



**BLOCK 5**  
**SPREADSHEETS AND BUSINESS**  
**APPLICATIONS**

Pignou  
THE PEOPLE'S  
UNIVERSITY

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## **BLOCK 5 SPREADSHEETS AND BUSINESS APPLICATIONS**

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This is the fifth and final block of the course “Computer Application in Business”. This block will familiarize the learners with various formulas, functions, advanced options available in computers and their applications in business. The block on the theme “Spreadsheets and Business Applications” comprise of five units, the detail of which is mentioned below:

**Unit-16:** The very first unit of this block particularly focuses on spreadsheets concepts such as making worksheets, handling & editing data, grouping worksheets, etc. The purpose of this particular unit is to emphasis on how the accounts, taxes, and sales or budgeting, electronic spreadsheets are playing as an important tool to handle such requirements. Also, this unit makes the learners familiar with the Excel screen layout and the Excel menu.

**Unit-17:** This unit helps in applying the various formulas and functions such as logical functions, financial functions, statistical functions, mathematical functions, text functions, date and time functions, etc. available in Microsoft Excel and their uses. The basic functionalities of MS Excel, used to store, maintain, manage, manipulate and organize our data is discussed which can be used efficiently for solving problems in Finance and Commerce.

**Unit-18:** This unit helps to understand the basic features for charts generation using Excel and its graphical representation of data. Charts and its various types such as column, pie, area, stock, etc. are explained in a lucidly manner with their applications. This unit also explains how to prepare the data and transfer it into charts. It will also help learners in framing pivot table as well as tabulating and charting.

**Unit-19:** This unit helps in analyzing, filtering and sorting the data. It also helps the users to apply data in worksheets, and finally compute with the formulas and lookup tables. Analyzing the data using descriptive statistics, correlation and regression for decision making would also be explained in this particular unit.

**Unit-20:** This unit explains almost all the basic kinds of industry level reporting and analysis sheets and their implementation in real time world which can be prepared with the help of MS Excel such as loan statement, payroll statement, lease statement, project management, etc. The unit also explains the analysis of data through ratios and various other financial statements.

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## UNIT 16 SPREADSHEET CONCEPTS

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### Structure

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- 16.3 Excel Screen Layout
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  - 16.5.3 Cell Comments
  - 16.5.4 Naming Cells and Ranges
  - 16.5.5 Addressing and Its Types
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- 16.7 Project Involving Multiple Spreadsheets
  - 16.7.1 Naming a Worksheet
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### 16.0 OBJECTIVES

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After completing this unit, you should be able to:

- understand the basic features of Excel;
- know how to create worksheet and compute data;
- understand the screen display of Excel;
- describe the different icons available in Excel menu;

- make worksheets in Excel;
- learn how to organize charts and graphs; and
- understand how to print the worksheet.

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## 16.1 INTRODUCTION

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At homes, we track our own budgets and investments, and at office we have numerical tasks to be performed, which may be related to accounts, taxes, sales or budgeting. Businesses also need graphs and charts for analysis and projections. Further, commerce students who are pursuing their bachelors in Commerce from School of Management Studies, Indira Gandhi National Open University deal with big numbers, formulas and calculations and almost all of us in the present scenario deal with tables, data and calculations in one way or other directly or indirectly. There are many worksheet software packages available to assist us in all these number based functions. Electronic spreadsheets are most common tools to handle such requirements. Spreadsheets are brilliantly conceived ways to organize data by grouping it into rows and columns, they are used to organize, analyze and manipulate all type of data but it provides enhanced functionalities for numerical data. There are quite a few electronic spreadsheet programs available like Microsoft Excel, Open Office Calc or Google spreadsheets which are available on cloud. We will consider MS Excel for our study due to its wide coverage and omnipresent usage in nature. It comes bundled in Microsoft Office which is an office automation tool. Microsoft Excel is one of the powerful spreadsheet tools, which is used by different people in their day-to-day jobs. In this unit, we will discuss the basic functionalities of Microsoft Excel, application software of the Microsoft Office package, used to store, maintain, manage, manipulate and organize the business data used for commercial purpose and running the business smoothly and systematically.

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## 16.2 STARTING MS EXCEL

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Microsoft Excel spreadsheet is designed for everyday tasks such as setting up a budget, maintaining an address list, or keeping track of a list of to-do items. Excel is part of Microsoft Office, and comes pre-loaded on your computer. You can start MS Excel by either of the following two ways:

- Click on Start → All Program → Microsoft Office → Microsoft Office Excel

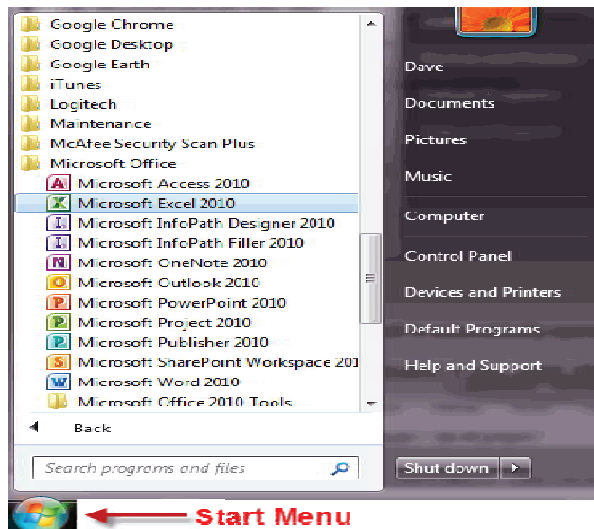


Fig. 16.1: Steps to start MS Excel

- Double click on the MS Excel icon  on the desktop (if you have one).

When Excel opens, a new document (called Workbook in Excel) with default name as Book1 is opened. For each additional Workbook you open, the number increases by one. Please note that you can open more than one Workbook at a time. By default each Workbook contains three worksheets. You may increase or decrease the number of worksheets in a Workbook. How we do it, we will learn later.

You may also start Excel by clicking on a Workbook saved on your hard drive. Excel will open automatically and the Workbook will be displayed in the Excel window.

### 16.3 EXCEL SCREEN LAYOUT

When you open Excel from the menu or desktop icon, the screen will look like in Figure 16.2

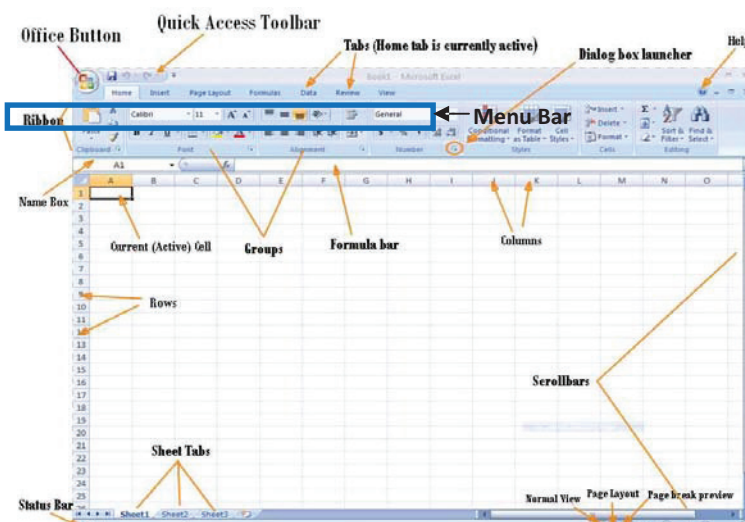


Fig. 16.2: Microsoft Excel Screen Layout

Let us familiarize ourselves with the key components, mentioned in the excel screen layout shown above in figure 16.2.

### The Microsoft Office Button

It is the button in the upper-left corner of the Excel Window. When you click on the button, it displays a menu that can be used to create a new Workbook, open an existing Workbook, save a Workbook, print and perform many other tasks.

### The Quick Access Toolbar

It is present next to the Microsoft Office Button on the top. It provides you access to the commands you frequently use. By default following appear on the Quick Access Toolbar:

- **Save:** To save your file (you may also press keyboard button (Ctrl + S).
- **Undo:** To rollback the action that you last took (Ctrl + Z).
- **Redo:** To reapply the action you rolled back or to repeat an action (Ctrl + Y).

### The Title Bar

It is next to the Quick Access toolbar at the top. It displays the title of the Workbook on which you are currently working. By default, the first new Workbook is named as Book1. For each additional Workbook you open, the number increases by one. You may save the Workbooks by any legal filename you want.

### Setting Up Your Excel Environment

Before you begin working on your spreadsheet, you may want to set up your Excel environment and become familiar with a few key tasks such as how to maximize and minimize the Ribbon, configure the Quick Access toolbar, display/ hide the formula bar, change page views etc.

### Minimize and Maximize the Ribbon

- Right click anywhere in the main menu
- Select **Minimize the Ribbon** in the menu that appears. This will **toggle** the Ribbon on and off.

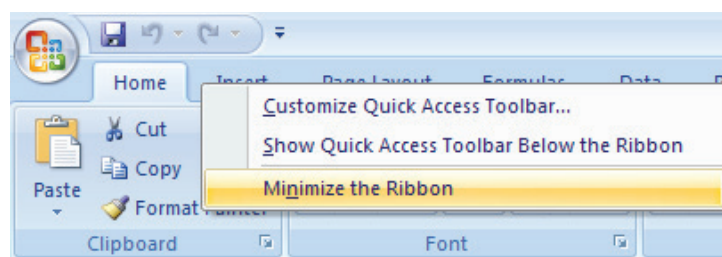


Fig. 16.3: Minimize the Ribbon

The check mark beside 'Minimize the Ribbon' option indicates the feature is active. You may choose to use this option, if you prefer not to use the Ribbon, but use different menus and keyboard shortcuts.

This menu also has option to **Show Quick Access Toolbar below the Ribbon**, instead of at the top. You can also Customize Quick Access Toolbar using the option available in this menu. Choosing this option displays the window as shown in figure 16.4

### Add Commands to Quick Access Toolbar

- Click the arrow (customize quick access toolbar) to the right of the Quick Access toolbar.
- Select the command you wish to add from the drop down menu. The command will appear in the Quick Access Toolbar

You can also select **More commands...** from the menu to open the screen as shown in Figure 16.4. Here, you can one by one add commands to the toolbar or remove commands from the toolbar to make specific features easily accessible.

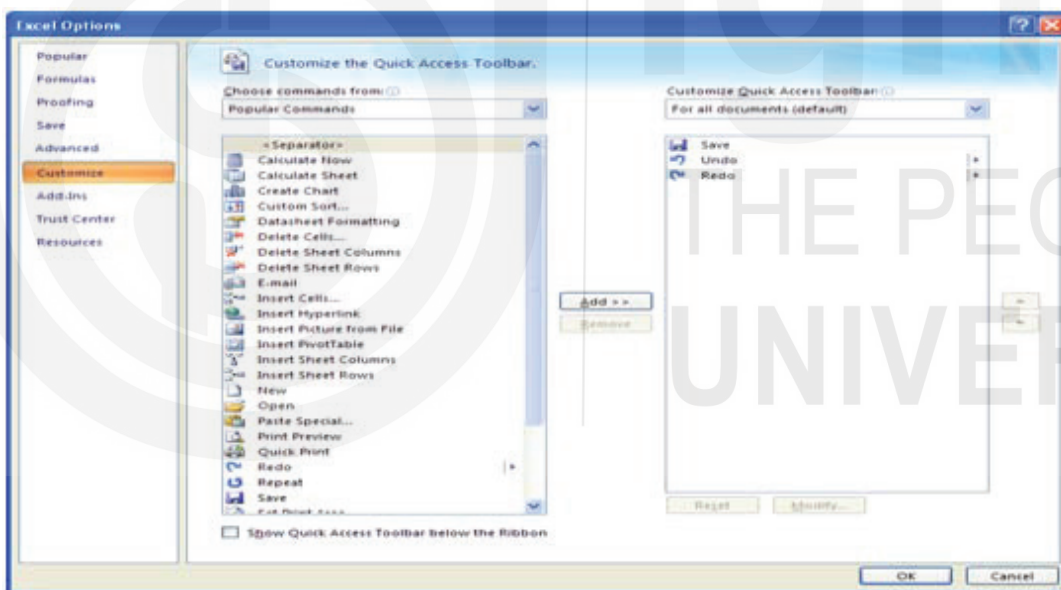


Fig. 16.4: Customizing Quick Access Toolbar

### Display or Hide the Formula Bar

- Click the **View** Tab of the Ribbon.
- In the **Show/ Hide** group check/ uncheck against formula bar to show/ hide formula bar.

### Expand Formula Bar

The **Expand/ Collapse formula bar** button is present at the far right end of the formula bar.

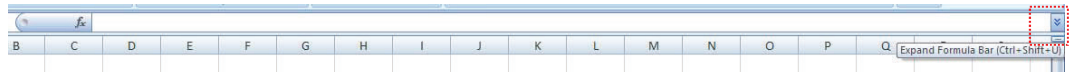


Fig. 16.5: Expand Formula Bar Button

Click on the button to expand or collapse the formula bar.

### Customize the Status Bar

- Right click anywhere on the Status Bar.
- From the menu that appears, select the options that you want to see on the Status Bar. If the option is selected a check mark appears before it. Ensure that **View Shortcuts** and **Zoom Slider** options are selected.

### Zoom In and Out

- Locate the **zoom bar** in the bottom, right corner.
- Left-click the **slider** and **drag** it to the left to zoom out and to the right to zoom in.



Fig. 16.6: Zoom In and Zoom Out

You can also use the **Zoom** group in the **View** Tab of the Ribbon to set your zoom.

### Change Page Views

- Locate the **Page View options** in the bottom, right corner. Click on an option to select it. Different page view options are:
  - **Normal**: This is the default view.
  - **Page Layout**: This view is very helpful from printing point of view. When you select this view, you are able to see the header block, all the margins around the worksheet, the vertical and horizontal rulers and the column and row headings also appear differently. This view shows how exactly the Workbook would look like when you print it.
  - **Page Break**: This view is useful to determine where the page will break when you are trying to print an Excel sheet that spans multiple pages.

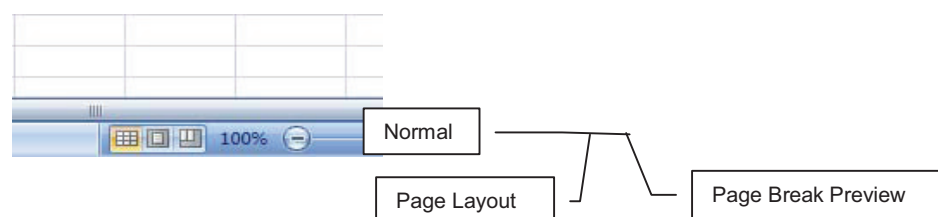


Fig. 16.7: Page Views

You can also set the page view using **Workbook Views** group in the View tab on the Ribbon.

### Customizing the Environment Using Excel Options

The **Excel Options** menu allows you to customize Excel according to your preferences.

- Click the Microsoft Office Button
- Click on 'Excel Options' button located at the bottom of the menu.

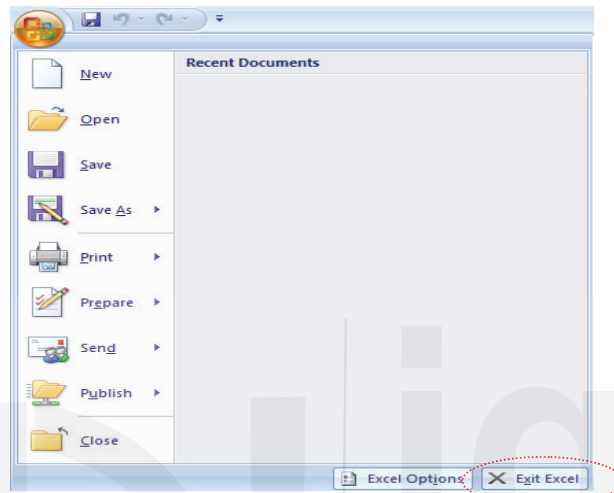


Fig. 16.8: Excel Options Button

When you click on Excel Options button, an extensive menu will open.

Using Excel Options menu, you can personalize your work environment with the mini toolbar, Live preview, color schemes, customize sort and fill sequence, auto correction setting, modify default options for new Workbooks, calculation options, specify options for editing, copying, pasting formulas, calculations and other general setting.

## 16.4 EXCEL MENU

When you open Excel from the menu or desktop icon, the screen will look like in Figure 16.9:

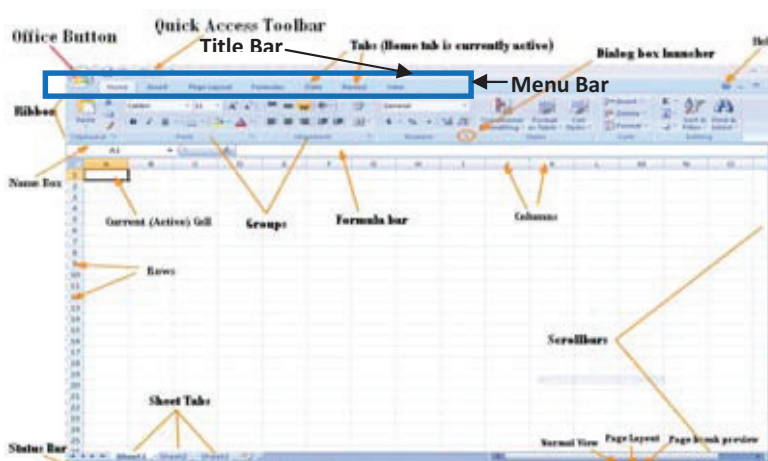


Fig. 16.9: Excel Menu

## The Menu Bar

The menu Bar is the panel at the top portion of the document, right below the Title Bar. To begin with it has following seven tabs:

- **Home:** It has basic commands for creating, formatting and editing the spreadsheets. It has controls for working with the clipboard, fonts, alignment, number, styles, cells and editing.
- **Insert:** It has commands for inserting tables, pictures, shapes, other illustrations, links, charts, header, footer, etc.
- **Page Layout:** The commands here help to set the layout of the spreadsheet, apply a theme to set the overall look, set the margins, orientation, size, backgrounds, etc.
- **Formulas:** It has commands that help you use different formulas and functions.
- **Data:** Has commands to import, query, view data from external sources, sort, filter or manage data.
- **Review:** Has commands to add comments, protect sheet, protect Workbook, share Workbook, etc.
- **View:** Helps to change the display of the worksheet area.

Besides these basic tabs, additional tabs appear from time to time, depending on the context we are working in. These tabs are called contextual tabs. For example, if you select a chart, a Chart Tools contextual tab appears that has commands to help you design and format the chart. These contextual tabs appear in a different color to make them easy to spot.

The commands on each tab are organized into groups. Hence, a group is a collection of logically related command buttons that you can use to manage a Worksheet. Commonly used features are displayed on the Ribbon and additional options can be accessed through the dialog box launcher at the bottom-right corner of each group.

## The Formula Bar

The formula bar is divided into three sections:

- **Name Box:** Located on the left most side of the formula bar, it displays the address of the current cell
- **Formula Bar Buttons:** Middle section of the formula bar with indented circle on the left (to increase or decrease the size of the name box) and **function wizard** (labeled fx) on the right. When you start entering data in the cell, **Cancel** (✕) and **Enter** (✓) buttons also appear.
- **Cell Contents:** Right side of the formula bar displays the cell entries.

**The Worksheet Area**

The worksheet area displays all the cells. It is in the cells that you enter, format or edit your data.

**The Status Bar**

The Status bar appears at the very bottom of the Excel window and provides such information as the sum, average, minimum, and maximum value of selected numbers. You can change what displays on the Status bar by right-clicking on the Status bar and selecting the options you want from the Customize Status Bar menu. You click a menu item to select it. You click it again to deselect it. A check mark next to an item means the item is selected.

**Check Your Progress A**

1) What is title bar?

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2) How to maximise and minimise the ribbon?

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3) Which are the three options available on Quick Access Toolbar by default?

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4) What is the role of page break?

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## 16.5 MAKING WORKSHEETS

When Excel opens, a new document (called Workbook in Excel) with default name as Book1 is opened. For each additional Workbook you open, the number increases by one i.e. Book1, Book2, and so on. Please note that you can open more than one Workbook at a time. By default each Workbook contains three worksheets. You may increase or decrease the number of worksheets in a Workbook. An Excel Workbook is another word for your Excel file. Here, we will learn how to open a Workbook, create a Workbook from a template and viewing multiple Workbooks at the same time. Further, Excel Worksheets (or spreadsheet) is a collection of cells where you keep and manipulate the data.

When you would like to open a new Workbook then click on the office button and click new, it will open the following window from where you can choose a blank Workbook.

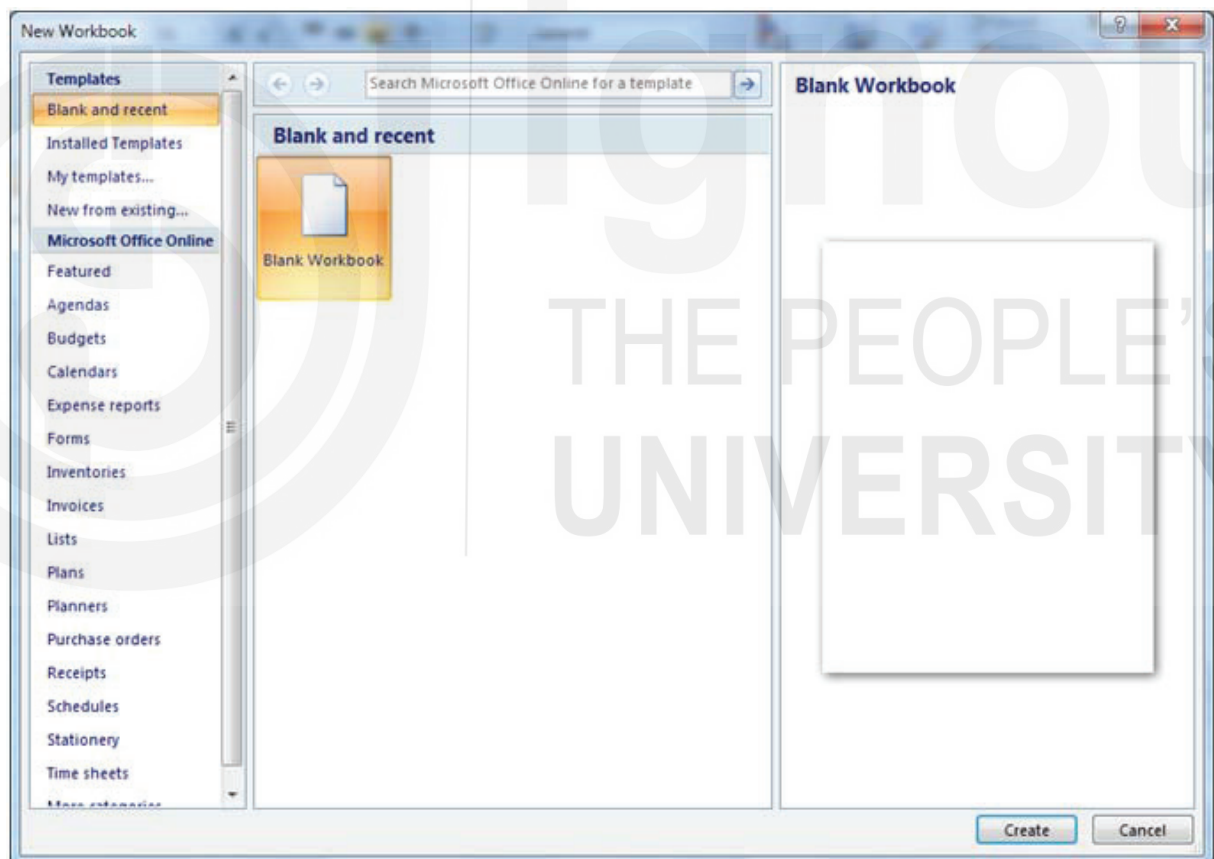


Fig. 16.10: Create a Workbook (blank)

If needed then you can choose installed templates from your system as well, if they are not available in your system then you can download the templates which can generate Workbooks of your choice.

