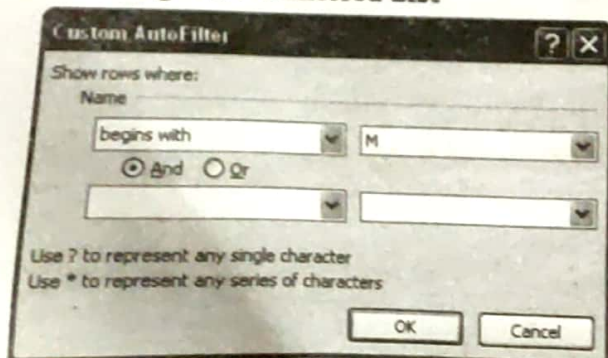
Fig. 7.7 : Custom Auto-Filter Dialog Box

	A	B	C
1	Name	Percenta	Resul
7	Mansi	82	Pass
8	Mayuresh	29	Fail

Fig. 7.8 : Filtered List (first letter M in name)

To Filter the List :

1. Click anywhere in the list.

2. Press CTRL + SHIFT + L

3. Click on the drop-down arrow that appears in the Name column.

4. Click on Text Filter and select "Begins With..." The Custom AutoFilter dialog box shown in Fig. 7.7 appears.

5. In the Name begins with, type M, and press OK. The following filtered list appears; it shows only those students' data whose names begin with 'M'. (Fig. 7.8).

GRAPHICAL REPRESENTATION OF DATA

Excel's formatting and data interpretation features are extensive. However, data is often better displayed in a graphical form. One of the most important features that Excel has incorporated its ability to create charts and graphs. This chapter discusses how to create and edit graphs in Excel. At the end of this chapter, you should be able to :

- Identify the various parts of a chart.
- Identify different types of charts.
- Create charts from the data.
- Modify the charts.

OVERVIEW OF CHARTS

Charts can be said to be a graphical representation of the numerical data that can be seen on a worksheet. Just as *a picture is worth a thousand words,* similarly, a chart can bring out the salient features of data in a worksheet. It is a sort of "at-a-glance" to the vast amount of numeric data. Data displayed on a chart is more easily understood. *A chart helps us to spot trends and patterns which would be nearly impossible to identify in a range of numbers.*

Placing the chart

When a new chart is created, it can either be inserted directly into the worksheet (*embedded chart)* or it can be on a new chart sheet in your workbook. A chart sheet is different from a worksheet in that it can hold a single chart, and it does not have cells.

Chart Types

Excel offers many chart types. These are: column chart, bar chart, line chart, pie chart, XY chart (scatter), area chart, doughnut chart, radar chart, surface chart, bubble chart, stock chart, cone, pyramid and cylinder charts. We will be studying in detail only the column, bar, line, and pie charts.

Which Chart type to use?

Since Excel offers so many different types of charts, the question that arises is which chart type is suitable for a given set of data. Try different chart types, and use the one that puts the message across unambiguously.

Let us see the salient features of different chart types :

1. **Column Chart :** A column chart shows data changes over a period of time or illustrates comparisons among items. Categories are organised horizontally, and values vertically, to emphasize the variation over time.

2. **Bar Chart :** A bar chart illustrates comparisons among individual items. Categories are organized vertically, values horizontally, to focus on comparing values and to place less emphasis on time.

3. **Stacked bar charts** show the relationship of individual items to the whole.

4. **Line Chart :** A line chart shows trends in data at equal intervals.

5. **XY Chart :** An XY chart either shows the relationships among the numeric values in several data series or plots two groups of numbers as one series of xy coordinates. It is commonly used for scientific data, such as variation of temperature with time.

6. **Pie Chart :** This chart shows the proportional size of items that make up a data series to the sum of the items. It always shows one data series; it is used to emphasize a significant element.

CREATING SIMPLE CHARTS

Creating a Column Chart

	A	B	C	D
1		Sale of Books		
2				
3	Subject	Mumbai	Pune	Nagpur
4	Accounts	2478	2640	2388
5	Taxation	2790	2173	2077
6	Bus. Law	2893	2722	1905
7	Total	8161	7535	6370

Fig. 7.9 : Sample worksheet

Fig. 7.10 : Chart Types in Excel 2007

The following worksheet shows the number of books of different subjects sold in three cities Mumbai, Pune and Nagpur :

Step I : Create the Basic Chart :

We create a basic chart based on this data as follows :

1. Select the range A3 : D6. This can be done by either of the following ways :

   a) Click on cell A3. Keep the SHIFT key pressed and click on the diagonally opposite cell D6. The complete range is highlighted.

   b) Press the function key F5. In te GoTo dialog box that pops up, in the reference text box, type A3:D6. The entire range is highlighted.

2. Click on Insert tab.

3. In the ribbon, click on Column button in Charts group. (Fig. 7.10)

4. Various chart types are shown. Select the first option, i.e., 2D Column → Clustered Column.(Fig. 7.11). Excel ceates a Clustered Column chart and the Chart Tools context tabs appear.

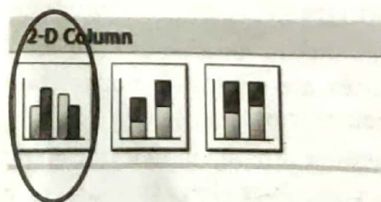5. The basic chart created by Excel is shown below (Fig. 7.12) :
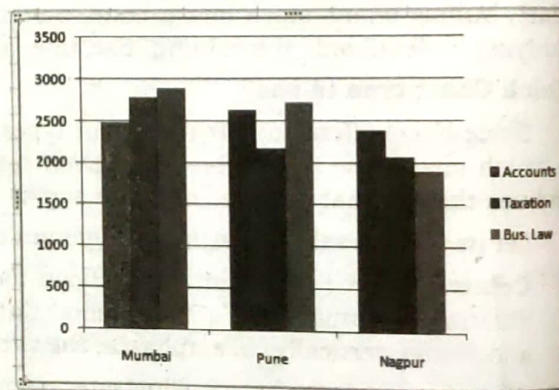

Fig. 7.11 : Selecting 2D Column Chart

Fig. 7.12 : Basic 2D Clustered Column Chart

Step II : Apply a Chart Layout :

Once the basic chart is created, we can change the chart layout and display the chart title, legend, axes labels, etc.