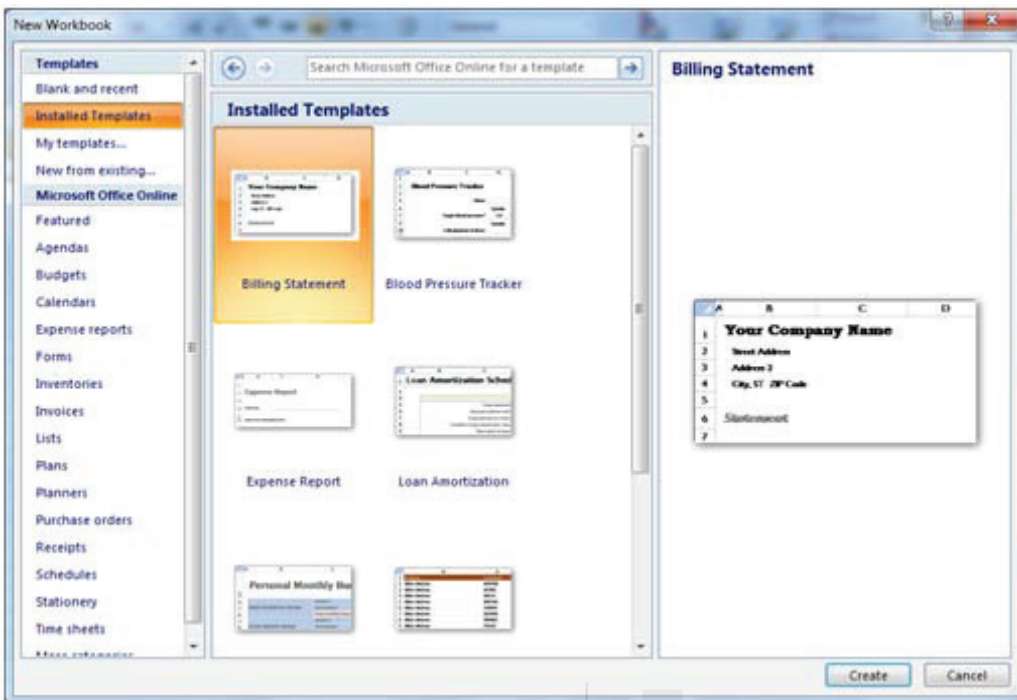


Fig. 16.11: Create a Workbook (templates)

Saving an excel Workbook as a file needs following steps to be followed:

- 1) Create a dataset in the Workbook – sheet1
- 2) Click on the office button, place at top left corner.
- 3) Choose the Save As option and it will open the following dialog box.
- 4) Write the file name for the Workbook and choose the location to save.
- 5) Click the save button.

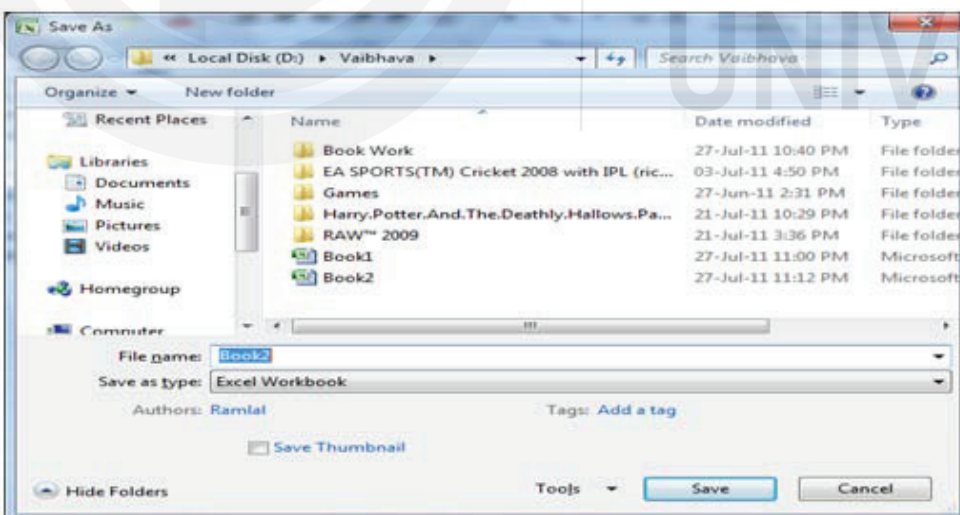


Fig. 16.12: Save a Workbook

To open an existing excel Workbook saved already at any given location, you have to follow the steps as mentioned below:

- 1) Click the office button.
- 2) Choose the file – open option.

- 3) It will open the following dialog box for you.
- 4) Select the location from where you have to choose the file.
- 5) Choose the file to open.
- 6) Click open file button.

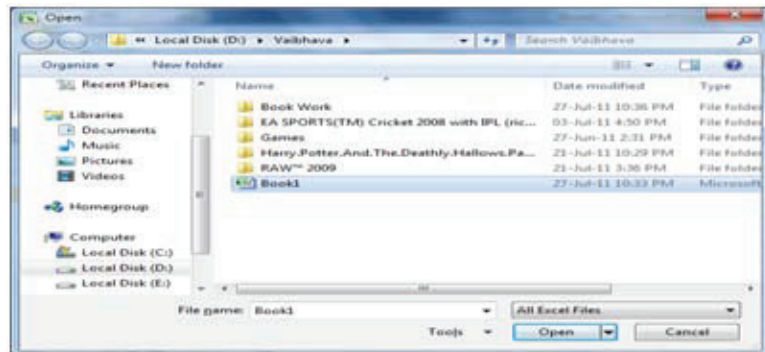


Fig. 16.13: Open a Workbook

### Working with Multiple Workbooks

Multiple Workbooks can be opened simultaneously if there is such a need. To see the list of open Workbooks:

- Click on **View** tab of the Ribbon
- Click on **Switch Windows** in the Window group. A drop down list of all open Workbooks is displayed.

The current Workbook has a checkmark besides its name. You may select any Workbook from the list to make it current.

To close an excel Workbook you have to follow the steps mentioned below:

- 1) Click the office button.
- 2) Select the Close option.

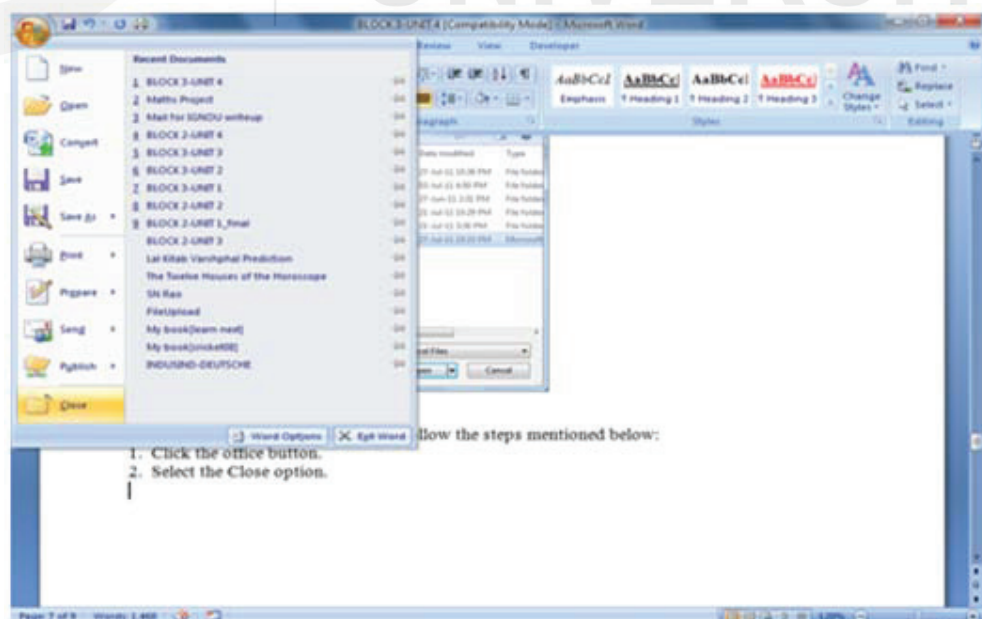


Fig. 16.14: Close a Workbook

### 16.5.1 Data Handling and Editing

Firstly, open the Workbook to start your work on a worksheet. At times, you might require inserting or deleting a worksheet, and cells to be selected.

- **Insert a Worksheet:** To insert a Worksheet between two worksheets choose Worksheet option from the Insert menu. A dialog box will appear to confirm this action.
- **Delete a Worksheet:** To remove a worksheet from the Workbook, select Delete Sheet from the Edit menu. A Dialog box will appear to confirm this action.
- **Move the Worksheet:** To move the worksheet in the same Workbook, place the mouse pointer on the sheet tab, press the left mouse button and drag it to the desired position. Release the button.

You enter all kinds of data in a cell in the worksheet. An Excel Workbook can hold any number of worksheets and each worksheet is made up of more than seventeen billion cells. Each cell carries some data and Excel treats different types of data differently. Each cell can hold any of the following three types of data:

- **A numeric value:** It can be numbers (example 300.40), dates (example 4-June-2020) or times (example 3:35 am). There are many different format options available in Excel for the display of numerical values. Numbers include digits from 0 to 9 and some special characters like \$ % + - / ( ), etc.
- **Text:** Text in Excel can be used as labels for values, headings for columns or worksheets or for any kind of instructions. Text that begins with a number is still considered as text. To enter digits as text (calculations cannot be done using these kinds of entries) use an apostrophe (') as the first character.
- **Formula:** Formulas can be entered in a cell where eventually the result of the formula is displayed. We will study more about formulas later in this unit. Example: Type TODAY () in a blank cell and press ENTER key (This function will display the system date and time)

A worksheet can also hold charts, diagrams, pictures and other objects. These objects are not contained in cells. Rather, they reside on the worksheet's draw layer, which is an invisible layer on top of each worksheet.

In order to enter or edit data in a cell, that cell must be current. Excel indicates that a cell is current in the following ways:

- A dark black border (called the cell cursor) appears around the cell.
- The cell address appears in the Name box of the formula bar. A cell address is combination of Column Letter(s) and Row number that

intersect at that cell position. For example, if the cell address is A3, it means it is at the intersection of column A and row 3.

- The cell column heading (letters) and row heading (number) is shaded for that particular cell.

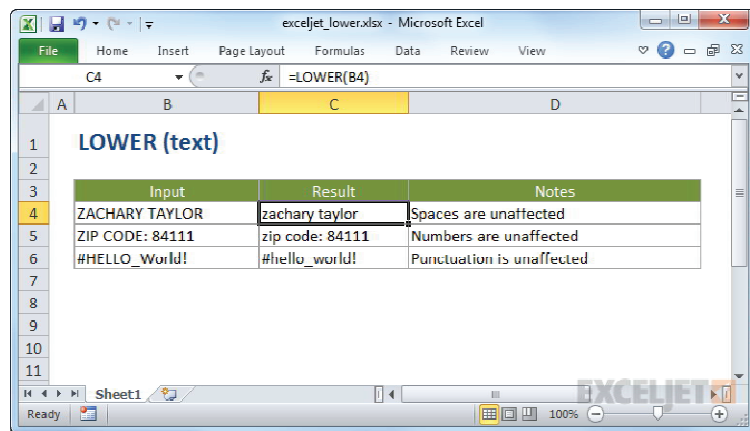


Fig. 16.15: Entering Data

### Entering Data:

For entering the data in a worksheet, you need to create a set of attributes which will be represented through a column [A, B ...] in the first row. Then you can enter the specific data using that dataset. You should enter the data in a specified format for getting better results while analysing the data, otherwise they may create a problem.

There are various options available in the Home tab

1) [Home →Clipboard]

There are options available like cut, copy, paste, format painter for making the task easier while entering a dataset.

2) [Home →Font]

There are options available like Font Face, Font Size, Font Type, Font Color, Cell Color, Borders, etc.

3) [Home →Alignment]

There are options available like Aligning the data in a cell [Left, Center, Right], Aligning the data in a merged cell [Top, Center, Bottom], Left Indent, Right Indent, Merging Cells, Wrapping Text.

4) [Home →Number]

There are options available like Currency, Percentage, General, Increasing decimal, Decreasing decimal, Date etc.

5) [Home →Styles]

There are options available like Conditional Formatting, Formatting table, Cell Styles etc.

6) [Home → Cells]

There are options available like

- a) Insert → Cells, Rows, Columns, Sheets
- b) Delete → Cells, Rows, Columns, Sheets
- c) Format
  - i) Cell Size
    - 1) Row Height
    - 2) AutoFit Row Height
    - 3) Column Width
    - 4) AutoFit Column Width
    - 5) Default Width
  - ii) Visibility
    - 1) Hide and Unhide
    - 2) Rows
    - 3) Columns
    - 4) Sheets
  - iii) Organizing Sheets
    - 1) Rename Sheet
    - 2) Move or Copy Sheet
    - 3) Tab Colors
  - iv) Protection
    - 1) Protect Sheet
    - 2) Lock Cell

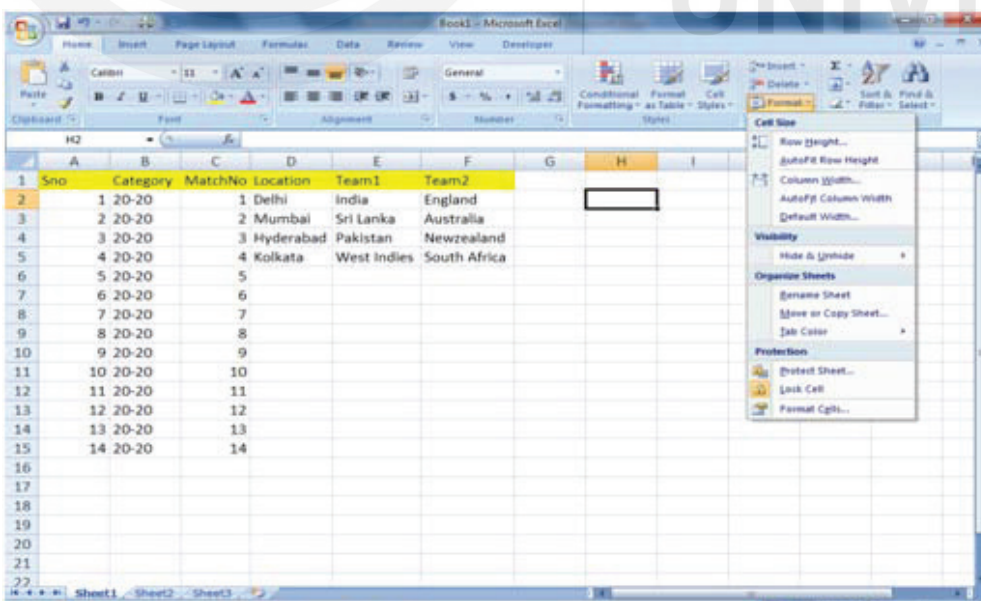


Fig. 16.16: Format options

## Editing Data

You have various options available in the ribbon [Home →Editing] for editing the dataset as per the requirement of any process.

- 1) Find & Select
- 2) Sort & Filter
- 3) Sum
- 4) Fill
- 5) Clear

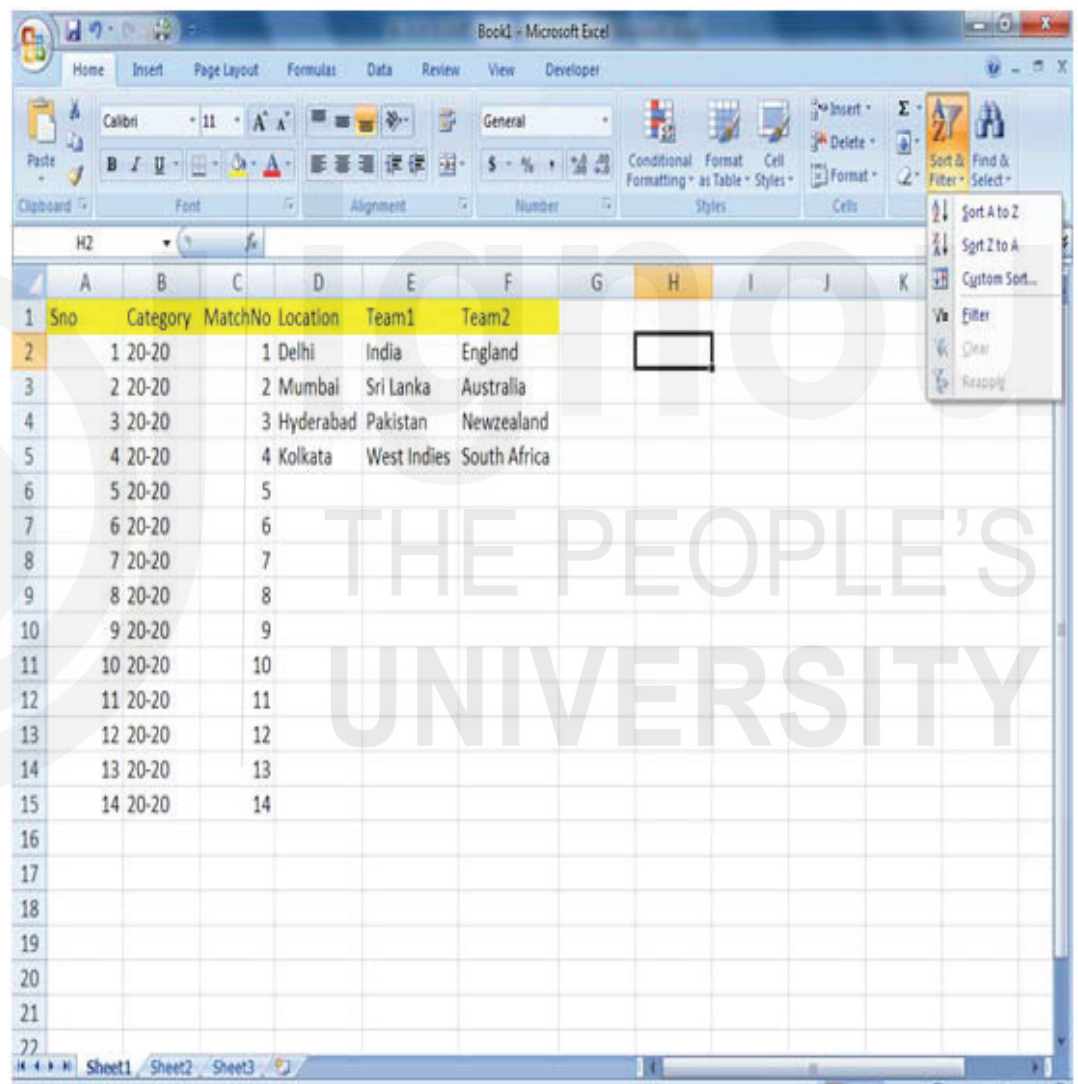


Fig. 16.17: Sort & Filter

Sort & Filter:

- 1) Sort A to Z
- 2) Sort Z to A
- 3) Custom Sort
- 4) Filter

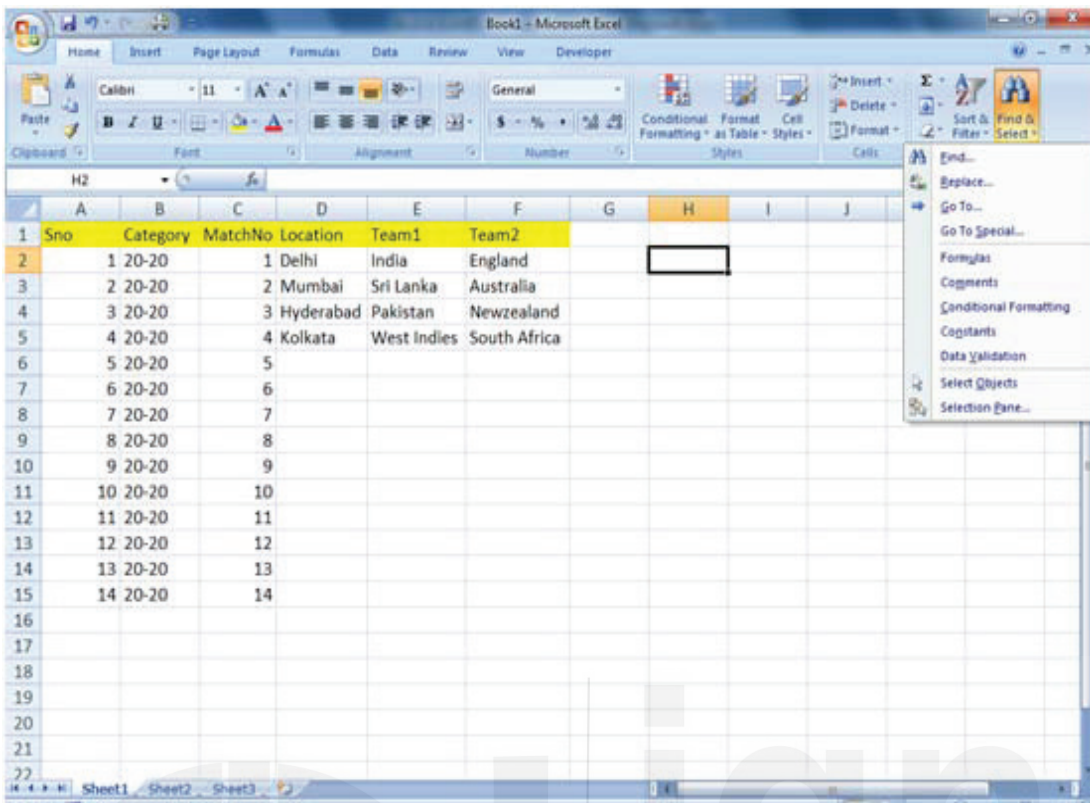


Fig.16.18: Find &amp; Select

Find & Select:

- 1) Find ...
- 2) Replace...
- 3) Go To
- 4) Go To Special
- 5) Formulas
- 6) Comments
- 7) Conditional Formatting
- 8) Constants
- 9) Data Validation
- 10) Select Objects
- 11) Selection Pane

### Importing Data:

For the successful operation of importing data into excel you need to have a dataset in any other generic format e.g. Text.