1. Click the chart as shown in Fig. 7.12 above. The Chart Tools becomes available on top of the Excel menu.

2. Choose the Design tab.

3. Click the Chart Layout button in the Chart Layout group. (Fig. 7.13)

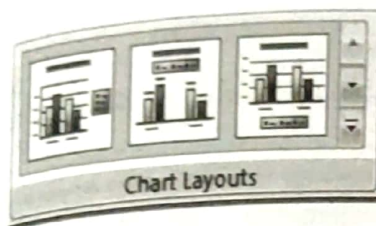4. Click layout 5. Excel applies the layout to the chart. (Fig. 7.14)
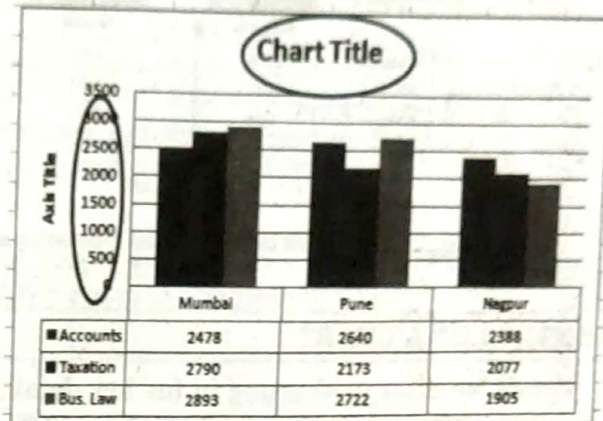

Fig. 7.13 : Chart Layouts

Fig. 7.14 : Chart with data at bottom

	Mumbai	Pune	Nagpur
Accounts	2478	2640	2388
Taxation	2790	2173	2077
Bus. Law	2893	2722	1905

Step III : Add Labels :

1. Select Chart Title. Click on Chart Title and then type Sale of Books. Excel adds your title.

2. Select Axis Title. Click on Axis Title. Type Quantity. Excel labels the axis.

3. Click anywhere on the chart to end your entry.

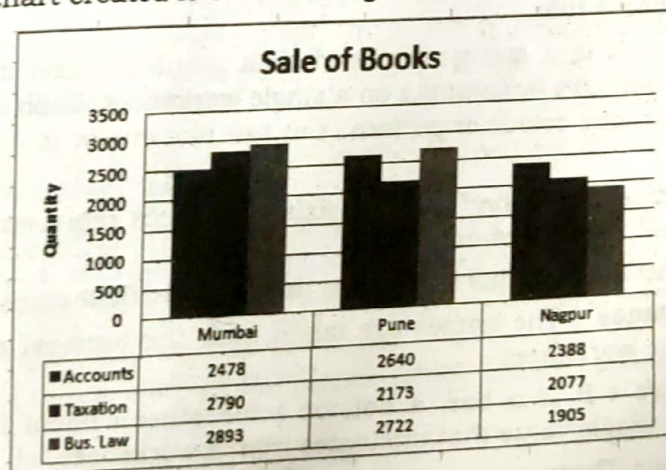4. The final chart created is shown in Fig. 7.15 below :

	Mumbai	Pune	Nagpur
Accounts	2478	2640	2388
Taxation	2790	2173	2077
Bus. Law	2893	2722	1905

Fig. 7.15 : Final Chart after labeling

Switching Data

We can switch from row data to column data and vice-versa to change how data is displayed in the chart. For example, to display the subjects along the X – axis, we can switch rows and columns as follows :

1. Click your chart. The Chart Tools become available.

2. Choose the Design tab.

3 Click the Switch Row/Column button in the Data group. Excel changes the data in your chart. (Fig. 7.16)
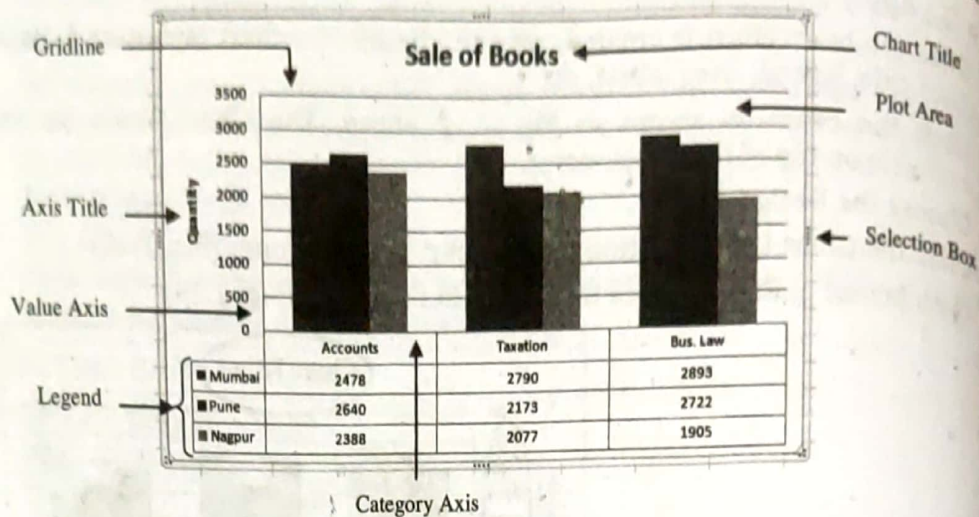
Fig. 7.16 : Switching Rows and Columns and Elements of a Chart

9/3/21

ELEMENTS OF A CHART

Before we discuss charting in further detail, let us see the different elements of a chart. Different types of charts have different elements – for example, pie charts do not have axes, and only 3D charts have walls and floors. (Fig. 7.28)

The various chart elements are described below :

1. **Gridline :** These are lines you can add to a chart that make it easier to view and evaluate data.

2. **Legend :** It is a box that identifies the patterns or colors assigned to the data series or categories in a chart.

3. **Plot Area :** The area where the actual chart is plotted, excluding the legend.

4. **Title :** The chart's title.

5. **Data Series :** It is a group of related data points plotted in a chart that originate a from rows or columns on a single worksheet. Each data series in a chart has a unique colour or pattern. You can plot one or more data series in a chart.

6. **X-Axis :** This is called the "Category axis". This axis represents the different *categories* that are plotted on chart.

7. **Value Axis or Y-axis :** This represents the *values* of data points.

8. **Category Names :** The names are taken from the topmost row or leftmost column of the worksheet.

9. **Data Markers :** It is a bar, a dot, or some other symbol in a chart that represents a single value that originates from a worksheet cell.

10. **Tick Marks :** These are small lines of measurement that intersect an axis, similar to divisions on a ruler.

MANIPULATING THE CHART

An Excel chart can be moved, changed in size, deleted, etc.

1. **Changing the chart size :** To change the size of a chart, click on the chart to select it. Small selection boxes appear on each corner of the chart. Drag one of the selection handles to make the chart larger or smaller.

2. **Moving the chart :** To move the chart, press the mouse on the border of the chart and drag the mouse.

3. **Deleting a chart** : Select the chart and press Delete or Backspace to delete it.

4. **Changing charted data** : Charts are linked to the selected data. Whenever the data changes, the chart adjusts to reflect those changes.

EXCEL'S CHART TYPES

Having studied the fundamentals of charting through Excel, let us now draw different types of charts. The column chart has already been covered earlier in this chapter.

BAR CHART

A bar chart is essentially a column chart that has been rotated by 90 degrees. The advantage of using a bar chart is that the category labels may be easier to read. Bar charts can consist of any number of data series.

Example :

The following table shows the loans disbursed to individuals by a housing finance company. Plot a bar chart for the data. (Rupees in crores)

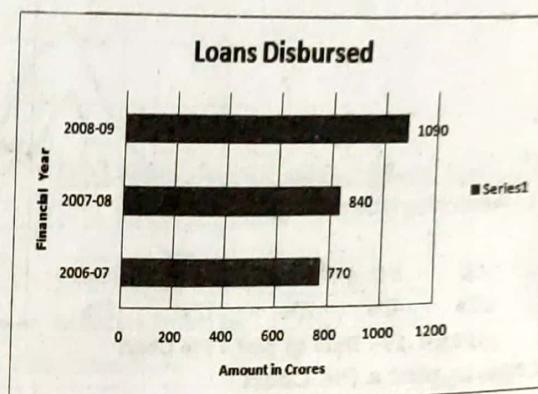|	A	B	C
1		Loans Disbursed	
2			
3	2006-07	2007-08	2008-09
4	770	840	1090

Fig. 7.17 : Data of Loans Disbursed

Fig. 7.18 : Bar Chart

Steps to Create a Bar Chart :

1. Select the data region A3:C4. You must include the labels also while plotting a chart. Excel uses the labels for legend and axis information. The labels in this example are the values contained in cells A3, B3, and C3.

2. Click on Insert.

3. In the Chart group, click on Bar and select 2D Clustered Bar. The basic chart is created.

4. In the Chart Tools, click on Design tab.

5. From the Chart Layouts group, select the first type Layout 1.

6. In the chart, click on the Chart Title and type Loans Disbursed.

7. In the Chart Tools, click on Layout.

8. In the Labels group, click on Axis Title → Primary Horizontal Axis Title → Title Below Axis

9. Excel shows the following below the X axis: Axis Title. Change this to Amount (in Crores).

10. In the Labels group, click on Data Labels → Outside End. The values are shown on the graph.

11. In the Labels group, click on Axis Title → Primary Vertical Axis Title → Rotated Title.

12. Excel shows the following near the Y axis: Axis Title. Change this to : Financial Year.

The completed graph is shown in Fig. 7.18.

PIE CHART

A Pie chart is the only chart type that can display only one data series. This type of chart is useful when you want to show the relative proportions or contributions to a whole. Generally, a pie chart should use not more than five or six data points; otherwise it's difficult to interpret.

Example :

Consider the table shown below which shows the shareholding pattern by various institutions, in a housing finance company.

Fig. 7.20 : Pie Chart

	A	B	C	D	E
1	Shareholding Pattern by Various Institutions				
2					
3	LIC	IFCI	UTI	Subsidiaries	Others
4	38%	12%	15%	12%	23%

Fig. 7.19 : Data to plot a Pie Chart

Steps to plot a Pie Chart

1. Select the data in the range A3: E4.
2. Click on Insert.
3. In the Chart group, click on Pie and select 2D Pie. The basic chart is created.
4. In the Chart Tools, click on Design tab.
5. From the Chart Layouts group, select the first type Layout 1.
6. In the chart, click on the Chart Title and type Shareholding Pattern.
7. In the Chart Tools, click on Layout.
8. In the Labels group, click on Data Labels → Outside End.
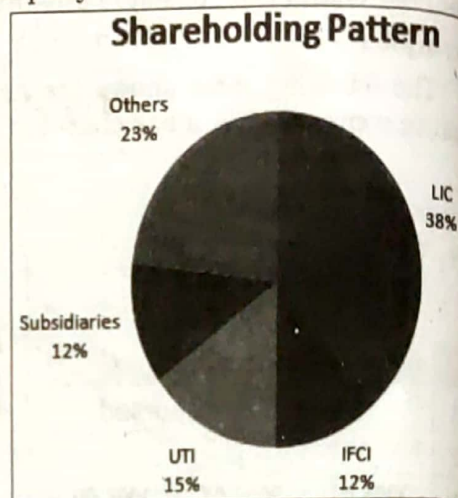
The completed graph is shown in Fig. 20.