Roll No, Name, Marks

1001, Amit, 65

1002, Arun, 68

1003, Atul, 78

1004, Asin, 64

1005, Ashu, 62

Now, you have to follow the steps as mentioned to import the dataset into excel format.

- 1) Open MS-Excel
- 2) Click office button
- 3) Select the File→Open option
- 4) Select the Text file option from the list of file formats.

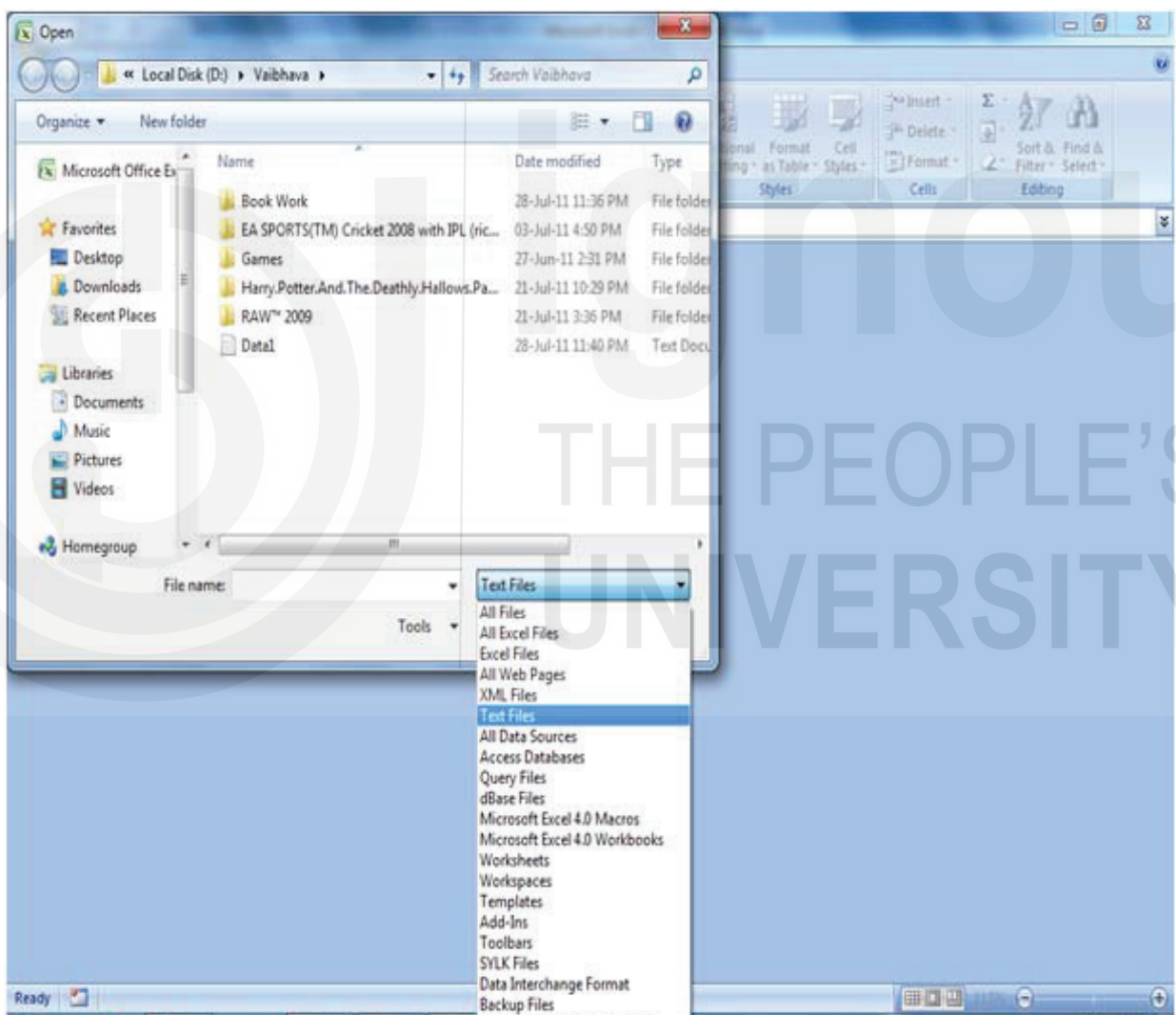


Fig. 16.19: Files option in Open

- 5) Choose the data file which you have placed in a location to be imported.
- 6) Press Open button, it will lead you towards a data import wizard → Step1

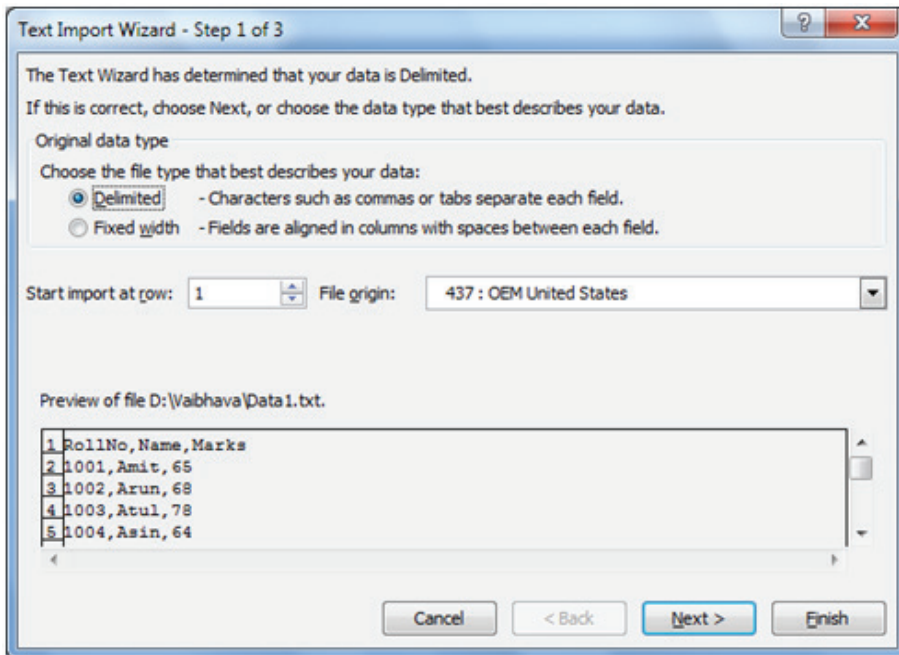


Fig. 16.20: Text importing Wizard [step1]

- 7) Choose the Delimited option and press next button. It will lead towards the next step of the wizard. Where you have to choose the delimiter (Comma, Tab, Space etc...)

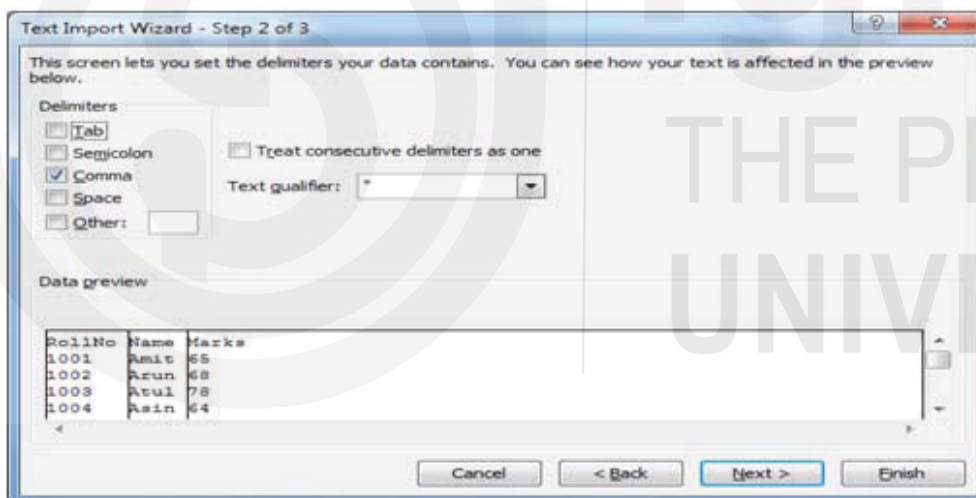


Fig. 16.21: Text importing Wizard [step2]

- 8) As in our case the data is delimited using [,] thus we have chosen [Comma] option from the list of delimiters.
- 9) Press Next button.
- 10) Provide the column data format [General, Text, and Date] for every column you would like to import from an existing text file. If you don't want to import any column than choose the same and click on "Do not import column (skip)".
- 11) Press Finish button.

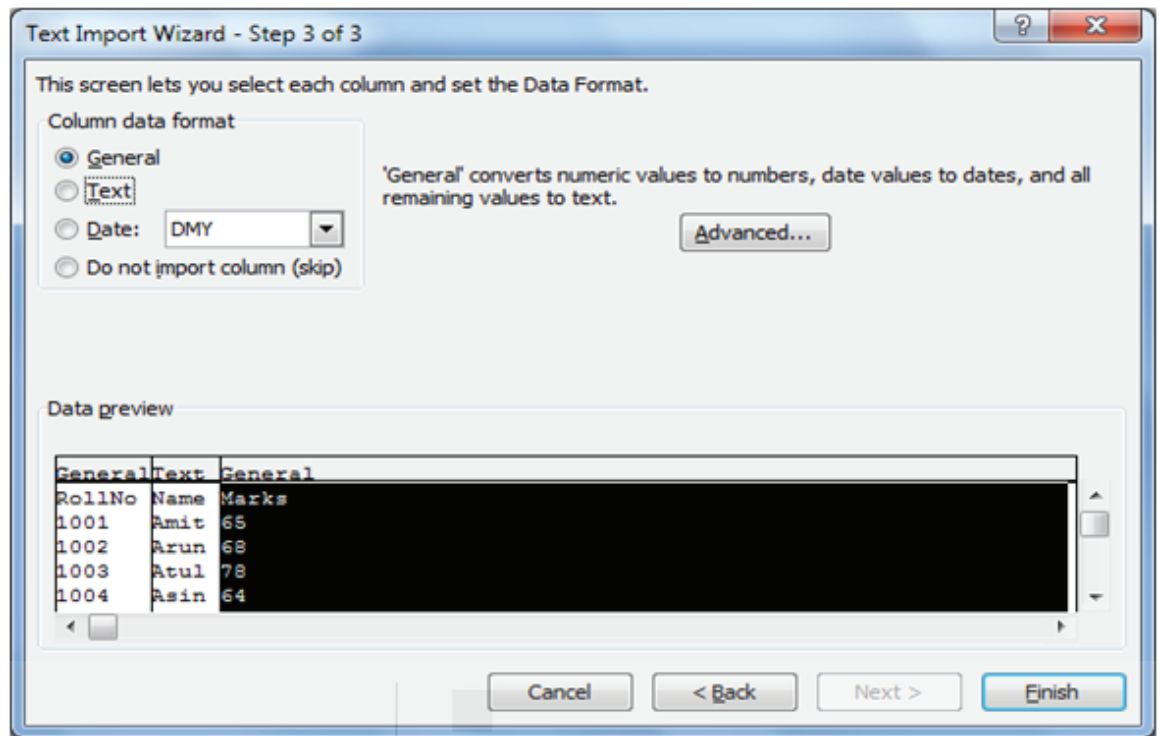


Fig. 16.22: Text importing Wizard

And you will find the data in your excel spread sheet ready for analysis or any other operation you would like to perform on it.

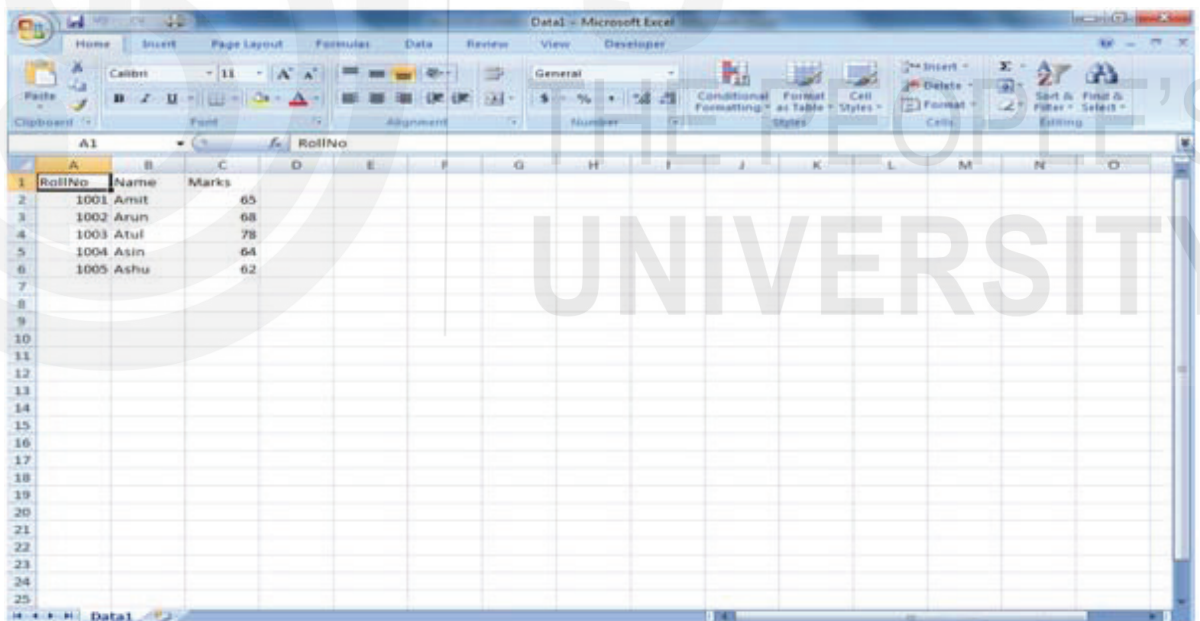


Fig.16.23: Data in spreadsheet

## 16.5.2 Formatting

There are many types of options available in MS Excel for formatting. These options are available in the Home tab. The options are as follows:

- 1) **Clipboard:** There are options available like cut, copy, paste, format painter for making the task easier while entering a dataset.

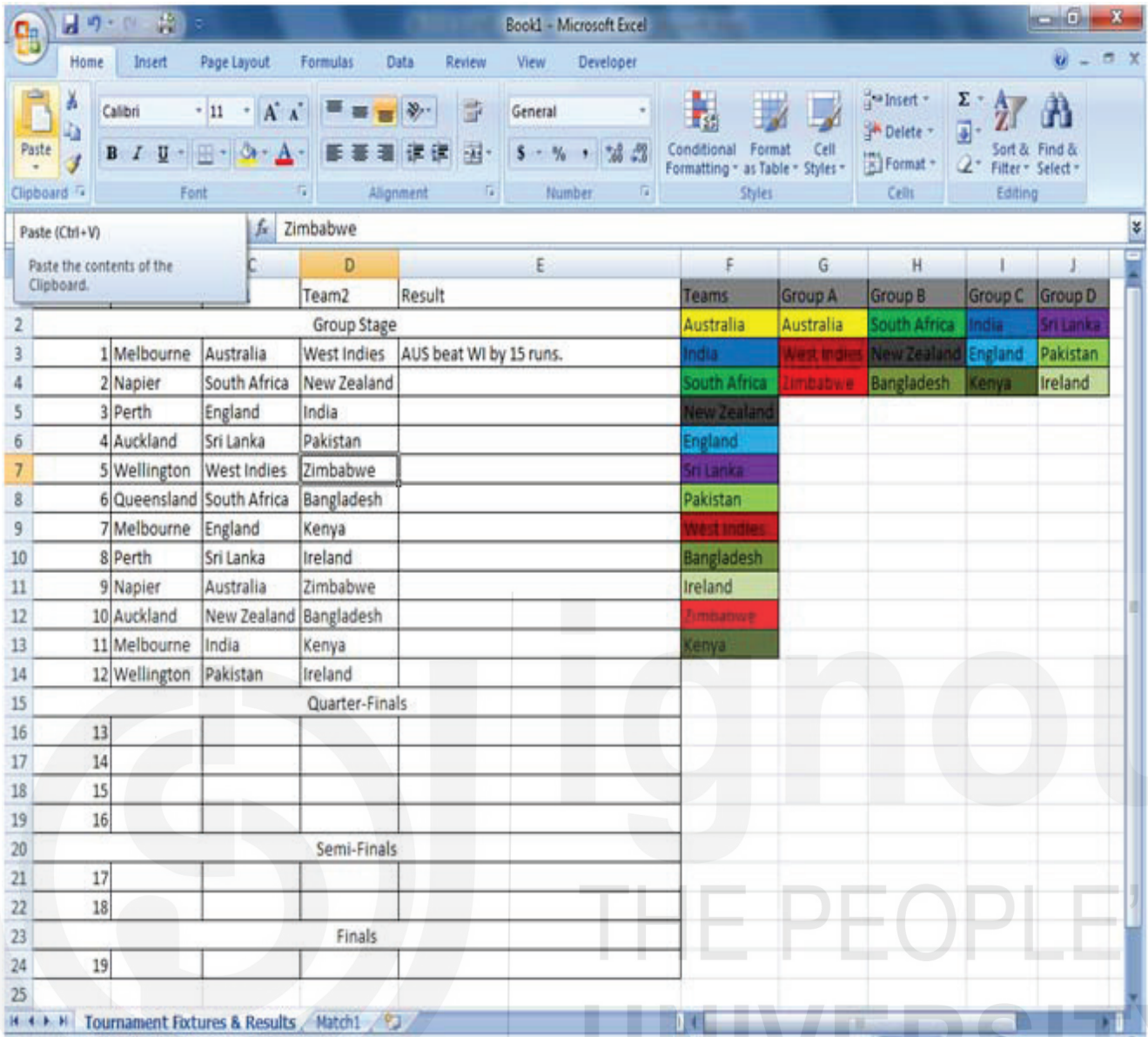


Fig. 16.24: Clipboard

- **Cut:** By clicking this option you can cut a selection from the document and put it on the clipboard.
  - **Copy:** By clicking this option you can copy a selection from the document and paste it on the clipboard.
  - **Paste:** By clicking this option you can paste the selected contents from the document on the clipboard.
  - **Format Painter:** By clicking on this option you can copy the formatting from one place and apply to another.
- 2) **Font:** There are options available like Font Face, Font Size, Font Type, Font Color, Fill Color, Borders, Effects, Number formats and Alignment.

Match No.	Location	Team1	Team2	Result	Teams	Group A	Group B	Group C	Group D
Group Stage					Australia	Australia	South Africa	India	Sri Lanka
1	Melbourne	Australia	West Indies	AUS beat WI by 15 runs.	India	West Indies	New Zealand	England	Pakistan
2	Napier	South Africa	New Zealand		South Africa	Zimbabwe	Bangladesh	Kenya	Ireland
3	Perth	England	India		New Zealand				
4	Auckland	Sri Lanka	Pakistan		England				
5	Wellington	West Indies	Zimbabwe		Sri Lanka				
6	Queensland	South Africa	Bangladesh		Pakistan				
7	Melbourne	England	Kenya		West Indies				
8	Perth	Sri Lanka	Ireland		Bangladesh				
9	Napier	Australia	Zimbabwe		Ireland				
10	Auckland	New Zealand	Bangladesh		Zimbabwe				
11	Melbourne	India	Kenya		Kenya				
12	Wellington	Pakistan	Ireland						
Quarter-Finals									
Semi-Finals									
Finals									

Fig. 16.25: Font

- **Font Face:** By clicking this option you can change the font face of the text that you like to change.
  - **Font Size:** By clicking this option you can change the font size of the text that you require.
  - **Font Type:** By clicking this option you can change the font type of the text as you want. The options are:
    - i) **Bold:** This makes the text Bold.
    - ii) **Italic:** This makes the text *Italic*.
    - iii) **Underline:** This makes the text underlined. You can change the type of underline by clicking on the arrow near the icon.
  - **Font Color:** By clicking this option you can change the font color of the text in the cell that you want.
  - **Fill Color:** By clicking this option you can change the cell color.
  - **Borders:** By clicking this option you can add the borders which you like to add.
  - **Effects:** By clicking this option you can add the effects to the text like strikethrough, etc.
  - **Number Formats:** By clicking this option you can change the number formats as you want like, General, Currency, etc.
- 3) **Alignment:** There are options available like Aligning the data in a cell [Left, Center, Right], Aligning the data in a merged cell [Top, Center, Bottom], Left Indent, Right Indent, Merging Cells, Wrapping Text and Orientation.