LINE CHART

Line charts are very common. They are frequently used to plot data that is continuous rather than discrete. For example, plotting daily price of a share or a mutual fund may let you spot trends over time.

Example :

Consider the table shown below which shows the daily rainfall in two towns for a twelve month period. We have to plot a line chart for the data in this table.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1						Daily Rainfall (in mm)							
2													
3		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4	Town A	1	2	5	7	9	11	16	10	6	3	3	1
5	Town B	5	7	8	10	13	19	21	15	11	7	5	4

Fig. 7.21 : Data for plotting a Line Chart

Steps to plot a Line Chart

1. Select the data in the range A3: M5.
2. Click on Insert.
3. In the Chart group, click on Line and select the first option Line. The basic chart is created.
4. In the Chart Tools, click on Design tab.
5. From the Chart Layouts group, select the first type Layout 1.
6. In the chart, click on the Chart Title and type Daily (Average) Rainfall. This becomes the chart title.
7. Click on the Y axis and type (in mm)
8. Click on Layout → Axes group and select Gridlines.
9. Click on Primary Vertical Gridlines → Major Gridlines.

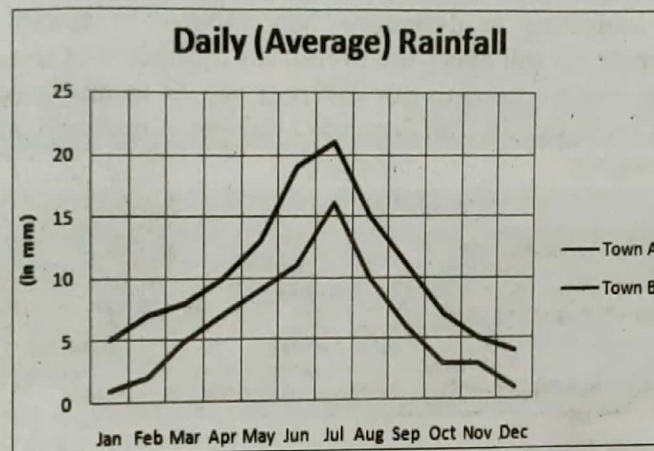The final chart is as shown in Fig. 7.22 below :

Fig. 7.22 : Line Chart

GUIDELINES FOR PLOTTING CHARTS

Excel has excellent charting capabilities, and all these cannot be covered in this text book for lack of space. The interested student is encouraged to experiment with different types of charts for a particular data. Here are a few guidelines for plotting charts.

1. Are the data that you want to plot in two rows of the table or in two columns?

If the data are in columns, select two columns for plotting :

- if the columns to be plotted are **not adjacent** to one another, you must click on the top of the first column on the letter of that column (for example, column A, or B, etc). Then press the CTRL key and click on the top of the second column on the letter of that column.
- if the columns to be plotted are **adjacent** to one another, you must click on the top of the first column on the number of that column. Then press SHIFT key and click on the top cf the adjacent column on that column's number.

If the data are in rows, select two rows for plotting :

- if the rows to be plotted are **not adjacent** to one another, you must click on the left of the first row on the number of that column. Then press the CTRL key and click on the left of the second row on the number of that row.

- if the rows to be plotted are **adjacent** to one another, you must click on the left of the first row on the number of that row. Then press SHIFT key and click on the left of the adjacent row on that column's number

2. Excel offers many **different** types of charts. Use the one which makes the values of your table easily understood. Don't use an esoteric chart type just because it is there!

3. If you have constructed a chart, you can easily **edit** any element of the chart by double-clicking the element. A dialog box relevant to that element will open up, and you can make changes to it.