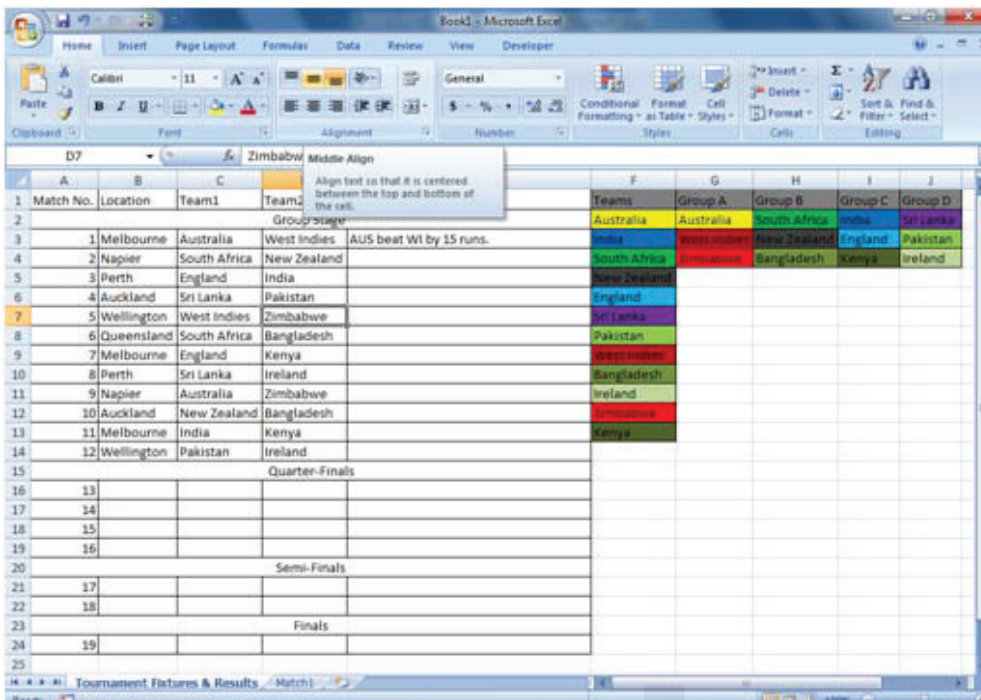


Fig. 16.26: Alignment

- **Aligning in a cell:** By clicking any one of the three options you can align the text in the cell as per the requirements. The options are:
  - i) Left Align: Aligning text to the left.
  - ii) Center Align: Aligning text to the center.
  - iii) Right Align: Aligning text to the right.
- **Aligning in a merged cell:** By clicking any one of the three options you can align the text in the merged cell as per the requirements. The options are:
  - i) Top Align: Aligning text to the top of the merged cell.
  - ii) Middle Align: Aligning text to the center of the merged cell.
  - iii) Bottom Align: Aligning text to the bottom of the merged cell.
- **Indentations:** By clicking any one of the two options you can decrease or increase the margin between the text and the cell.
- **Orientation:** It is used to rotate text or do vertical orientation and there are many types of options in it. This is often used for labeling narrow columns. There are many types of orientation that are:
  - i) Angle counterclockwise
  - ii) Angle clockwise
  - iii) Vertical Text

- iv) Rotate Text up
- v) Rotate Text down
- vi) Format Cell alignment

- **Wrapping Text:** It is used to visible all the contents within a cell by displaying it on multiple lines.

- **Merge Cells:** It is used to join the group of selected cells into one larger cell and centers the content in a new cell. This is often used to create labels that span multiple columns. There are options available in it that are:

- i) Merge & Center
- ii) Merge Across
- iii) Merge Cells
- iv) Unmerge Cells

4) **Number:** There are options available like Number Format, Percentage, Increasing decimal, Decreasing decimal, Accounting Number Format and Comma style.

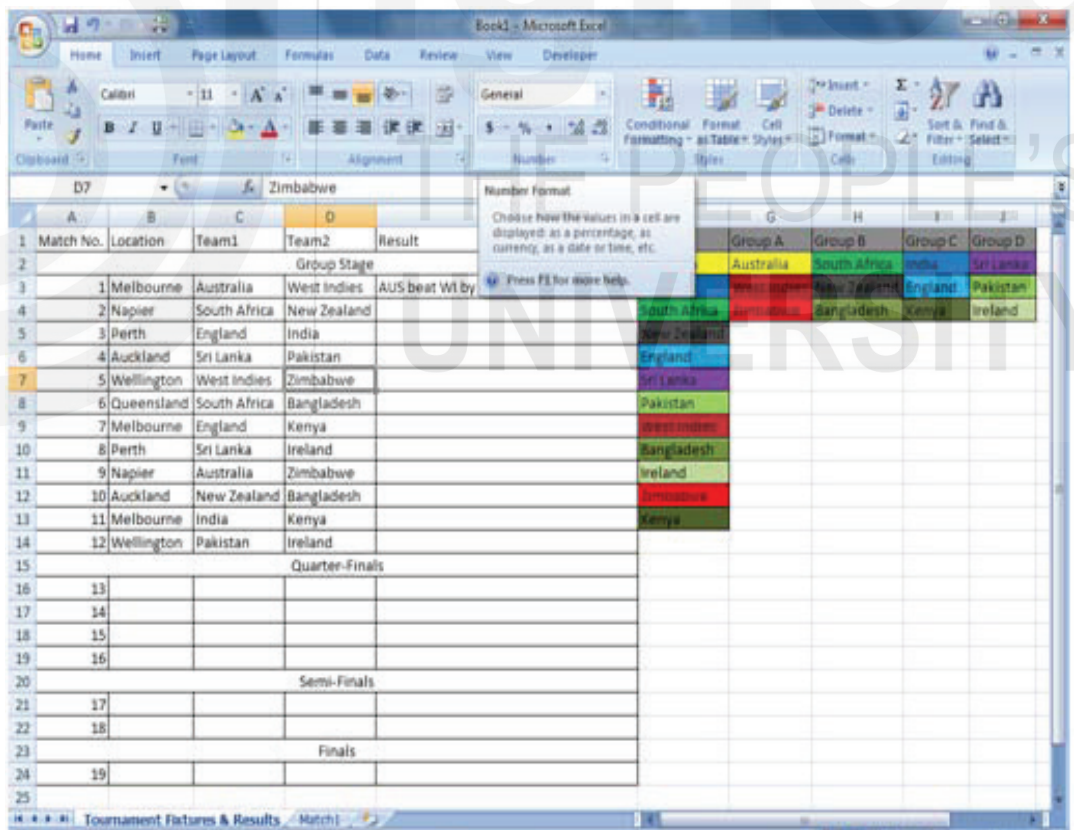


Fig. 16.27: Number

- **Number Format:** It is used to choose that how the values should be displayed in a cell. As a date, percentage, currency, etc.

- **Accounting Number Format:** It is used to choose the currency format or style of your number. For example \$45,000.
- **Percentage:** It is used to show the value of the number in percent format.
- **Comma style:** It is used to display the value of the cell with a thousand separators. This will change the format of the cell to Accounting without a currency symbol.
- **Increasing decimal & decreasing decimal:** It is used to increase or decrease the decimal place of the number.

5) **Styles:** There are options available like Conditional Formatting, Formatting table and Cell Styles.

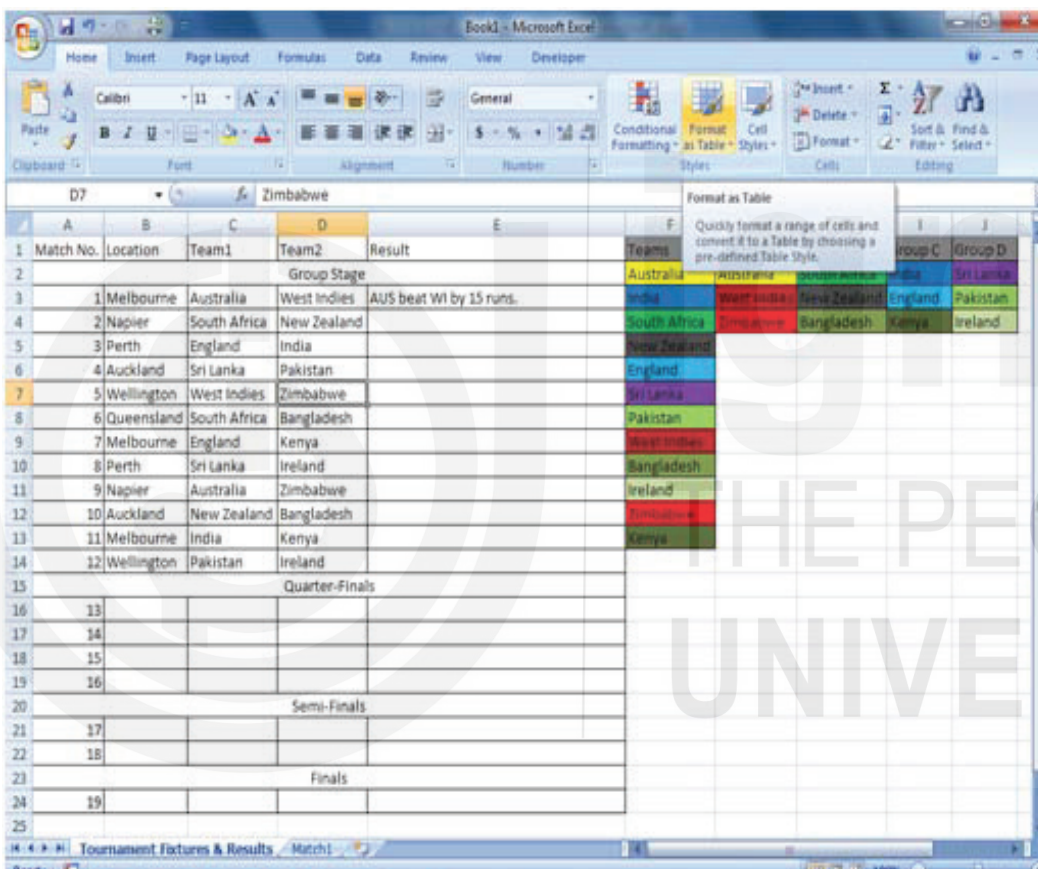


Fig.16.28: Styles

- **Conditional Formatting:** It is used to highlight interesting cells, visualize data bars, color scales and icon sets based on criteria. There are options available in it that are:
  - Highlight cell rules
  - Top/Bottom rules
  - Data Bar
  - Color Scales
  - Icon Sets

You also have three other options available for the rules that are:

- vi) New rule
- vii) Clear rule
- viii) Manage Rules

Conditional formatting is one of the many other features in Excel that help us to create professional and error-free documents. Let us learn more about it.

**Conditional Formatting** allows you to quickly see differences in numbers, patterns and trends at a glance. You can highlight interesting or unusual cell values using different conditional formatting rules. To apply conditional formatting:

- Select the cells you wish to format.
- Select the Home tab and locate the Styles group.
- Click the Conditional Formatting command. A menu will appear with your formatting options. You can choose from the predefined rules or create your own new rule.
- Select one of the options to apply it to the selected cells. When you choose a predefined rule, a cascading menu will appear. And an additional dialog box may appear, depending on the option you choose. Make the necessary choices, and click OK.

*To Remove Conditional Formatting Rules:*

- Click the Conditional Formatting command.
- Select Clear Rules. A cascading menu appears.
- Choose to clear rules from the entire worksheet or the selected cells.
- **Format as Table:** It is used to quickly format a range of cells and convert it to a table by using the pre-defined label style. It has many options of colors which are differentiated by the Light, Medium and Dark type of colors. You can also create new table and pivot table styles.
- **Cell Styles:** It is used to create many types of cell styles for the selected cell. You can format the cell by choosing from the pre-defined styles. There are many options available like Data and Model, titles and Headings, etc.
- **Cells:** There are options available like:

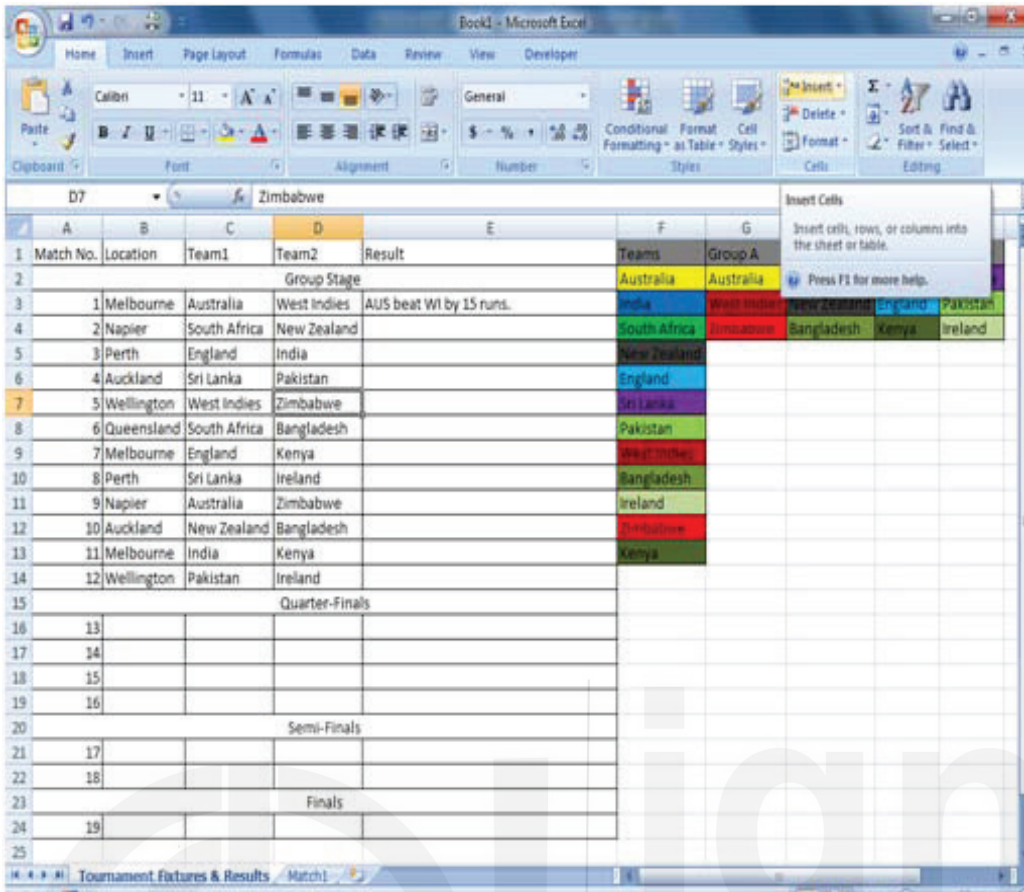


Fig. 16.29: Cells

- Insert → Cells, Rows, Columns, Sheets
- Delete → Cells, Rows, Columns, Sheets
- Format
  - i) Cell Size
    - 1) Row Height
    - 2) AutoFit Row Height
    - 3) Column Width
    - 4) AutoFit Column Width
    - 5) Default Width
  - ii) Visibility
    - 1) Hide and Unhide
      - a) Rows
      - b) Columns
      - c) Sheets
  - iii) Organizing Sheets
    - 1) Rename Sheet
    - 2) Move or Copy Sheet
    - 3) Tab Colors

iv) Protection

- 1) Protect Sheet
- 2) Lock Cell

6) **Editing:** There are options available:

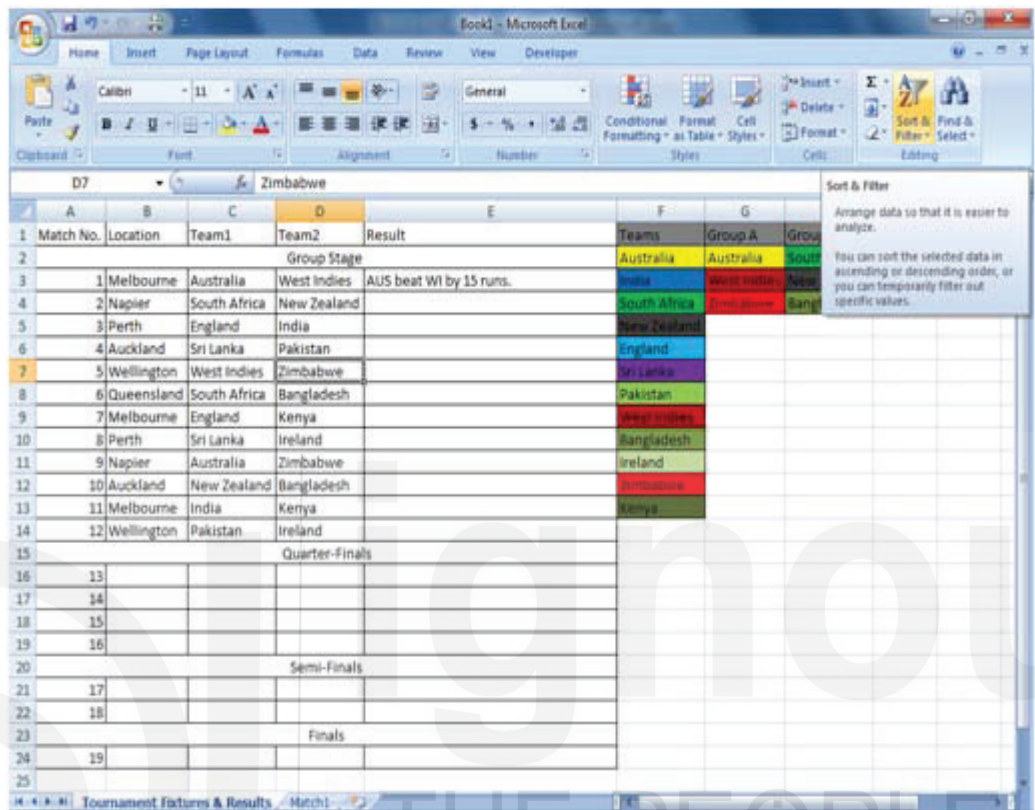


Fig. 16.30: Editing

- **Sort & Filter:** It is used to arrange the data so that it is easier to analyze. You can sort the selected in ascending or descending order or you can temporarily filter out specific values. It has options available that are:
  - i) Sort A to Z
  - ii) Sort Z to A
  - iii) Custom Sort
  - iv) Filter
- **Find & Select:** It is used to find and select specific data, formatting or type of information within the Workbook. You can also replace the information with new text or formatting. It has options available that are:
  - i) Find ...
  - ii) Replace...
  - iii) Go To
  - iv) Go To Special
  - v) Formulas

- vi) Comments
- vii) Conditional Formatting
- viii) Constants
- ix) Data Validation
- x) Select Objects
- xi) Selection Pane

### 16.5.3 Cell Comments

Comments are notes that can be inserted into any cell in Excel. Comments can be used to explain formulas, cells, and other data in the spreadsheet itself.

To add a comment in the Excel worksheet:

- Select the cell where you want to add the comment.
- Click on Review tab on the Ribbon.
- Select New Comment in the Comments group.

OR

- Right click the cell to which you want to add a comment.
- Select Insert Comment from the menu. The comment box appears near the selected cell, displaying the user name.
- Type your comments in the box.
- When finished, click any other cell.

A red triangle appears on the upper right corner of the cell, indicating a comment has been attached. When you place your mouse over the cell, the comment appears.

	A	B	C	D	E	F	G
1	Student Marks						
2							
3	Name	Subject1	Subject2	Subject3	Total		
4	Student1	80	89	88	257		
5	Student2	50	67	69	186		
6	Student3	59	80	75	214		
7							

A comment box is displayed over the 'Total' column (E5), containing the text: "rg: This Total needs to be used to calculate the percentage marks and grade in the final result." A red triangle is visible on the top-right corner of the cell E5.

Fig. 16.31: Comment on the Total Column in Student Marks Worksheet

In our example of Students Marks in Figure 16.31, notice a small triangle on top right corner of Total column indicating there is a comment associated with it.

### 16.5.4 Naming Cells and Ranges

Assign a descriptive name to a cell or range in Excel to help make formulas in your worksheets much easier to understand and maintain. Range names

make it easier for you to remember the purpose of a formula, rather than using obscure cell references.

For example, the formula `=SUM(Qtr2Sales)` is much more intuitive than `=SUM(C5:C12)`. In this example, you would assign the name `Qtr2Sales` to the range `C5:C12` in the worksheet.

## NAMING CELLS

To name a cell or range, follow these steps:

- 1) Select the cell or cell range that you want to name.

You also can select noncontiguous cells (press `Ctrl` as you select each cell or range).

- 2) On the **Formulas** tab, click **Define Name** in the **Defined Names** group.

The **New Name** dialog box appears.

Use the **New Name** dialog box to assign a name to the selected range.

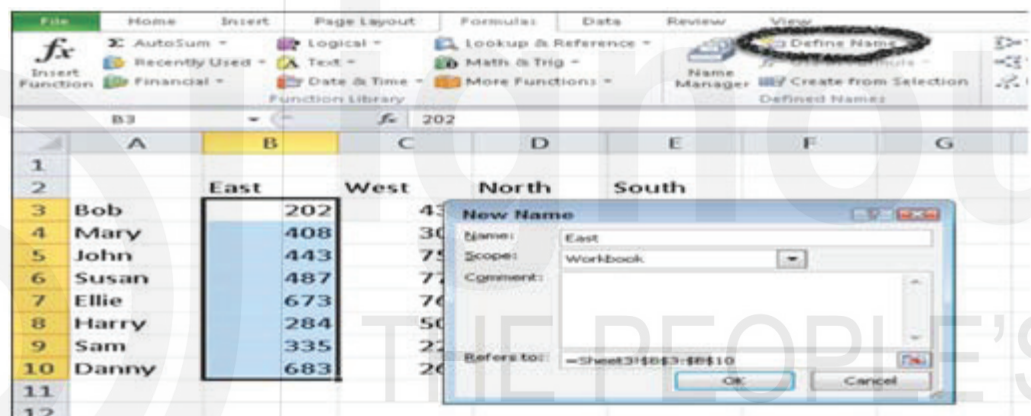


Fig. 16.32: Naming Cells

- 3) In the **Name** text box, type up to a 255-character name for the range.

Range names are not case-sensitive; however, range names must follow these conventions:

- The first character must be a letter, an underscore, or a backslash.
- No spaces are allowed in a range name.
- The range name should not be the same as a cell address. For example, you can't name a range `U2` or `UB40`, but `BLINK182` and `ABBA` are just fine.

- 4) Click **OK**.

## Using a Named Range

To use a named cell or range, click the down arrow in the **Name** box at the left end of the **Formula** bar. Select the range name you want to access, and Excel highlights the named cells.

You can select a range name in the Name box to quickly locate an area of a worksheet.

		West	North	South
3	Bob	202	431	492
4	Mary	408	300	728
5	John	443	756	625
6	Susan	487	771	577
7	Ellie	673	760	689
8	Harry	284	507	341
9	Sam	335	224	241
10	Danny	683	264	661

Fig. 16.33: Range name

You can insert range names into formulas just like they were normal cell references. Be careful while using named multi-cell ranges, though. Remember to use functions that require a range instead of a single cell reference such as MAX, SUM, or AVERAGE or else you will get an error message.

### 16.5.5 Addressing and Its Types

There are 16384 rows and 256 columns in one worksheet. The first cell is labeled as A1 (column as A and row number as 1) or R1C1. When a cell address is used as part of a formula, it is called a cell reference/address because instead of entering specific numbers into a formula, the cell address referring to a specific cell is being used, for example, if you have the formula =A1+B1 in cell C1, and you can use the fill handle to fill the formula into cell C3. Note that the formula won't appear the same in C3 as it does in C1. Instead of =A1+B1, you will see =A3+B3 in cell C3. This is called Relative Reference where cell references in formulas have changed cell addresses relative to the row and column they are moved to. In relative reference, formulas automatically adjust to new locations when they are pasted into different cells. Sometimes, our requirement is such that we don't want this change of cell address on pasting. To achieve this, cells must be addressed by Absolute Reference.

In Absolute cell references, a formula always refers to the same cell or cell range used in it. If a formula is copied to a different location, then the cell address remains the same. An absolute reference is designated in the formula by the addition of a dollar sign (\$). It can precede the column reference or the row reference, or both. Examples of absolute referencing are:

\$A1 – here, the column will not change when copied.

A\$1 – here, the row will not change when copied.

\$A\$1 – here, both row and column will not change when copied.

In the above example, if we have formula as  $=\$A\$1+\$B\$1$  in cell C1 and we copy this formula in cell C3, then you will still see  $=\$A\$1+\$B\$1$  in cell C3.

In short the Cell references/addresses are given in different ways:

a) **Relative:** This refers to the cell relative to the given position.

Example: Enter the following values:

In cell A3 enter the value 34

In cell A4 enter the value 23

In cell A5 enter the value 89

In cell A6 enter the formula  $= A3 + A4 + A5$

Copy this formula to the cell A7, and see the result.

Observe the formula entered in cell A7. It is  $A4 + A5 + A6$ . The formula entered in cell A6 means the sum of the values given in the three cells given above the current cell. Therefore when we move down, the relation specified in the formula was copied (i.e. the three values given above the current cell which is A7 now).

b) **Absolute:** This refers to the specific cell irrespective of the position of the formula. The '\$' sign is used to denote an absolute reference.

Example: In the cell B3 copy the formula  $\$A\$3 + \$A\$4 + \$A\$5$

Copy this formula to the cell B4.

We find that the result and the formula remain the same.

c) **Mixed:** It is a combination of both relative and mixed references. It has one absolute co-ordinate and one relative co-ordinate.  $\$D1$  and  $D\$1$  are both examples of mixed references.

### Linking Worksheets

Sometimes, you may want to use the value from a cell in another worksheet within the same Workbook in a formula. For example, the value of cell A1 in the current worksheet and cell A3 in the second worksheet can be added using the format "sheet name! cell address". The formula for this example would be  $=A1+Sheet3!A3$  where the value of cell A1 in the current worksheet is added to the value of cell A3 in the worksheet named "Sheet3".

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## 16.6 ORGANISING CHARTS AND GRAPHS

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By this option you can add various types of readymade charts and graphs. It will take the data that you have entered and it will add a datasheet and add a chart as well.

After clicking on the insert tab, these options will be available in the charts option. You can select the type of chart that you want. There are many types

of charts available like Column, Pie, Line, Bar, Area, Scatter and other charts are also available in the Other Charts option. The options are:

- 1) **Column:** These charts are used to compare values across categories.

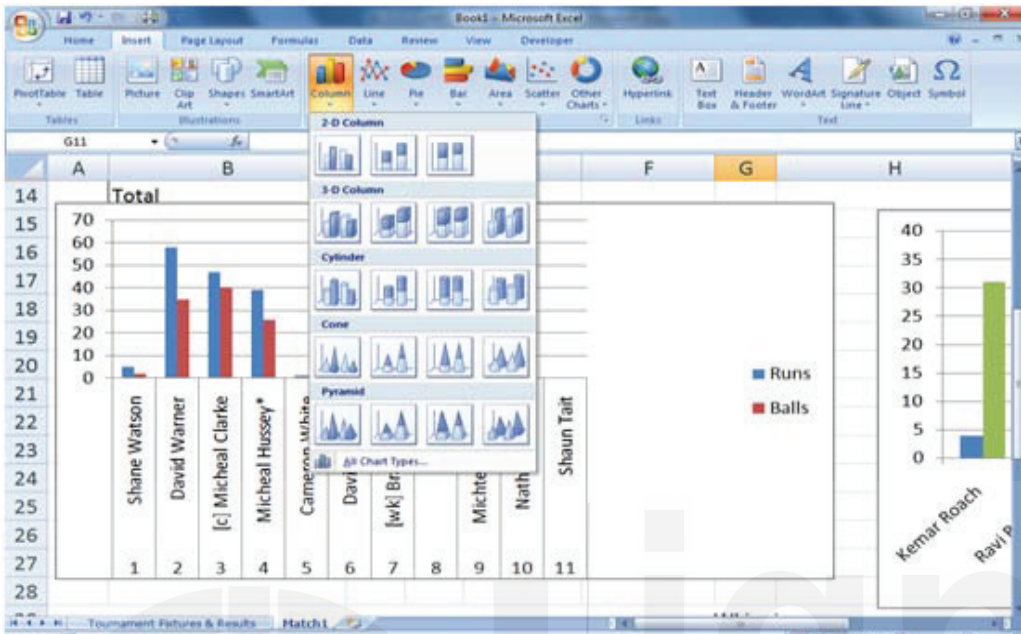


Fig. 16.34: Column charts

- 2) **Line:** These charts are used to display trends over the time.

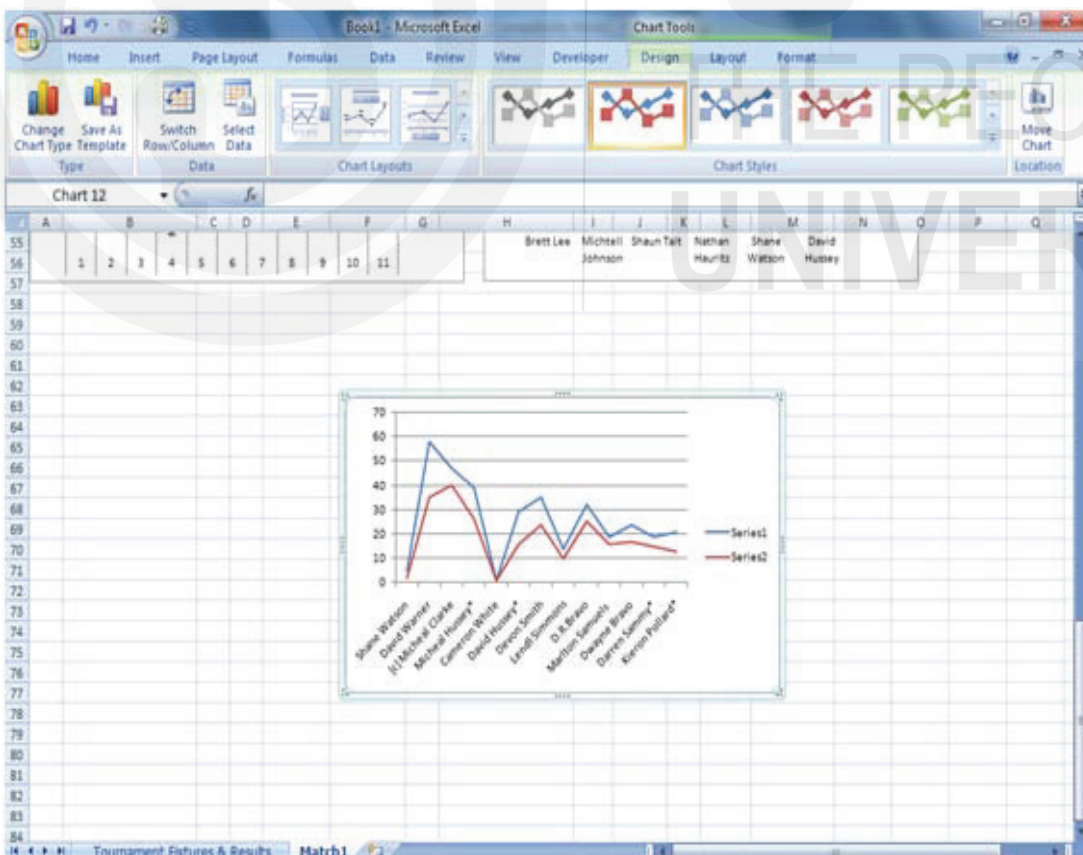


Fig. 16.35: Line charts

- 3) **Pie:** These charts are used to display the contribution of each value to the total.

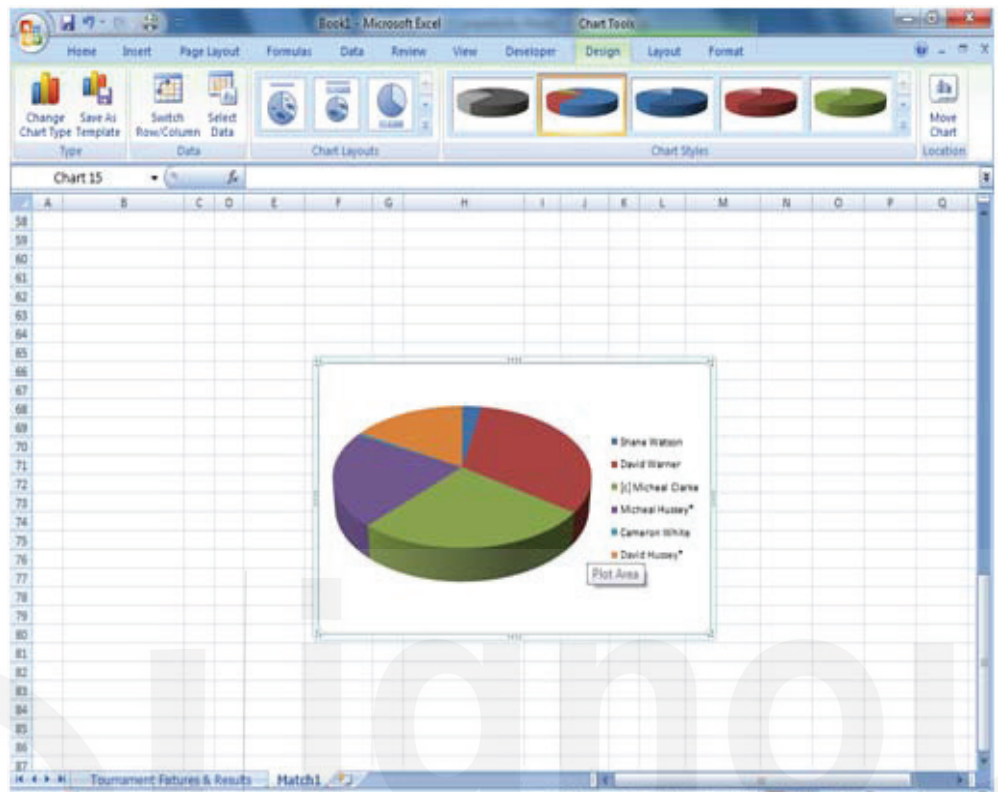


Fig. 16.36: Pie charts

- 4) **Bar:** These charts are used to compare multiple values.

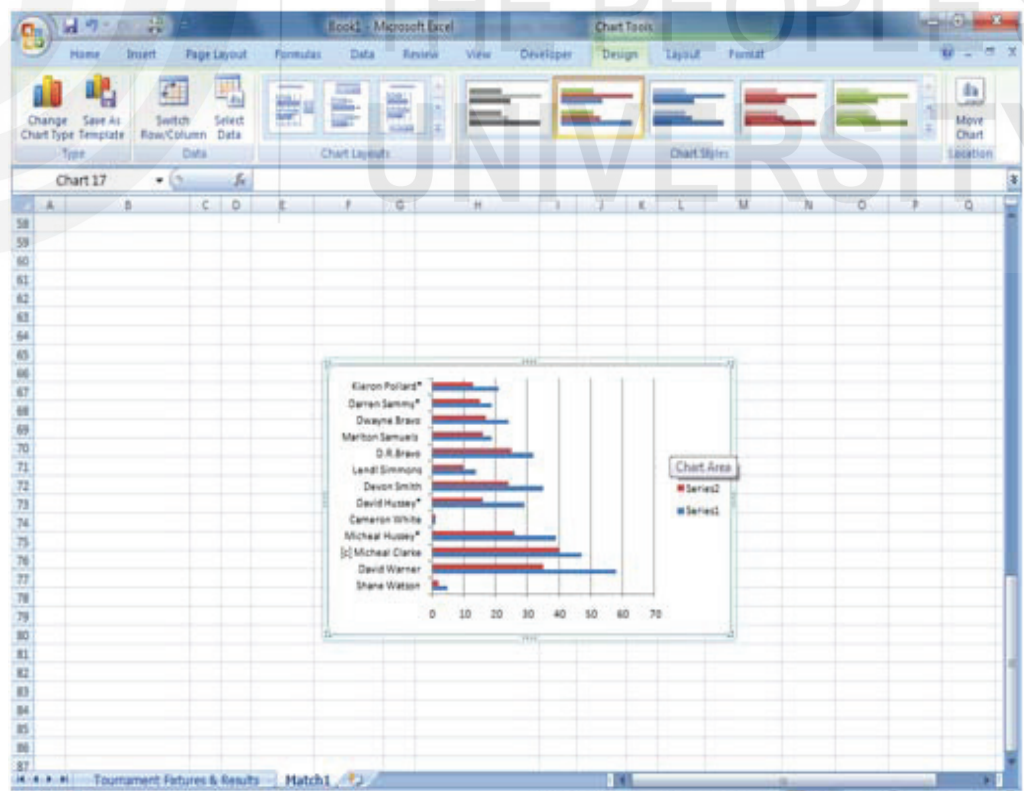


Fig. 16.37: Bar charts

- 5) **Area:** These charts are used to compare between several sets of data over a period of time.

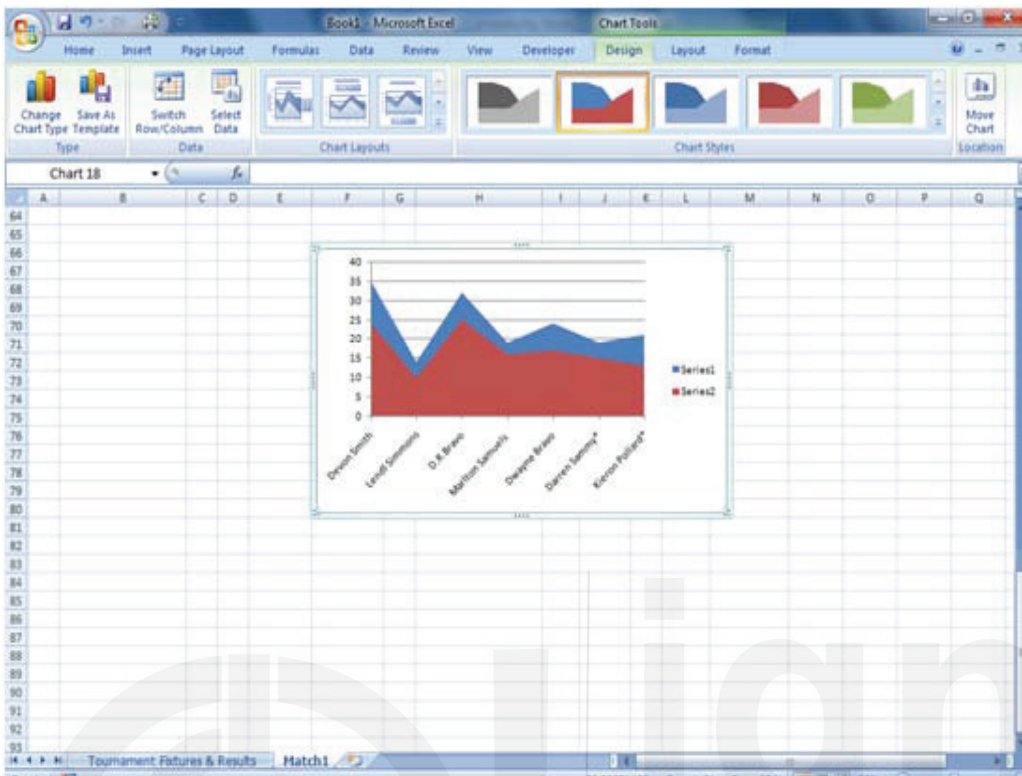


Fig. 16.38: Area charts

- 6) **Scatter:** These charts are used to compare pairs of values.

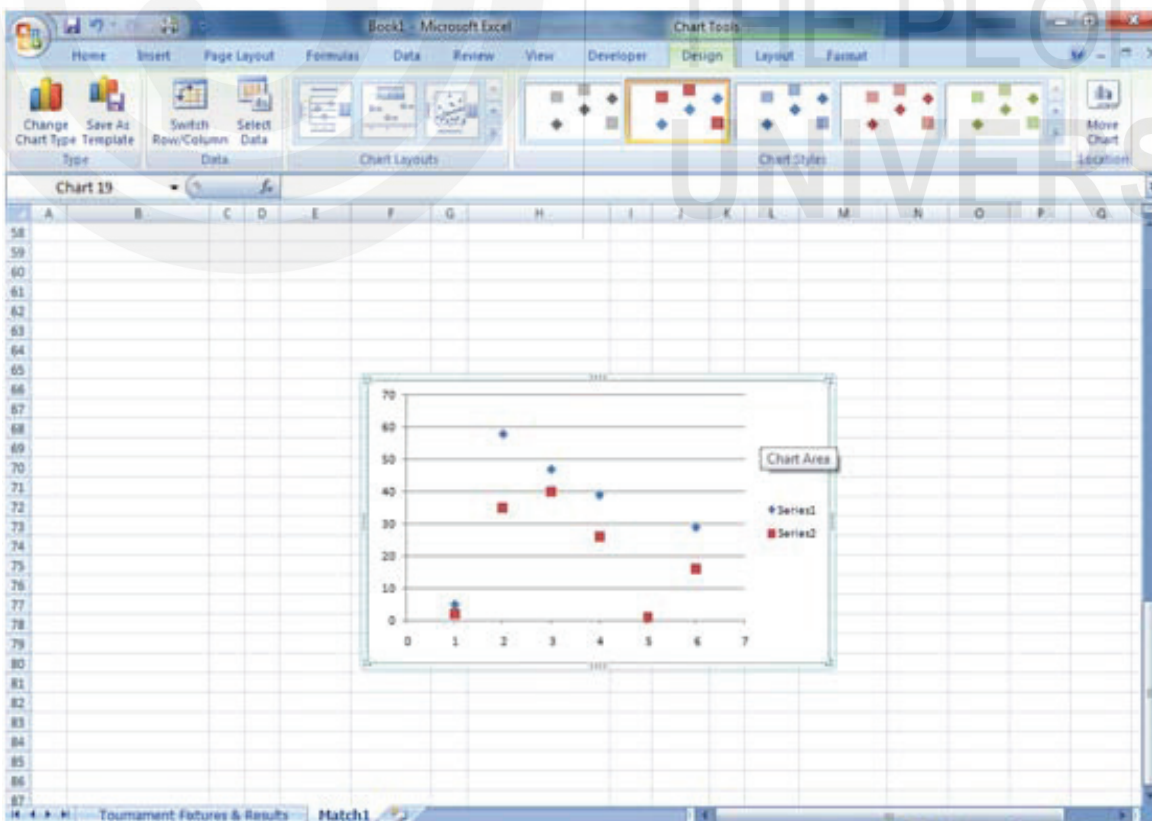


Fig. 16.39: Scatter charts

7) **Other:** In this option there are more different types of charts like:

- a. Stock
- b. Surface
- c. Doughnut
- d. Radar
- e. Bubble

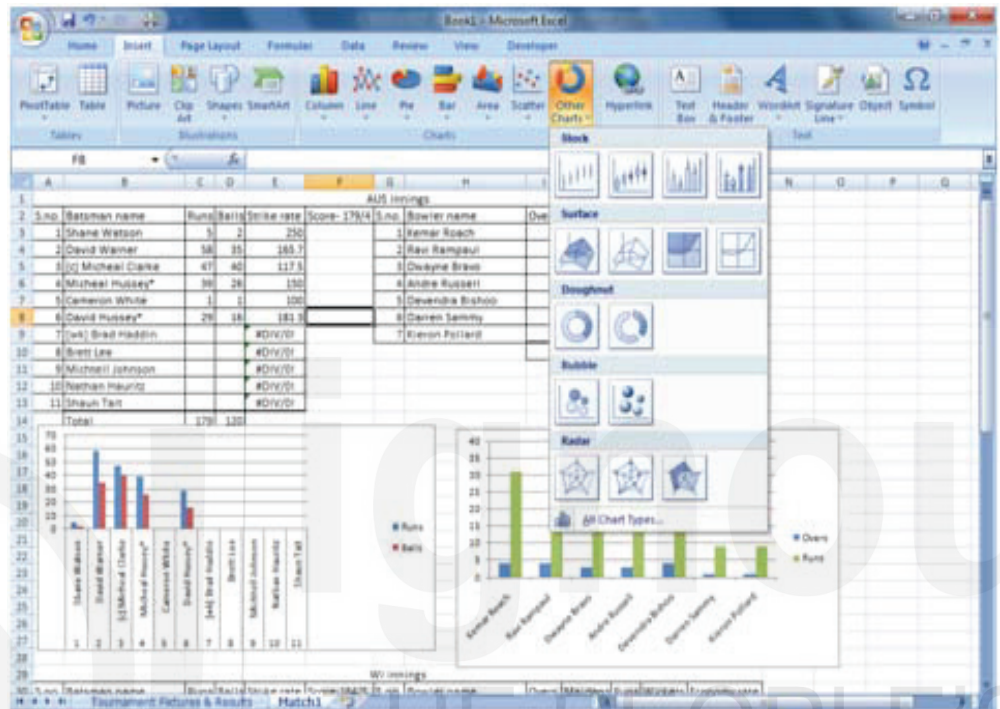


Fig. 16.40: Other charts

## 16.7 PROJECT INVOLVING MULTIPLE WORKSHEETS

In this section, we will learn to name, add, delete, group or ungroup worksheets. We will also learn to format a worksheet for printing.

### 16.7.1 Naming a Worksheet

The default names of Worksheets are Sheet1, Sheet3 and Sheet3. Since these names are not useful and descriptive, we will learn to rename the worksheet.

You can rename a worksheet using any of the following ways:

- Right mouse click on the Sheet1 tab. The menu appears as shown in figure 16.41(a).
- Select option Rename. The name Sheet1 is highlighted by a black box and becomes editable.
- Type the new name at the tab.
- Press Enter. The worksheet is renamed.

OR

- Click the Format command of the Cells group in Home Tab. A menu appears as shown in Figure 16.41(b).
- Select option Rename Sheet under Organize Sheet. The sheet name is highlighted by a black box and becomes editable.
- Type the new name at the tab.
- Press Enter. The worksheet is renamed.