USING SCENARIOS – CREATING AND MANAGING A SCENARIO

Scenarios are part of a group of commands sometimes called what-if analysis (what-if analysis is a process of changing the values in cells to see how those changes affect the outcome of formulas on the worksheet). A Scenario is a group of values that give different results when involved in a calculation. They are widely used in budgeting to determine how change in values e.g. increase expense on raw material will affect the overall future budget of the company. The Scenario Manager can be used to put different values in and generate different budgets for each set of values. The Scenario Manager is available in the Data Tab under What-If Analysis.
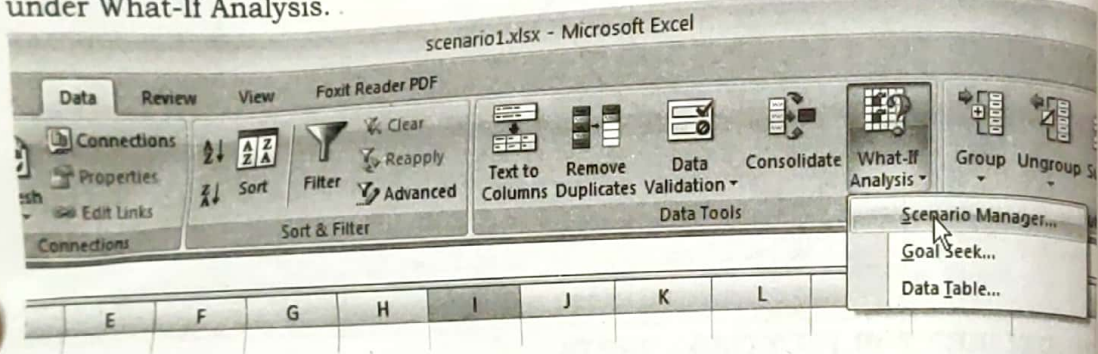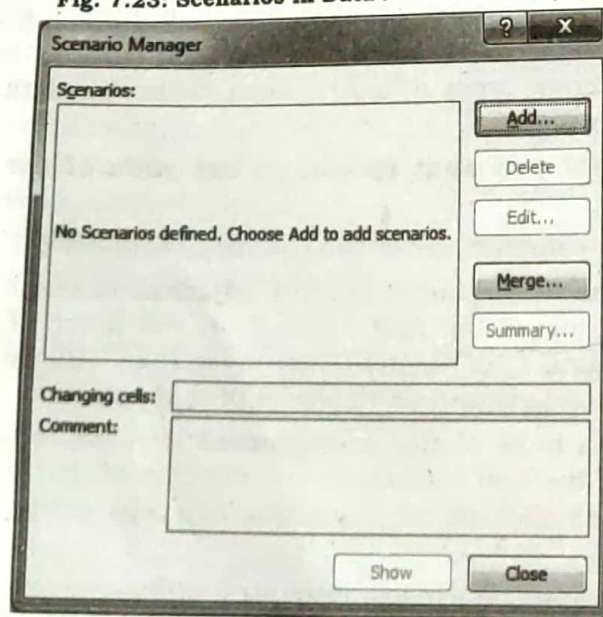

Fig. 7.23: Scenarios in Data→ What-if-Analysis

Fig. 7.24

This is where the scenario can be created. By clicking on Add we can give the scenario a name e.g. Budget, then enter the cells range which contain the values e.g. A5:A15 that can be changed to produce different scenarios:

Fig. 7.25

Then click ok to finish creating the scenario. Subsequently the Scenario Manager can save this scenario in a preset report format in a different worksheet. The Sheet is automatically given the name 'Scenario Summary' by Excel and formatting is applied to the data.

Example :

Consider the following worksheet containing the amount spent for various items during the year.

	A	B	C	D
1	Items	Costs		
2	Machinery	60000		
3	Carriage	8000		
4	Transport	30000		
5	Office equipment	6000		
6	Postage	7000		
7	Miscellaneous	3000		
8	Generator	5000		
9	Total	119000		
10				

Prepare scenarios where there is an increase as follows :

i) Machinery increases to 80,000, Carriage increases to 9000 and Postage increases to 8000

ii) Carriage increases to 10000, office equipment increases to 7000 and Postage increases to 9000.

Solution :

1. From Data Tab select What-If Analysis and then select Scenario Manager.
2. Click on Add in the scenario manager and in the scenario dialog box type **Current Expenses.**
3. In the changing cells type **B2:B8** and click on ok.
4. Again click on Add in the scenario manager and in the scenario dialog box type **Increase in Machinery and Carriage** and click on ok.

5. In the scenario values dialog box type in Machinery Text box $B$2 type 80000
6. In the carriage box $B$3 type **9000**.
7. In the Postage box, $B$6 type **8000** and click on ok
8. Again click on Add in the scenario manager and in the scenario dialog box type **Increase in Carriage and Office equipment** and click on ok.
9. In the carriage box $B$3 type **10000**.
10. In the office equipment box $B$5 type **7000**.
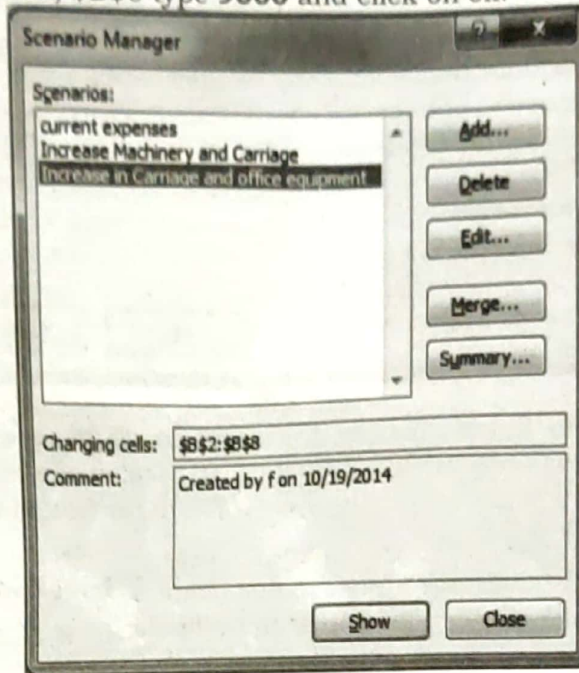11. In the Postage box, $B$6 type **9000** and click on ok.

Fig. 7.26

12. In the Scenario manager dialog box click on Summary.
13. In the Scenario Summary dialog box select Scenario Summary, type **B9** in the result cell and click on ok.
14. The Scenarios are displayed on a new Scenario Summary Worksheet.
15. Select A1:A8 and select copy.
16. Select A5 in the scenario summary and click Paste. The following scenario is obtained.

			Current values	current expenses	increase in Machinery and Carriage	Increase in Carriage and office equipment
Scenario Summary						
Items	**Changing Cells:**					
Machinery	$B$2		60000	60000	80000	60000
Carriage	$B$3		8000	8000	9000	10000
Transport	$B$4		30000	30000	30000	30000
Office equipment	$B$5		6000	6000	6000	7000
Postage	$B$6		7000	7000	8000	9000
Miscellaneous	$B$7		3000	3000	3000	3000
Generator	$B$8		5000	5000	5000	5000
	Result Cells:					
	$B$9		119000	119000	141000	124000

Notes: Current Values column represents values of changing cells at
time Scenario Summary Report was created. Changing cells for each
scenario are highlighted in gray.

Fig. 7.27

GOAL SEEK

Using known values we can perform calculations using Formulas and functions to obtain the required answer. This is very common and we have used it in several examples. However, sometimes we may know the answer (goal), but we do not know the value to be used in the formula to achieve this goal. Goal Seek option is available in the Data Tab under What-If analysis.
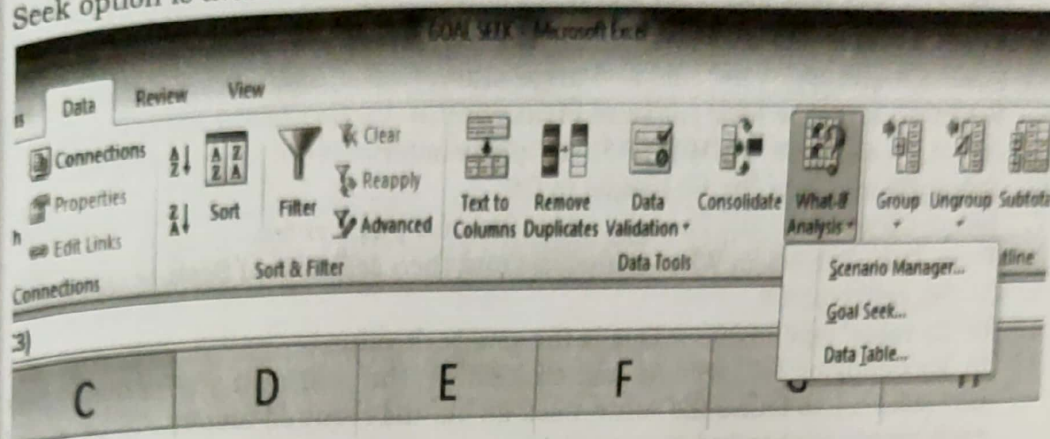

Fig. 7.28 : Data → What-if-Analysis → Goal Seek

For example, let us suppose that we need to save ₹ 5,00,000 for our child's education which will be required in 6 years' time from now. Hence we know the goal that we want to achieve. What is required to be determined is the amount that should be saved each month so that this goal can be met. The Goal Seek feature can help find this amount. Hence it comes under the 'What-If Analysis' option in Excel and is referred to as the 'What –If' analysis tool.
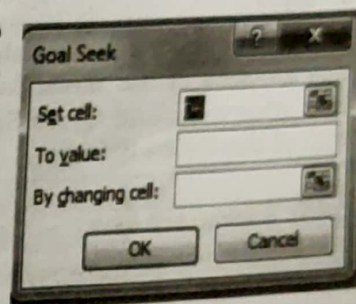

Fig. 7.29

The Goal Seek dialog box is shown in the above figure which is in the Data Tab, under the Data Tools group. In the Set cell box, the address of the cell that contains the formula is entered. This enables Excel to know the formula that has to be used in the calculation. In the to value box, the desired required amount that has to be collected. In the by changing cell box the address of the cell in which we want the answer to appear is entered.

Example :

Consider the following worksheet

	A	B	C
		Amount in 2014	Amount in 2020
1	Cost Centers		
2	Fees	200000	
3	Hostel Charges	15000	
4	Food & Clothing	25000	
5	Miscellaneous	10000	
6	Total Amount required		
7			
8			

Fig. 7.30

In the above worksheet the costs involved for education in 2014 under four categories is given. Calculate the Amounts required in 2020 taking into account increase in fees by 50%, Hostel charges by 25%, Food & Clothing by 50% and

Miscellaneous amounts by 30%. Find the total amount required in B6 and C6 respectively. Further assuming that this target amount required in 2020 taking into account various other factors is say ₹ 4,50,000 find using goal seek, the amount that has to be saved each month in the next 6 years in the cell A8 to meet this target amount assuming no interest being received on amounts saved.

Solution :

1. Select C2 and type =B2*1.50 and press enter.
2. Select C3 and type =B3*1.25 and press enter.
3. Select C4 and type =B4*1.50 and press enter.
4. Select C5 and type =B5*1.30 and press enter.
5. Select B6 and type =SUM(B2:B5) and press enter.
6. Select B6 and drag the fill handle to C6.
7. Select C8 and type the formula = A8*12*6 and press enter.
8. From Data Tab select What-If analysis and then select Goal Seek.
9. In 'Set cell' type C8.
10. In 'To value' type 450000. This is the goal seek value.
11. In 'By changing cell' type A8 and click on ok, the goal seek status dialog box indicates it has found the value, click on ok, the required amount to be saved each month is obtained in the cell A8.

Example :

For the following worksheet calculate the DA as 100% of the Basic Salary, HRA as 33% of the Basic Salary when the Basic Salary is ₹ 50,000 or less and 25% otherwise, and Gross Salary in column C, D, E respectively. Find the grand total of the Gross Salary.

	A	B	C	D	E
1	EMPLOYEE NAME	BASIC SALARY	DA	HRA	GROSS SALARY
2	SUNDER RAJAN	20000			
3	JIGNESH SHAH	25000			
4	KALIM KHAN	45000			
5	JEROME D'SOUZA	38000			
6	FREDDY PATEL	60000			
7					
8	2015 Total Gross Sales		85000000		
9	2015 Projected Growth Rate				
10	2015 Projected Growth Sales				

Fig. 7.31

Further using Goal Seek find the projected growth rate in 2115 to achieve a target value of 10,00,00,000.