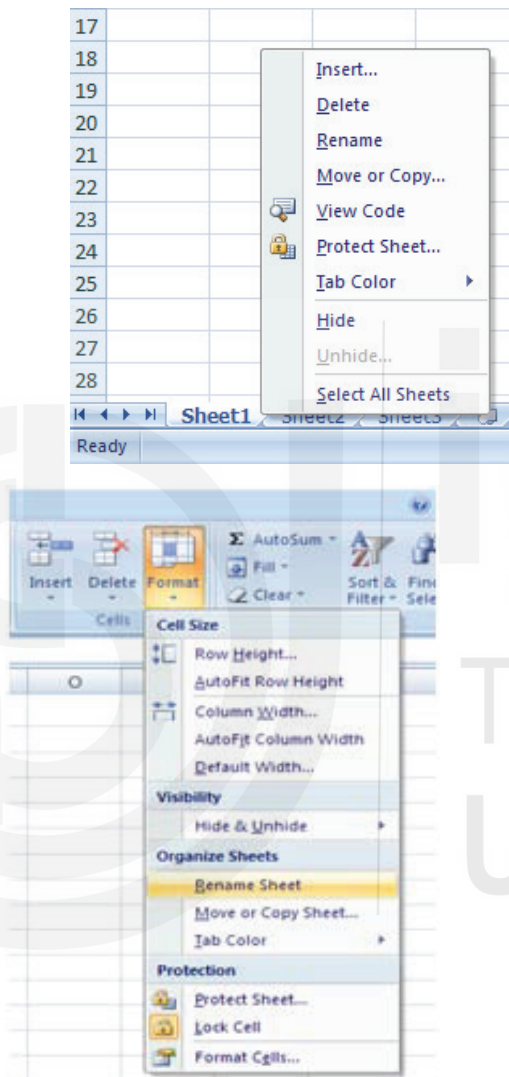


Fig. 16.41: Renaming a Worksheet

### 16.7.2 Inserting a New Worksheet

You can add worksheets to the Workbook anytime you want. The new sheets added will be named as Sheet4 and so on. There are many ways that you can add a new worksheet:

- Click on the Insert Worksheet icon near the worksheet tabs OR press Shift+F11.
- A new worksheet after the last tab will be added.

OR

- Right mouse click on the worksheet tab.
- Choose Insert... from the menu (shown in Figure 16.41(a)). Insert dialog box opens.
- Select Worksheet. Click Ok
- A new worksheet before the selected tab will be added.

OR

- Click the down arrow of Insert command in the Cells group of Home Tab. A menu appears.
- Choose Insert Sheet from the menu.
- A new worksheet before the selected worksheet will be added.

### 16.7.3 Deleting a Worksheet

Any number of worksheets can be deleted irrespective of the fact that they contain any data or not. But, there should be at least one worksheet in the Workbook. To delete a worksheet:

- Right mouse click on the worksheet tab.
- Choose Delete from the menu (shown in Figure 16.41(a)).
- The selected worksheet is deleted.

OR

- Click the down arrow of Delete command in the Cells group of Home Tab. A menu appears.
- Choose Delete Sheet from the menu.
- The selected worksheet is deleted.

### 16.7.4 Grouping Worksheets

If the multiple worksheets of a Workbook contain identical formula and formatting, then you can group them together. When the worksheets are grouped together, then any change made to one worksheet will be applied to all other worksheets in the group. You can group both contiguous and noncontiguous worksheets. To group contiguous worksheets:

- Click on the first worksheet tab.
- Press the Shift key.
- While holding the Shift key, click the last worksheet tab you want in the group.
- Release the Shift key.
- All the sheets from the first sheet to the last sheet are now grouped. The tab color will now change to white indicating that they are grouped together.

To group noncontiguous worksheets:

- Click on the first worksheet tab.
- Press the Ctrl key.
- While holding the Ctrl key, select all the other worksheets you want in the group.
- Release the Ctrl key.
- All the sheets that you selected while keeping the Ctrl key pressed would be grouped together and sheet tabs will appear white.

### 16.7.5 Ungrouping Worksheets

To ungroup worksheets:

- Right mouse click one of the worksheets in the group.
- Select Ungroup Sheets from the menu.

### 16.7.6 Repositioning Worksheets in a Workbook

To change the position of worksheets in a Workbook:

- Click and hold the worksheet tab that is to be moved until an arrow appears on the left corner of the sheet.
- Drag the worksheet to the desired location

### 16.7.7 Hiding Worksheets

To hide a worksheet:

- Right-click on the tab of the sheet you wish to hide.
- Select Hide

OR

- Click the Format button.
- Select Hide & Unhide under Visibility on the menu.
- Choose Hide Sheet option.

To unhide a worksheet:

- Right-click on tab of any sheet.
- Select Unhide.... A dialog box with the list of hidden worksheets is displayed.
- Choose the sheet to unhide.

OR

- Click Format button.

- Select Hide & Unhide under Visibility on the menu.
- Choose Unhide Sheet... option. A dialog box with the list of hidden worksheets is displayed.
- Choose the sheet to unhide.

### 16.7.8 Linking Worksheets

Sometimes, you may want to use the value from a cell in another worksheet within the same Workbook in a formula. For example, the value of cell A1 in the current worksheet and cell A3 in the second worksheet can be added using the format "sheet name! cell address". The formula for this example would be "=A1+Sheet3!A3" where the value of cell A1 in the current worksheet is added to the value of cell A3 in the worksheet named "Sheet3".

For with protecting your to you Workbook you need access to the credentials via Information Rights Management, which assigns a valid code for identification.

### 16.7.9 Protecting the WorkBook

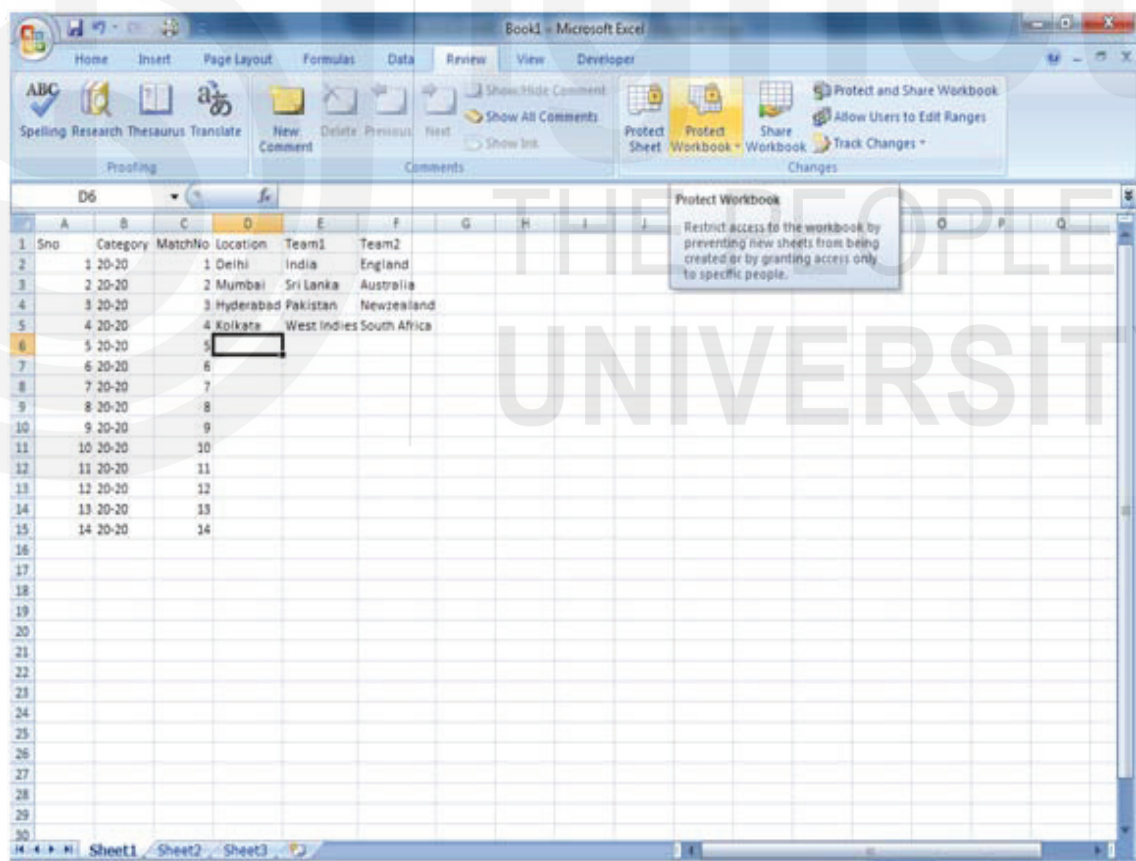


Fig. 16.42: Protect Workbook

It provides you worthy credentials after a service signup. IRM uses a server to authenticate the credentials of people who create or receive documents or e-mail with restricted permission.

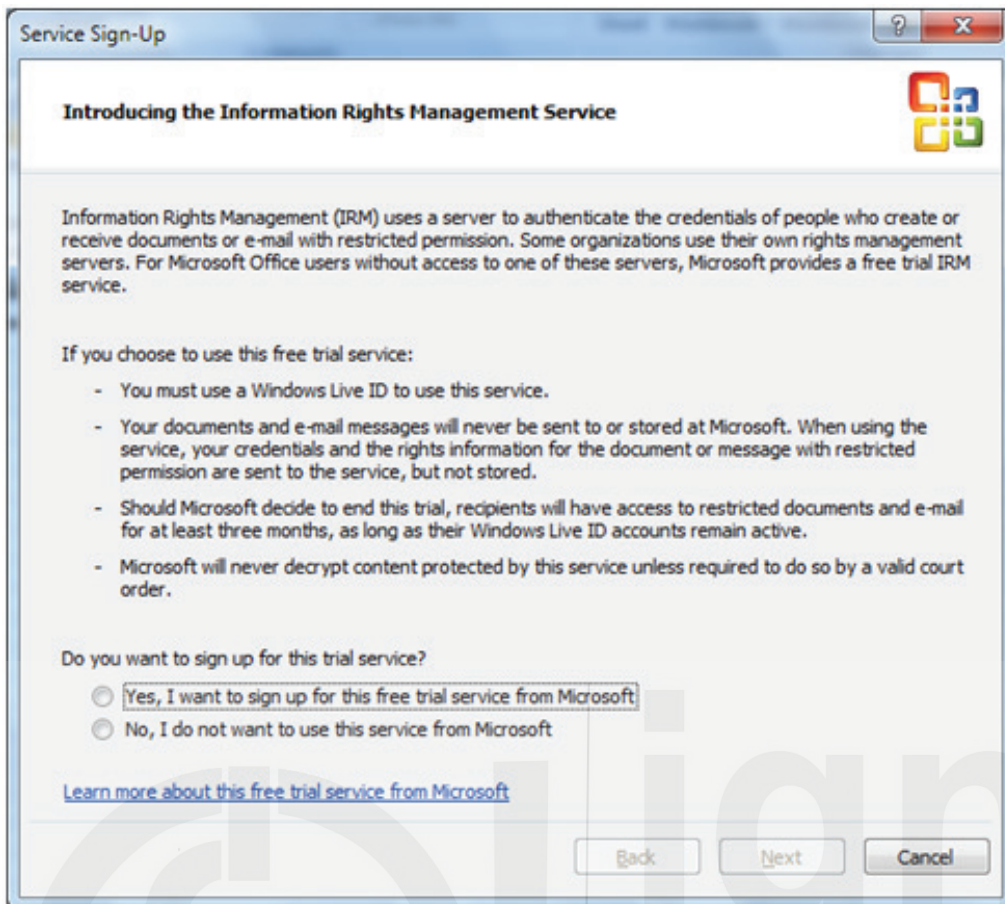


Fig. 16.43: Service Sign-up

You can protect your worksheet using following options available in excel.

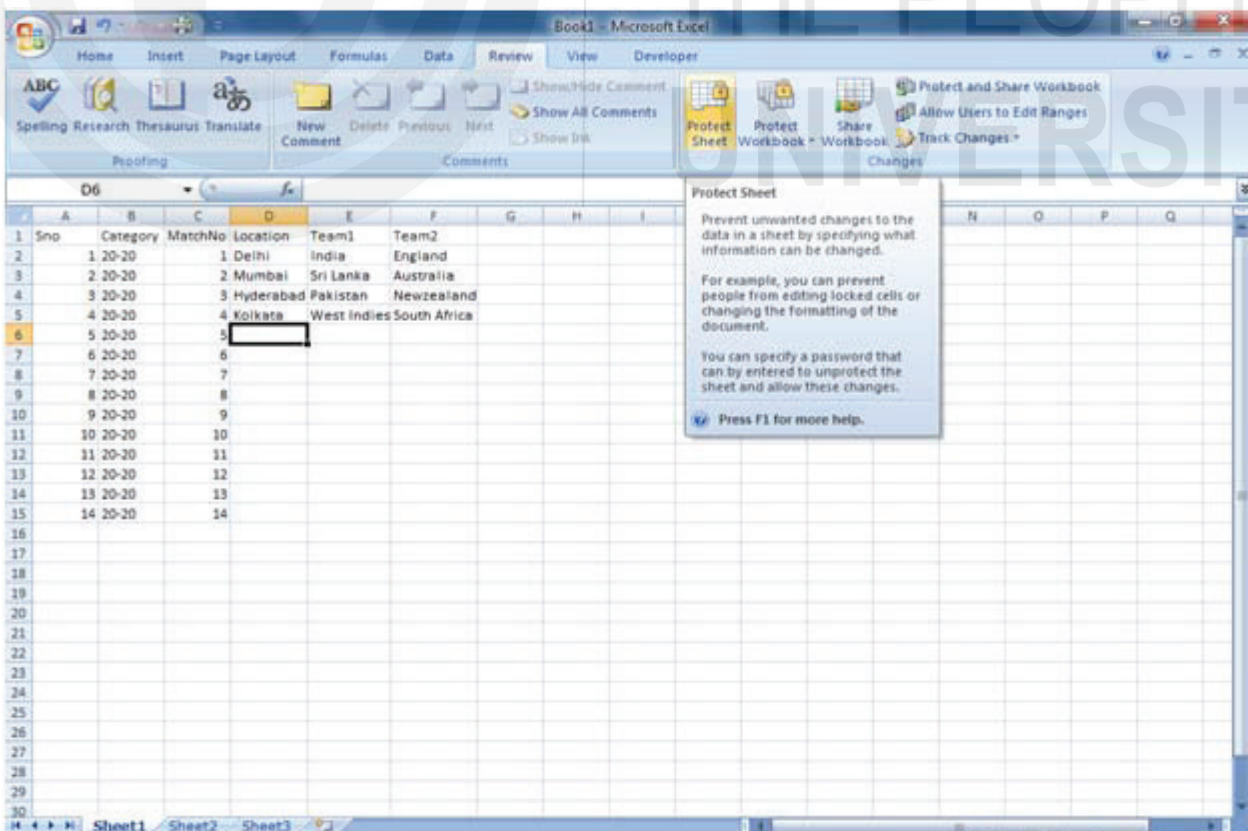


Fig. 16.44: Protect Sheet

You can protect various components of the worksheet individually:

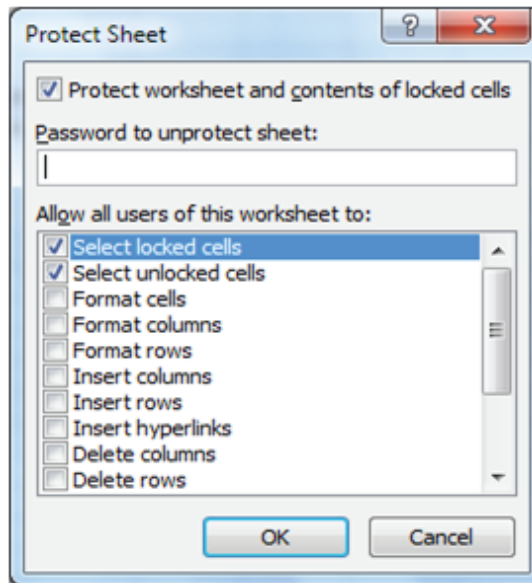


Fig. 16.45: Protect Sheet dialog box

For the protection purpose you need to mention a password, which will be required if you would like to unprotect or unlock the worksheet.

### 16.7.10 Saving a Worksheet

You can also save the worksheet for various purposes like:

- 1) Open a Workbook
- 2) Editing a Workbook

It could be done at the time of saving the Workbook. You can opt for “General options” through the Tools button available near Save Button.

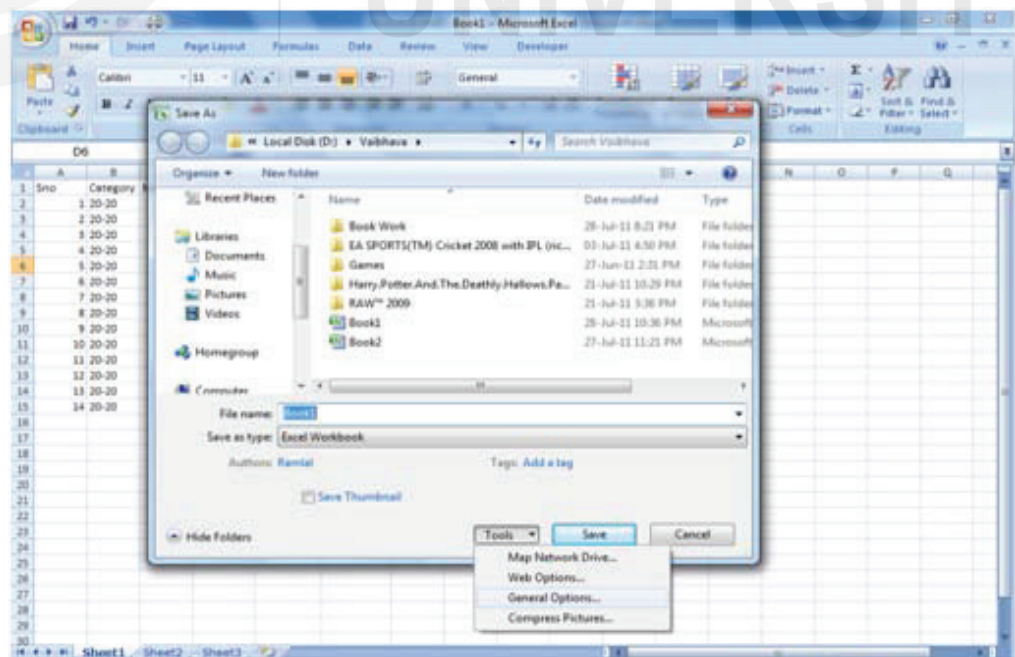


Fig. 16.46: Tools option in Save As

You can provide password to open or a password to modify. The point to remember is you have to click the Read-only recommended.

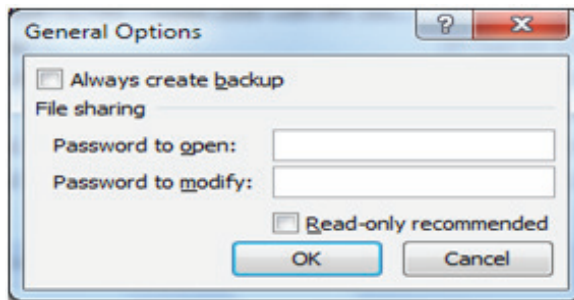


Fig. 16.47: Creating password

## 16.8 PRINTING A WORKSHEET

Once you are finished with your work in a Workbook, you would like to have some prints of your worksheet, for which you have to follow the given instructions:

- Click Office button
- Select Print option
- Choose the option out of given list
  - Print
  - Quick Print
  - Print Preview

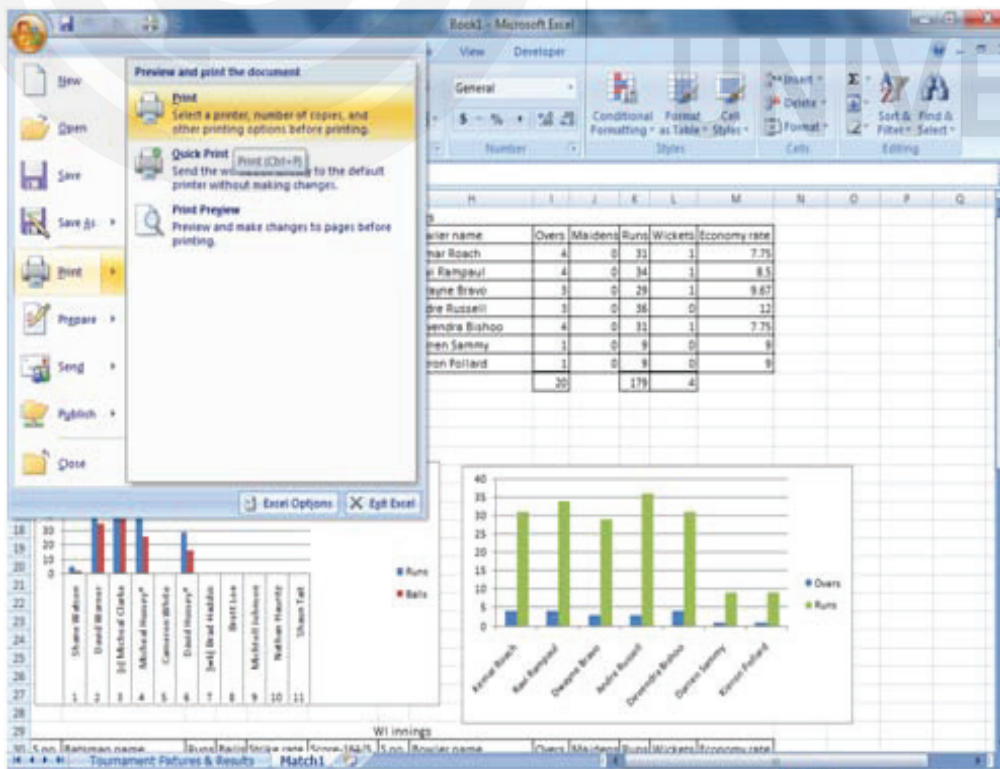


Fig. 16.48: Print Menu

- 1) **Print:** This option will open a dialog box through which you can customize your printout.

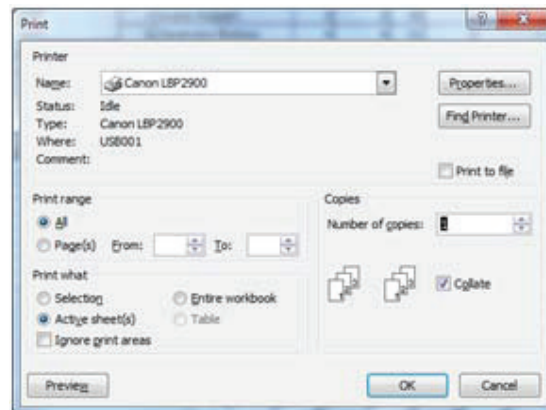


Fig. 16.49: Print Option

- 2) **Quick Print:** This option follows the default setting for your printer and directly forwards the worksheet for printing purpose.
- 3) **Print Preview:** This option shows a print preview screen as shown in figure below which provides various options through which you can customize your print without wasting printouts (hard copies) of the actual document/ worksheet.