Solution :

DA

1. Select C2 and type =B2*1.00 and press enter.
2. Select C2 and drag the fill handle to C6.

HRA

1. Select D2 and type =IF(B2<=50000,B2*.33,B2*.25) and press enter.
2. Select D2 and drag the fill handle to D6.

GROSS SALARY

1. Select E2 and type = SUM(B2:D2) and press enter.
2. Select E2 and drag the fill handle to E6.

PROJECTED GROWTH RATE

1. Select C10 and type =C8*C9 and press enter. (This will calculate the projected sales once Goal Seek has obtained the growth rate in C9).
2. Give cell C9 the percentage format with 2 decimals.
3. In Data Tab select What-If analysis and then select Goal Seek.
4. In 'Set cell' typeC10.
5. In 'To value' type 100000000.
6. In 'By changing cell' type C9 and click on ok, the goal seek status dialog box indicates it has found the value, click on ok, the overall required growth rate is obtained in the cell C9. Subtract 100 from the growth rate shown to obtain the growth rate necessary to achieve this projected sales.

	A	B	C	D	E
	EMPLOYEE NAME	BASIC SALARY	DA	HRA	GROSS SALARY
1			20000	6600	46600
2	SUNDER RAJAN	20000	25000	8250	58250
3	JIGNESH SHAH	25000	45000	14850	104850
4	KALIM KHAN	45000	38000	12540	88540
5	JEROME D'SOUZA	38000	60000	15000	135000
6	FREDDY PATEL	60000			
7					
8	2015 Total Gross Sales		85000000		
9	2015 Projected Growth Rate		117.65%		
10	2015 Projected Growth Sales		100000000		
11					

Fig. 7.32

SOLVER

Solver is a What-If analysis tool, which finds the *optimum* value in a target cell by changing values in cells used to calculate the target cells. Hence, when two or more unknown values have to be determined, Solver can be used. Goal Seek is used when there is only one unknown value to be found. For example let us assume that a sale of ₹ 5,00,000 has to be made of three different products if a company has to break even. Then, using solver we can determine how many units of each of these three products should be sold, so as to achieve required goal of the sale amount of ₹ 5,00,000.

Solver is an Add-in and is found in the Data Tab. If it is not visible in the Data Tab it indicates that it has not been installed. To install it, select options in the File Tab and then use the add-in option.

Example :

A Company makes three products Bats, Racquets and Footballs whose sale price is ₹ 300, ₹ 200 and ₹ 150 respectively. For the company to break even, it has to achieve a total sale of ₹ 5,00,000 in a year. Using Solver, find out the number of units of each of these three products that should be sold in order to meet the desired target sale.

Solution :

1. In A1 type 300, A2 type 200 and in A3 type 150.
2. Type 0 in the cells B1,B2 and B3.(Solver will enter the quantity to be sold of each of these 3 products in these cells.
3. Select C1 and type =A1*B1 (here we are asking Excel to multiply the selling price per unit with the quantity sold in order to obtain sales value.)
4. Select C1 and drag the fill handle to C3.
5. Select C4 and type =SUM(C1:C3). This is the total sales to be achieved.
6. In D1 type Bat, D2 type Racquet and in D3 type Football.
7. Select C4 and from the Data Tab select Solver.

	A	B	C	D	E	F	G	H
1	300	0	0	BATS				
2	200	0	0	RACQUETS				
3	150	0	0	FOOTBALL				
4			0					

Fig. 7.33

8. In the dialog box in the 'Set objective' option the cell C4 is already selected.
9. In the 'To' option there is Max, Min and Value. Max is selected when you want to increase the goal to the largest value, if Min is selected it decreases the goal cell to the smallest value. Select 'Value of' and type 500000 in the text box.
10. In the option 'By Changing Variable cells' text box enter B1:B3.

Fig. 7.34

11. Then click on Solve. When Solver will obtain the result, click on ok.

Fig. 7.35

☐ ☐ ☐

12. Round the numbers in Column B by using the decrease decimal option from the Home Tab. These are the required number of units of each of the three products that have to be sold in order to achieve the sales goal of ₹ 500000.

Example :

A Company makes four products Printers, LCD Monitors, Keyboards and Hard disks whose sale price is ₹ 5000, ₹ 3000, ₹ 1000 and ₹ 3500 respectively. For the company to break even, it has to achieve a total sale of ₹ 1,00,00,000 in a year. Using Solver find out the number of units of each of these four products that should be sold in order to meet the desired target sale, given that the Company has the capacity to make maximum 2000,1000,3000 and 1800 units of each of these four products respectively in a year.

Solution :

1. In A1 type 5000, A2 type 3000, in A3 type 1000 and in A4 type ₹ 3500.
2. Type 0 in the cells B1, B2, B3 and B4. (Solver will enter the quantity to Be sold of each of these 4 products in these cells.
3. Select C1 and type =A1*B1 (here we are asking Excel to multiply the selling price per unit with the quantity sold in order to obtain sales value.)
4. Select C1 and drag the fill handle to C4.
5. Select C5 and type = SUM(C1:C4) . This is the total sales to be achieved.
6. In D1 type Printer, D2 type Monitor, in D3 type Keyboard and in D4 type Hard Disk.
7. Select C5 and from the Data Tab select Solver.
8. In the dialog box in the 'Set objective' option the cell C5 is already selected.
9. In the 'To' option select 'Value of' and type 10000000 in the text box.
10. In the option 'By Changing Variable cells' text box enter B1:B4.
11. In the 'Subject to Constraints' select Add option.(as we want to add the constraints of the maximum number of units of each of these four products that the company can produce.)
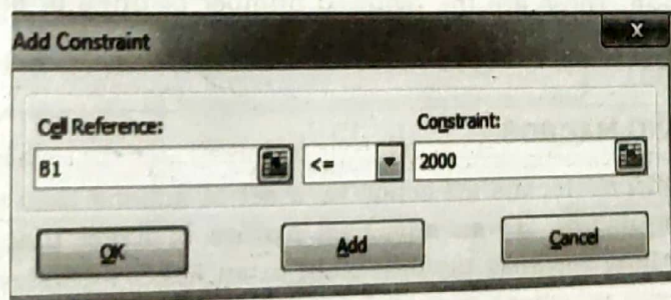