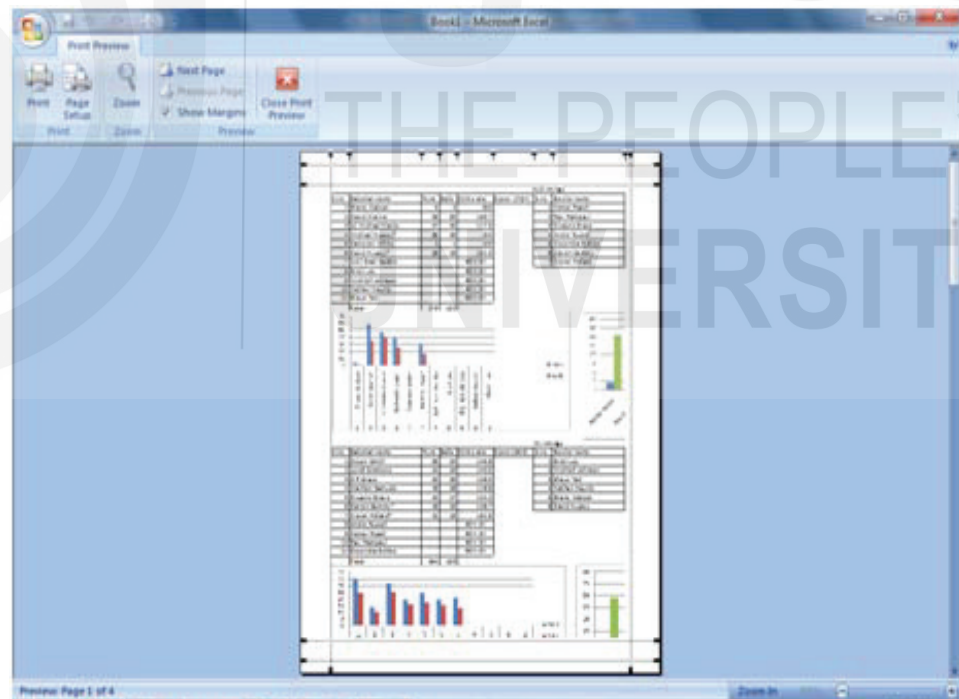


Fig. 16.50: Print Preview

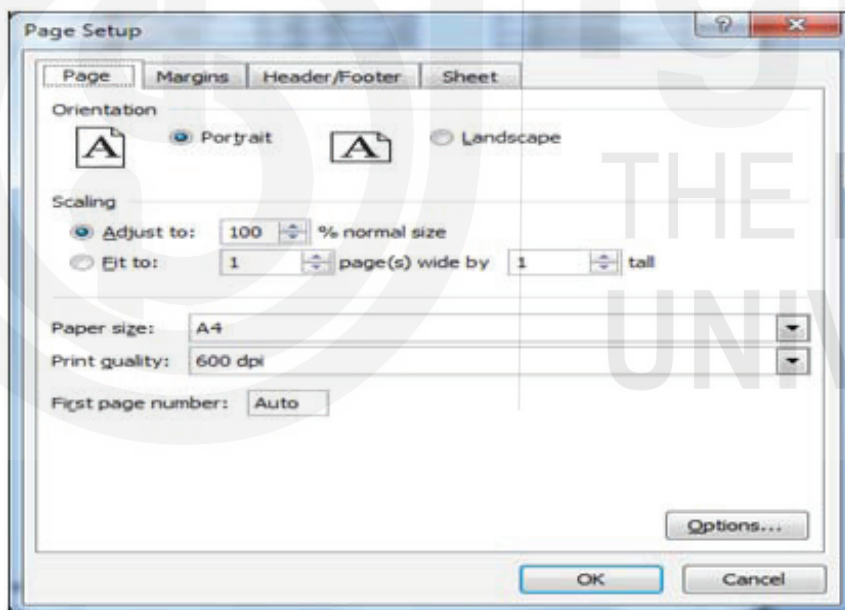
After having a print preview of the worksheet we can look forward to page setup before taking the printout. It gives further options for setting following dimensions of a printout:

- Page
- Margins

- Header/ Footer
- Sheet

Now, the Page option has got sub-options for page setup:

- 1) Page Orientation
  - a) Portrait [e.g. 8.5” x 11” for letter]
  - b) Landscape [e.g. 11” x 8.5” for letter]
- 2) Scaling
  - a) Adjust: You can adjust [Enlarge/ Reduce] the content size from 100% scale.
  - b) Fit to: You can choose that how many pages are needed to occupy the content of your worksheet.
- 3) **Paper Size:** You can choose the paper size from the drop-down list.
- 4) **Print Quality:** You can choose the print quality
  - a) Standard
  - b) Text/ Line
  - c) Web quality



**Fig. 16.51: Page Setup**

Next option is assigned by the next tab – Margins. It offers various options to set for the margin purpose.

- 1) Top / Bottom: By default [0.75]
- 2) Left / Right: By default [0.7]
- 3) Header / Footer: By default [0.3]

You can also center your printout by either / both [Horizontally/ Vertically].

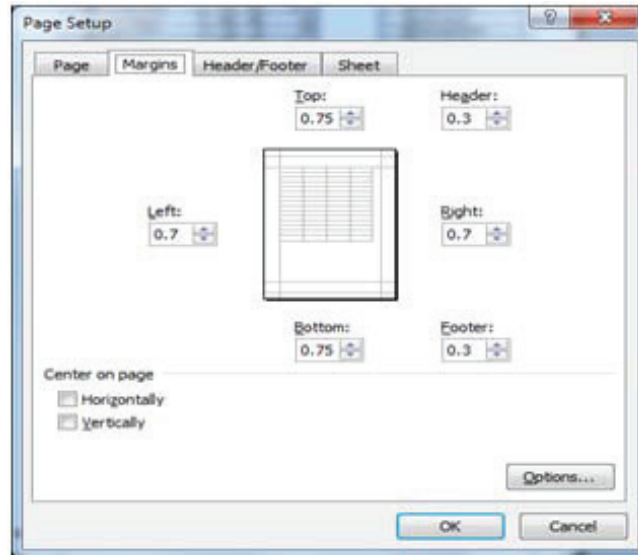


Fig. 16.52: Page Setup - Margins

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## 16.9 HOW TO USE EXCEL HELP

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How to Get Help in Excel

- 1) Click the Excel Help button or press F1. ...

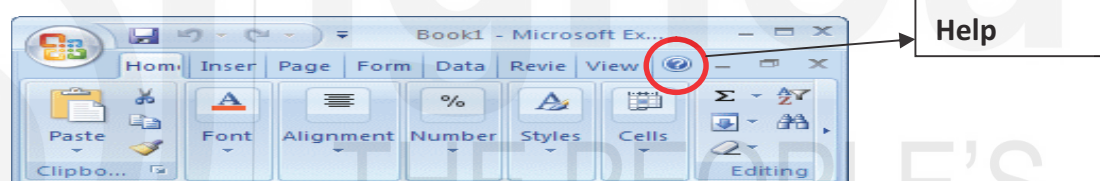


Fig. 16.53: Using Excel Help

- 2) Click the Help links until you find the topic you want. ...
- 3) Click the Show Table of Contents button. ...
- 4) Type keywords in the Search box and click the Search button. ...
- 5) Right-click the Windows taskbar and select Show Windows Side by Side.

The Help button (circle with a question mark inside) is located above and to the right of the Ribbon

Once selected a new Excel Help window appears

- Help Categories :
  - Select any Topic under Browse Excel Help to find more helpful Subtopics
- Help Search
  - Click inside the textbox, type a topic, and click Search
- You can also navigate and find other helpful options (like Home and Print) on the toolbar located near the top of the Help window

- Click on the button shaped like a closed book to view the Table of Contents

A large number of help documents are located on your computer. However, greater detail and more topics are available if the computer is connected to the internet.

**Check Your Progress B**

- 1) What is a cell address?

.....  
 .....  
 .....  
 .....  
 .....

- 2) What are cell comments?

.....  
 .....  
 .....  
 .....  
 .....

- 3) Name the cell referencing in which both row and column will not change when copied.

.....  
 .....  
 .....  
 .....  
 .....

- 4) Which charts are used to display the contribution of each value to the total?

.....  
 .....  
 .....  
 .....  
 .....

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**16.10 LET US SUM UP**

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Spreadsheets are brilliantly conceived ways to organize data by grouping it into rows and columns, they are used to organize, analyze and manipulate all type of data but it provides enhanced functionalities for numerical data.

Microsoft Excel comes bundled in Microsoft Office which is an office automation tool. It is one of the powerful spreadsheet tools, which is used by different people in their day-to-day jobs.

Excel screen layout is the screen that appears when we open the Microsoft Excel. It has different components such as the ribbon, the quick access toolbar, the title bar. And each component has its own significance. For instance the quick access toolbar provides you access to the commands you frequently use or the title bar displays the title of the Workbook on which you are currently working.

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## 16.11 KEY WORDS

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**The Title Bar:** It displays the title of the Workbook on which you are currently working. By default, the first new Workbook is named as Book1.

**The Menu Bar:** The menu Bar is the panel at the top portion of the document, right below the Title Bar. To begin with, it has the following seven tabs such as Home, Insert, Page Layout, Data, etc.

**The Worksheet Area:** The worksheet area displays all the cells. It is in the cells that you enter, format or edit your data.

**The Status Bar:** The Status bar appears at the very bottom of the Excel window and provides such information as the sum, average, minimum, and maximum value of selected numbers.

**Cell address:** It is a combination of Column Letter(s) and row number that intersect at that cell position. For example, if the cell address is A3, it means it is at the intersection of column A and row 3.

**Conditional Formatting:** It is used to highlight interesting cells, visualize data bars, colour scales and icon sets based on criteria. There are various options available in it that such as Highlight cell rules, Top/Bottom rules, Data Bar, Colour Scales, etc. It helps us to create professional and error-free documents.

**Cell Comments:** Comments are notes that can be inserted into any cell in Excel. They are used to explain formulas, cells, and other data in the spreadsheet itself.

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## 16.12 TERMINAL QUESTIONS

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- 1) Explain the various components of excel screen.
- 2) Explain the different tabs available on Menu Bar.
- 3) What are the three sections of the Formula Bar?
- 4) What are the different types of data that cells can hold?

- 5) What are the various options available in the Home tab?
- 6) What is Conditional Formatting?
- 7) What do you mean by Cell referencing?
- 8) Explain the three types of cell referencing with examples.
- 9) What is the difference between Print and Print Preview?

**Note:** These questions are helpful to understand this unit. Do efforts for writing the answer of these questions but do not send your answer to university. It is only for yours practice.



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## UNIT 17 FORMULAS AND FUNCTIONS

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### Structure

- 17.0 Objectives
- 17.1 Introduction
- 17.2 Formulas
  - 17.2.1 Constructing Formulas
  - 17.2.2 Array Formulas
- 17.3 Functions
  - 17.3.1 Inserting Functions
  - 17.3.2 Built-in Functions
- 17.4 Mathematical Functions
- 17.5 Statistical Functions
- 17.6 Financial Functions
- 17.7 Logical Functions
- 17.8 Text and Formatting Functions
- 17.9 Date and Time Functions
- 17.10 Let Us Sum Up
- 17.11 Key Words
- 17.12 Answers to Check Your Progress
- 17.13 Terminal Questions

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### 17.0 OBJECTIVES

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After completing this unit, you should be able to:

- understand the basic features of Excel such as the creation of worksheets and computation of data;
- understand the basic formulas available in MS Excel;
- understand how to construct and insert formulas; and
- learn about various kinds of Functions available in MS Excel, and their uses.

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### 17.1 INTRODUCTION

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At home, we keep a track our own budgets and investments, and at office, we have numerous tasks to perform, which may be related to accounting, analytics, sales or budgeting. Businesses also need graphs and charts for data analysis and projections. Further, Mathematics and Engineering students have to deal with large numbers, formulas and calculations, in which

Spreadsheets are one of the best software to use. Moreover, almost all of us face-off with tables and datasets day-to-day for which, there are many software packages available to assist us in all the above stated functions. Electronic spreadsheets are most common tools to handle such requirement. Spreadsheets are integrated with ways to organize data by grouping it into rows and columns; they are used to organize, analyze and manipulate all type of data and provide enhanced functionalities for numerical datasets. There are quite a few electronic spreadsheet programs available like Microsoft Excel, Open Office Calc or Google spreadsheets. We will consider MS Excel for our study. It comes bundled in Microsoft Office, which is an office automation tool. Microsoft Excel is one of the highly regarded spreadsheet software, which is used by people in their daily routine jobs. In this unit we will discuss the basic functionalities of Microsoft Excel, used to store, maintain, manage, manipulate and organize our data.

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## 17.2 FORMULAS

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Microsoft Excel consists of many powerful formulas and functions, which can be used for various problems, whether it is financial, logical, statistical or mathematical. A Formula, in MS Excel, is an expression, which consists of values, operators and conditions, applied over a cell or a range of cells.

### 17.2.1 Constructing Formulas

To insert/construct a formula in MS Excel, follow the following steps:

- 1) Select a cell with your cursor.
- 2) Type in the “=” sign. Every formula in MS Excel starts with the “=” sign.
- 3) For Example, let us start with a simple formula of addition.
- 4) After the “=” sign, select the cells to be added or type in their cell reference, like B2, C3, etc.
- 5) The screen will reflect like the following figure:

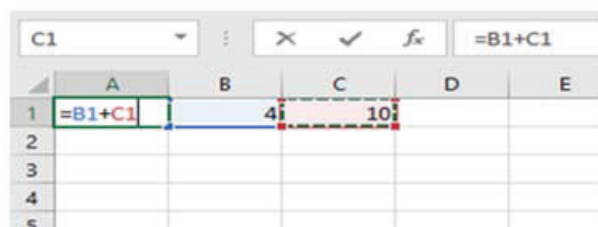


Fig. 17.1: Constructing Formula

- 6) The result of the formula is shown as follows:

	A	B	C	D	E
1	14	4	10		
2					
3					
4					
5					

Fig. 17.2: Result

## 17.2.2 Array Formulas

An array is a combination of either a row of values, column of values or both the row and column of values. An array formula can perform multiple no. of calculations on one or more cells of an array. It can give both single and multiple cell results. Array formulas are also known as CSE (Control + Shift + Enter) Formula.

To insert an array formula, follow the following steps:-

- 1) Let us take an example of a computer shop buying certain products. We have created a following table for the same:-

	A	B	C	D
1	Product	Quantity	Price	Amount
2	Laptop	8	35000	
3	Desktop	5	30000	
4	Smart Phones	10	25000	
5	Ear Phones	20	600	
6	Head Phones	10	1000	
7	Covers & Cases	20	300	
8	Chargers & Data Cables	20	200	

Fig. 17.3: Array Formula Example

- 2) Insert array formula, it is required to select the entire cell range on which the multiple cell array formula has to be applied.
- 3) Then, enter the formula as shown in the below figure:-

	A	B	C	D	E
1	Product	Quantity	Price	Amount	
2	Laptop	8	35000	280000	
3	Desktop	5	30000	150000	
4	Smart Phones	10	25000	250000	
5	Ear Phones	20	600	12000	
6	Head Phones	10	1000	10000	
7	Covers & Cases	20	300	6000	
8	Chargers & Data Cables	20	200	4000	
9					
10					
11					

Fig. 17.4: Using "CSE"

- 4) When you enter the formula, rather than pressing Enter, use a combination of Ctrl + Shift + Enter. It will show the formula covered with brace bracket characters. Same formula will appear on every cell, on which the formula is applied.
- 5) An array formula can also be applied on a single cell. All the process remains the same, but entire cell range shall not be required before application of formula; just that single cell is selected on which the formula has to be applied.

## 17.3 FUNCTIONS

A function, in MS Excel, can be termed as a pre-structured or pre-defined formula that can calculate certain results using the selected specific values. A function is based on a certain basic syntax. It includes an equal sign "=", the name of the function, like SUM, PRODUCT, IF and at last, the argument(s). Arguments are entered in a bracket; they contain the information that is to be calculated.

### 17.3.1 Inserting Functions

To insert a function, see the below steps:-

- 1) Select the Formulas tab on the menu ribbon.
- 2) Select a function from the horizontal list, as shown below in Fig. 17.5.



Fig. 17.5: Formulas Ribbon

- 3) Let us take an example of SUM.
- 4) This function is available under Math & Trig tab.

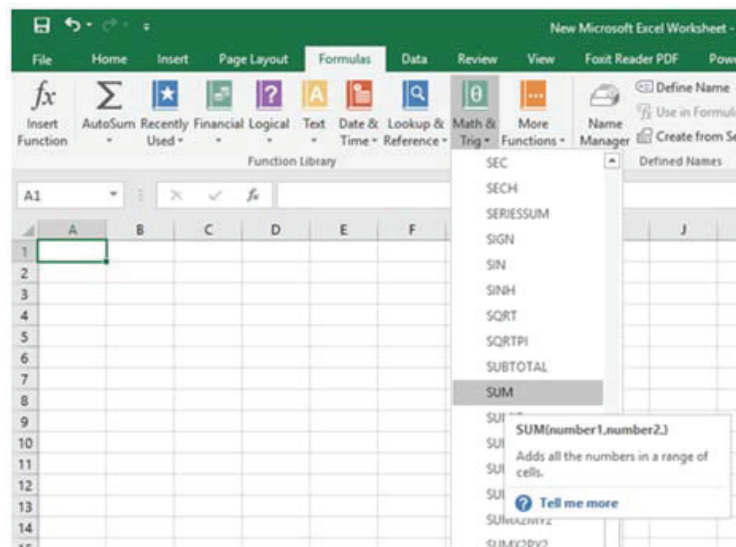


Fig. 17.6: Math & Trig Tab Section

- 5) When we click on this option, syntax will appear on the selected cell, and a dialog box would appear.

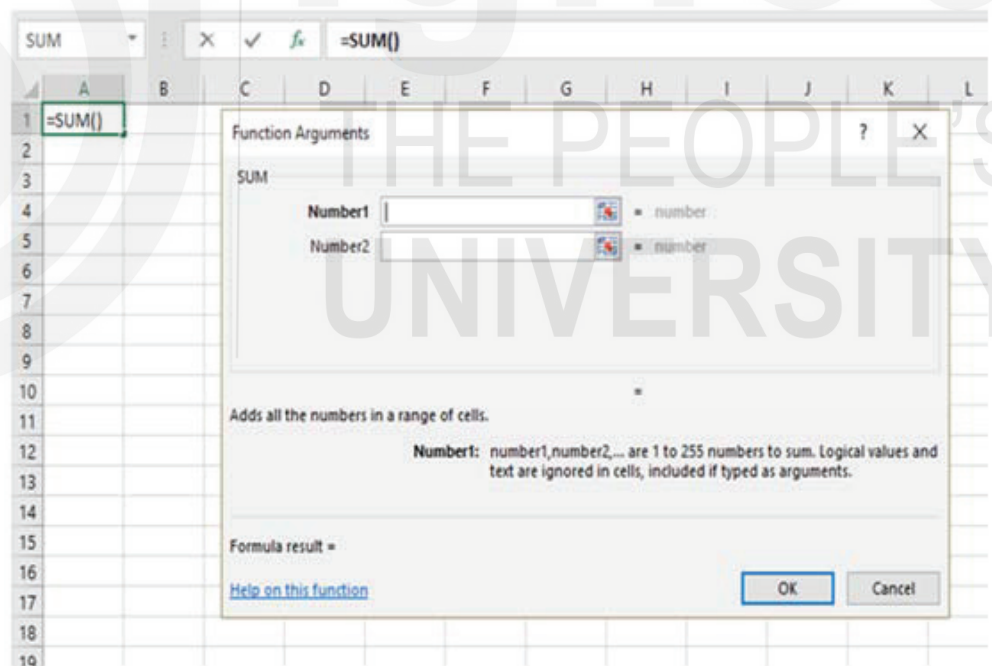


Fig. 17.7: Sum Formula

- 6) We need to put in the required information for the function to calculate, in this case the cells that need to be added.

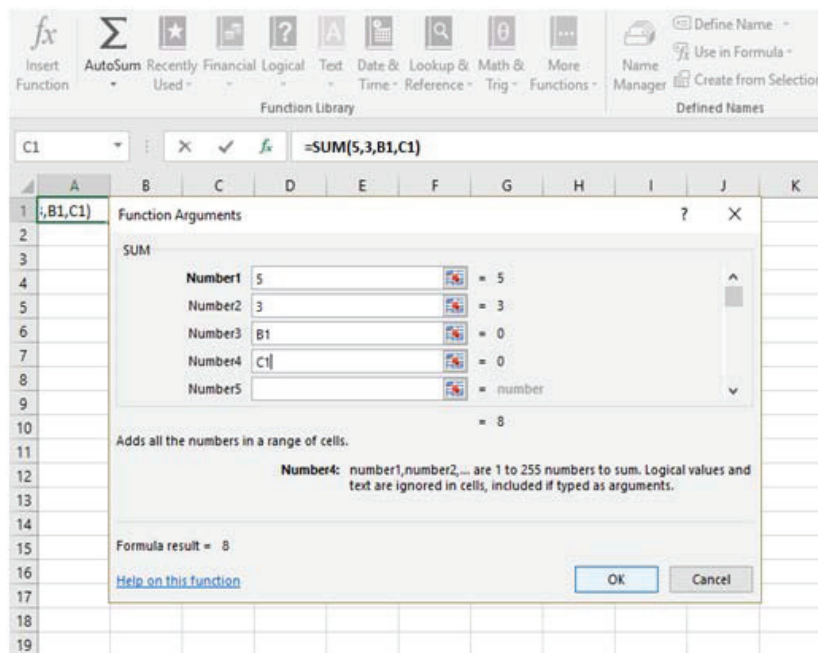


Fig.17.8: Sum Formula Data

- 7) After putting in the information, press OK.
- 8) This will result in provision of selected cells sum, as in the figure 17.9, but needful is to contain numerical values in the cells under process.