Fig. 7.36

12. In 'Cell Reference' type B1 and in constraint type 2000 and click on Add.
13. In 'Cell Reference' type B2 and in constraint type 1000 and click on Add.
14. In 'Cell Reference' type B3 and in constraint type 3000 and click on Add.
15. In 'Cell Reference' type B4 and in constraint type 1800 and click on ok.
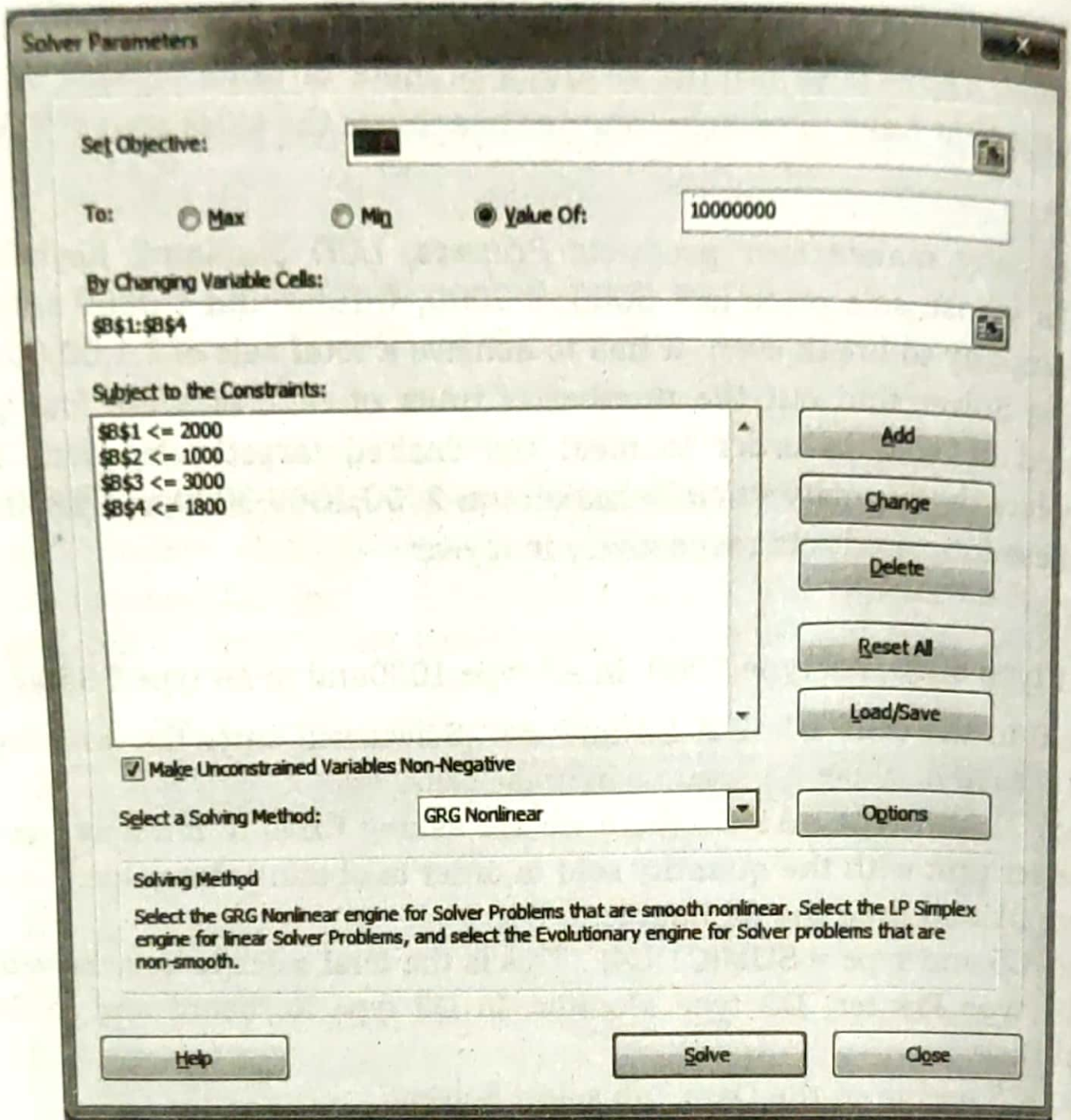
Solver Parameters		✕
Set Objective:	▓	

To: ○ Max   ○ Min   ● Value Of: `10000000`

By Changing Variable Cells:

`$B$1:$B$4`

Subject to the Constraints:

```
$B$1 <= 2000
$B$2 <= 1000
$B$3 <= 3000
$B$4 <= 1800
```

- Add
- Change
- Delete
- Reset All
- Load/Save

☑ Make Unconstrained Variables Non-Negative

Select a Solving Method: GRG Nonlinear   ▼   Options

Solving Method

Select the GRG Nonlinear engine for Solver Problems that are smooth nonlinear. Select the LP Simplex engine for linear Solver Problems, and select the Evolutionary engine for Solver problems that are non-smooth.

Help   Solve   Close

Fig. 7.37

16. Then click on Solve. When Solver will obtain the result, click on ok.

17. Round the numbers in Column B by using the decrease decimal option from the Home Tab. These are the required number of units of each of the four products that have to be sold in order to achieve the sales goal ₹ 1,00,00,000.