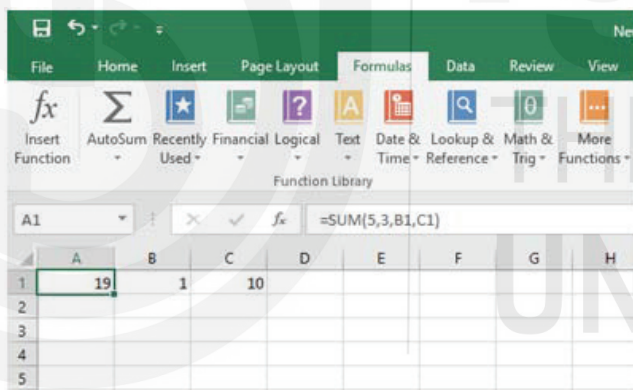


Fig. 17.9: Sum Formula Result

### 17.3.2 Built-in Function

As we can see in the below figure, there are broadly six types of built-in functions in MS Excel, namely,

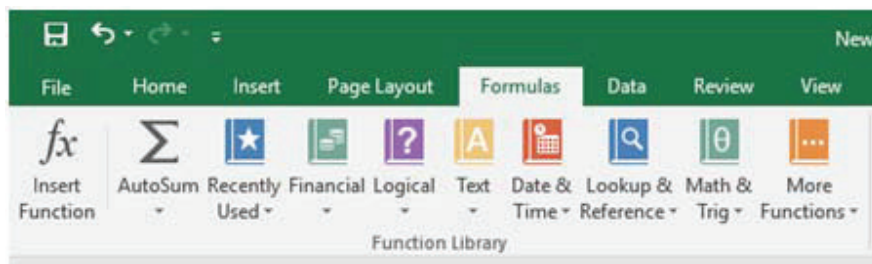


Fig. 17.10: Formulas Ribbon

## 1) Financial Functions

- a) **PMT:** This function is used for calculating periodical installments for a loan at a constant interest rate.
- b) **PV:** This function is used for calculating the Present Value of a given Loan as an Investment Amount at fixed rate of interest.
- c) **FV:** This function is used for calculating the Future Value of the current investment amount; calculation is dependent on the fixed rate of interest.

## 2) Logical Functions

- a) **IF:** It makes a logical comparison between the value and the expected value.
- b) **AND:** This is basically a supportive function for making better logical comparisons. Its outcome goes TRUE keeping all the inputs TRUE and results FALSE if one or more inputs are FALSE.
- c) **OR:** This function is also a supportive logical function, but it works on the following basis of logic, its resultant outcome becomes TRUE if one or more inputs provides TRUE and results FALSE if all the inputs provided FALSE.

## 3) Text Functions

- a) **CONCATENATE:** It combines two or more text strings into one single cell.
- b) **DOLLAR:** It converts a number to text with a dollar sign as its prefix.

## 4) Date & Time Functions

- a) **DATE:** This function returns selected cells in a date (mm/dd/yyyy - default) format.
- b) **MONTH:** It results the name of the month, given any number between 1(JAN) to 12(DEC).

## 5) Lookup & Reference Functions

- a) **VLOOKUP:** This is a very popular function. It refers to the value of provided input in the leftmost column of given dataset in the form of selected cells and results with the value from the matching row of a different/selected column.
- b) **MATCH:** It returns with the relative position of the required value from an array that matches a specified value.

## 6) Math & Trig Functions

- a) **SUM:** It returns with the sum of the selected cells, given the selected cells are numerical values.
- b) **PI:** It resultant outcome is mathematical value of PI i.e. (3.14159265) precisely till 15 decimal places.
- c) **PRODUCT:** These results in the multiplication of the selected cells, given those cells are numerical values.

## 17.4 MATHEMATICAL FUNCTIONS

Mathematics is an inevitable part of any decision making, Microsoft Excel categorically provide the set of functions to handle mathematical problems. There is a separate category of Math & Trig functions dealing into providing support for mathematical and trigonometric challenges.

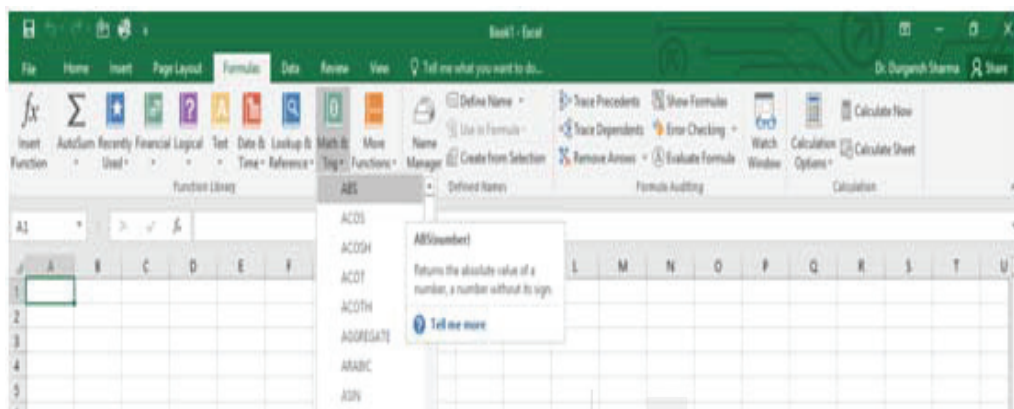


Fig. 17.11: Mathematical Formulas

Adding and subtracting in Excel is easy; you just have to create a simple formula to do it. Remember that all formulas in Excel begin with an equal sign (=), and we have the formula bar to create and edit them.

Add two or more numbers in one cell, Click any blank cell, and then type an equal sign (=) to start a formula. After the equal sign, type a few numbers separated by a plus sign (+).

For example,  $40+21+14+3$ . Press RETURN, the result is 78.

Subtract two or more numbers in a cell, click any blank cell, and then type an equal sign (=) to start a formula. After the equal sign, type a few numbers that are separated by a minus sign (-).

For example,  $70-20-15-3$ . Press RETURN, if you use the example numbers, the result is 32.

Mathematical function sum() described below:

### Sum() function:

This function is used to add two or more numbers, by providing their respective cell addresses. The cell addresses provided by using operators or directly as a cell range to the function. The result is addition of given numbers in general conditions, but it changes when there are some gaps in the cell ranges.

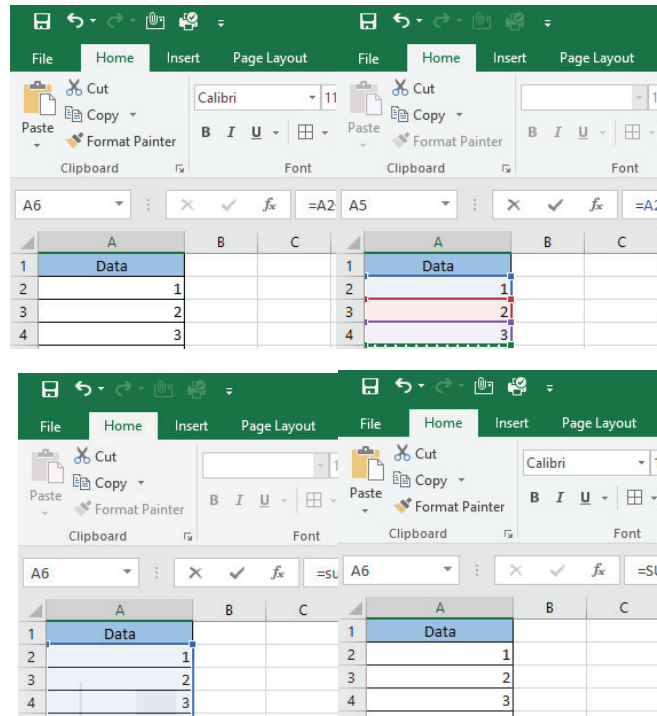


Fig. 17.12: Sum Formula Application

The sum() function needs cell addresses of numbers to be passed as arguments. Text and Logical Values are ignored in cells, only included if typed as arguments.

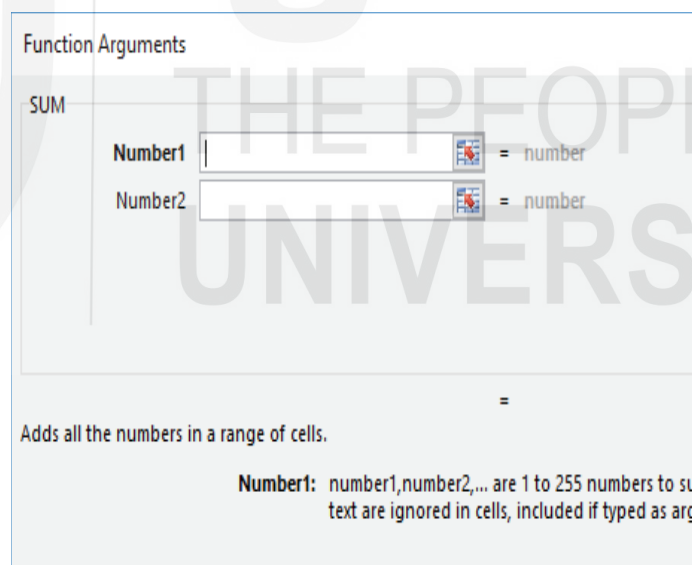


Fig. 17.13: Sum Formula Dialog Box

Subtract numbers using cell references

A cell reference combines the row number and column letter, like A1 or F345. When you use cell references in a formula instead of the cell value, you can change the value in that cell without having to change the formula.

- 1) Type a number in cells C1 and D1. For example, 5 and 3.
- 2) In cell E1, type an equal sign (=) to start the formula.

3) After the equal sign, type **C1-D1**.



Fig. 17.14: Subtract Function

4) Press RETURN, If you used the example numbers, the result is 2.

Some best practices for working with the SUM function.

The =1+2 or =A+B Method – While you can enter =1+2+3 or =A1+B1+C2 and get fully accurate results, these methods can be error prone for several reasons:

1) Typos – If you enter more and/or much larger values like this:  
=14598.93+65437.90+78496.23

Now try to validate that the entries are correct. It is much easier to put these values in individual cells and use a SUM formula. In addition, you can also format the values when they are in cells.

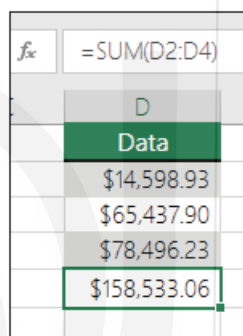


Fig. 17.15: Use of SUM Function

Use the SUM function instead of hard-coding values in formulas.

Formula in cell D5 is =SUM(D2:D4)

2) #VALUE! Errors, when referencing text instead of numbers

If you use a formula like:

=A1+B1+C1 or =A1+A2+A3

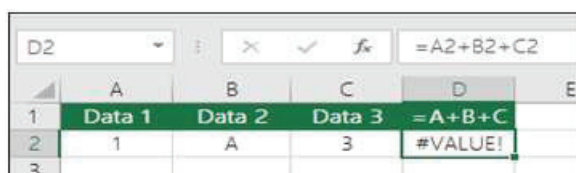


Fig. 17.16: #VALUE! Error

Example of a poor formula construction: Formula in cell D2 is =A2+B2+C2

Your formula can break if there are non-numeric values in the referenced cells, which will return a #VALUE! Error. SUM will ignore the text values and provide the sum of just the numeric values.

	A	B	C	D
1	Data 1	Data 2	Data 3	SUM
2	1	A	3	4

Fig. 17.17: Strength of SUM Function

Proper formula construction - Instead of  $=A2+B2+C2$ , use  $=SUM(A2:C2)$

3) #REF! error from deleting rows or columns

	A	B	C	D	E
1	Data 1	Data 3	=A+B+C		
2	1	3	#REF!		

Fig. 17.18: #REF! Error

#REF! error caused if a column is deleted. Formula has changed to  $=A2+#REF!+B2$

If you delete a row or column, the formula will not update to exclude the deleted row and it will return a #REF! error, where a SUM function will automatically update.

	A	B	C	D
1	Data 1	Data 3	SUM	
2	1	3	4	

Fig. 17.19: Positives of SUM Function 2

SUM function will automatically adjust for inserted or deleted rows and columns.

4) Formulas will not update references when inserting rows or columns

	A	B	C	D	E
1	Data 1	Data 2	Inserted	Data 3	=A+B+C
2	1	2		3	6

Fig. 17.20: No Update in referencing

$=A+B+C$  formulas will not update if you add rows

Dependent upon your inserted values in a row or column, the formula shall not update to include the adjustments made, where as a benefits of

using SUM function is that it will automatically update itself (as long as you are not outside of the range referenced in the formula). This is especially important if you expect your formula to update and it does not, as it will leave you with incomplete results that you might not catch.

	A	B	C	D	E
1	Data 1	Data 2	Inserted	Data 3	SUM
2	1	3		3	7

**Fig. 17.21: Positives of SUM Function**

Example portrays a SUM formula automatically expanding from =SUM(A2:C2) to =SUM(A2:D2) when a column was inserted

#### 5) SUM with individual Cell References vs. Ranges

Using a formula like “=SUM(A1,A2,A3,B1,B2,B3)” is equally error prone when we insert or delete rows within the referenced range for the same reasons, as given above. It’s much better to use individual ranges, like “=SUM(A1:A3,B1:B3)”.

It will automatically update when adding or deleting rows.

Multiplication in Excel is easy; you just have to create a simple formula to do it. As we already know that all formulas in Excel begin with an equal sign (=), and you can use the formula bar to create them.

To multiply two or more numbers in one cell, Click any blank cell, and then type an equal sign (=) to start writing a formula. After the equal sign, type a few numbers separated by a multiplication sign (\*).

For example, 40\*21.Press RETURN, the result is 840.

Apart from above method mathematical function for multiplication product() described below:

#### **Product() function:**

The PRODUCT function multiplies all the numbers entered and returns the product. For example, if cells A1 and A2 contain numbers, you can use the formula =PRODUCT(A1, A2) to multiply the two numbers together. You can also perform the same function by using the multiply (\*) operator; like, “=A1 \* A2”.

The PRODUCT function is better when you need to multiply many cells together. For example, the formula =PRODUCT(A1:A3, C1:C3) is same as =A1 \* A2 \* A3 \* C1 \* C2 \* C3.

The syntax of this function is as follows:

PRODUCT(number1, [number2], [number3], [number4],...)

The syntax used for the PRODUCT function relates with the following arguments:

- number1 – It is mandatorily required. The first number or range that you want to multiply.
- number2, 3, 4 – They are optional. Additional numbers or ranges to multiply, up to a maximum of 255 arguments.

This function realizes only numbers in an array or reference for calculations and they got multiplied. The empty excel cells, or containing logical or text values are ignored for calculation.

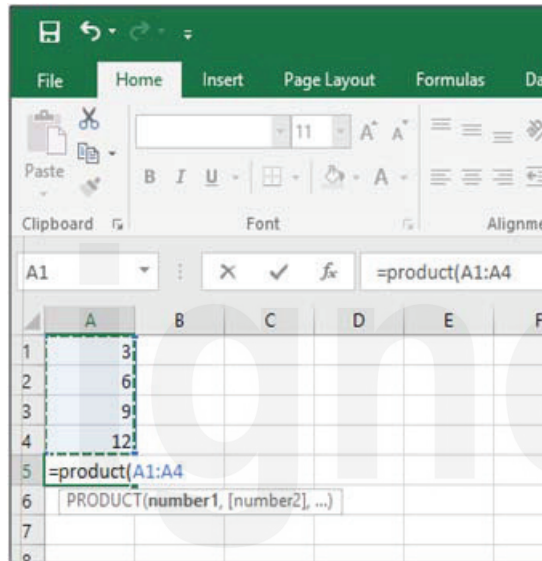


Fig. 17.22: Product Function

The data as mentioned in the spreadsheet is - 3,6,9,12. The following table distinguishes between various ways to multiply cells.

Table 17.1: Formula

Formula	Description	Result
=PRODUCT(A1:A4)	Multiplies the numbers in cells from A1 through A4.	1944
=PRODUCT(A1:A4, 2)	Multiplies the numbers in cells from A1 through A4, and then multiplies that particular result by 2.	3888
=A1*A2*A3*A4	Multiplies the numbers in cells from A1 through A4 by using mathematical operator (*) instead of the PRODUCT function.	1944

**MOD () function:**

This function returns the remainder of a number once the provided number is divided by another number as divisor. The result has the same sign as divisor.

Syntax – MOD (number, divisor)

Number (Required) - The number for which you want to find the remainder.

Divisor (Required) - The number by which you want to divide number.

While using this function you need to keep in mind that if the divisor is “0”, it returns the #DIV/0! Error. The MOD function can be expressed in terms of the INT function:

$$\text{MOD}(n, d) = n - d * \text{INT}(n/d)$$

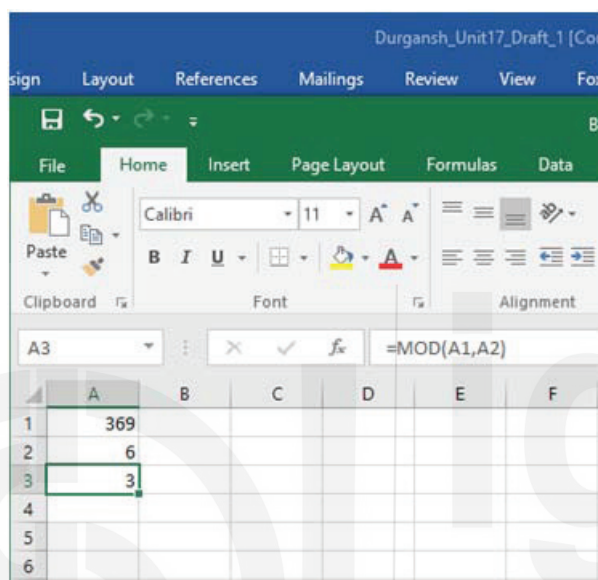


Fig. 17.23: MOD Function

As described in above figure, function mod (A1,A2) returns the remainder in cell A3 where A1 is 369, A2 is 6 and finally the output of this function is remainder of 369 divided by 6 as 3.

Following table shows details of various permutations used amongst number and divisor to be provided to the function mod ().

Table 17.2: Permutations used amongst number and divisor by mod ()

Number	Divisor	=mod(number, divisor)
369	6	3
369	-6	-3
-369	-6	-3
-369	6	3

### SUMIF:

You use the SUMIF function to sum the values and it meets the criteria that you specify. For example, suppose that there is a column that contains numbers, and you want to sum only the values that are less than 3. The following formula can be used:

=SUMIF(B1:B15,"<3") results in 12

This formula results in adding those numbers out of the list which are less than the defined parameter in the formula bar i.e. "<3"

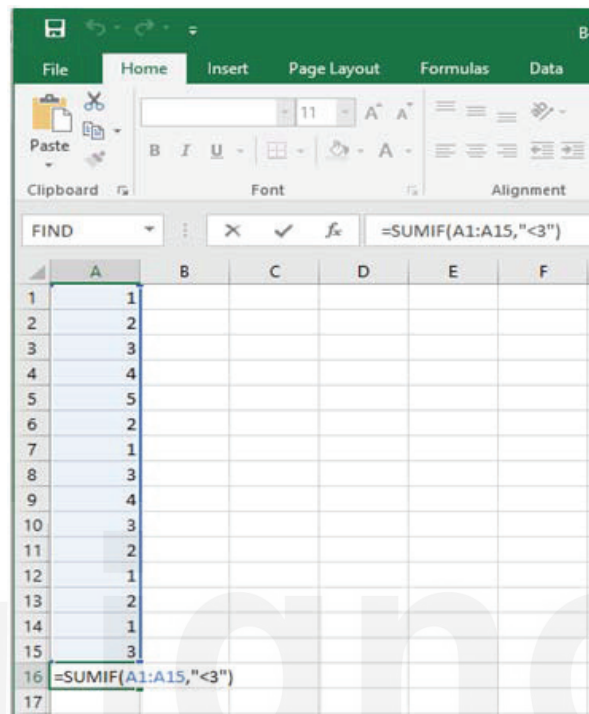


Fig.17.24: Use of SUMIF Function

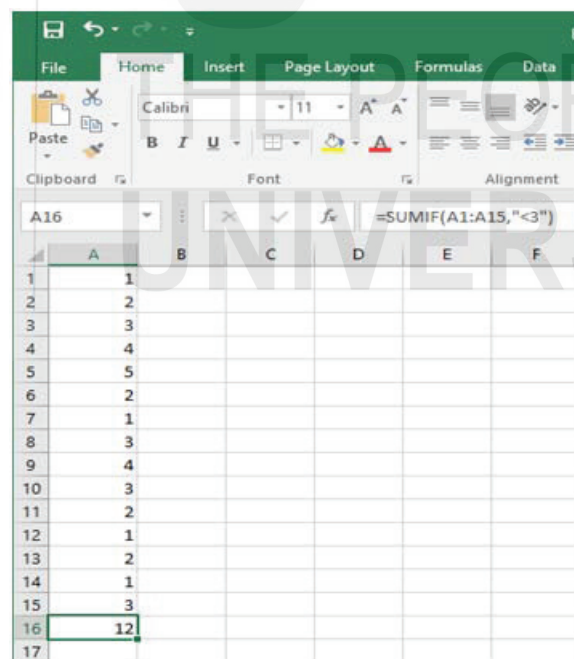


Fig. 17.25: Result of SUMIF Function

In the following example, this criterion is applied to the same values that are being summed. If there is a need, then you can apply the criteria to one range and sum the corresponding values in a different range. For example, the formula =SUMIF(A1:A5, "Jack", B1:B5) sums just the set of values provided

in the range B1:B5, once the matching cells in the provided range A1:A5 equal "Jack."

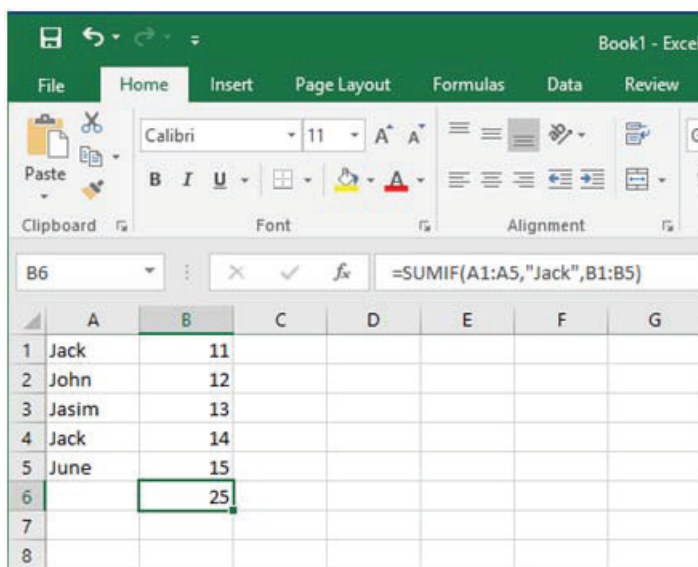


Fig. 17.26: SUMIF Criterion

**MMULT:**

Now to make it understand better, we shall discuss a matrix multiplication for products like Spoon, Fork and Cup with certain attributes like Price and Weight purchased by customers like Big Bazaar and Easy Day.

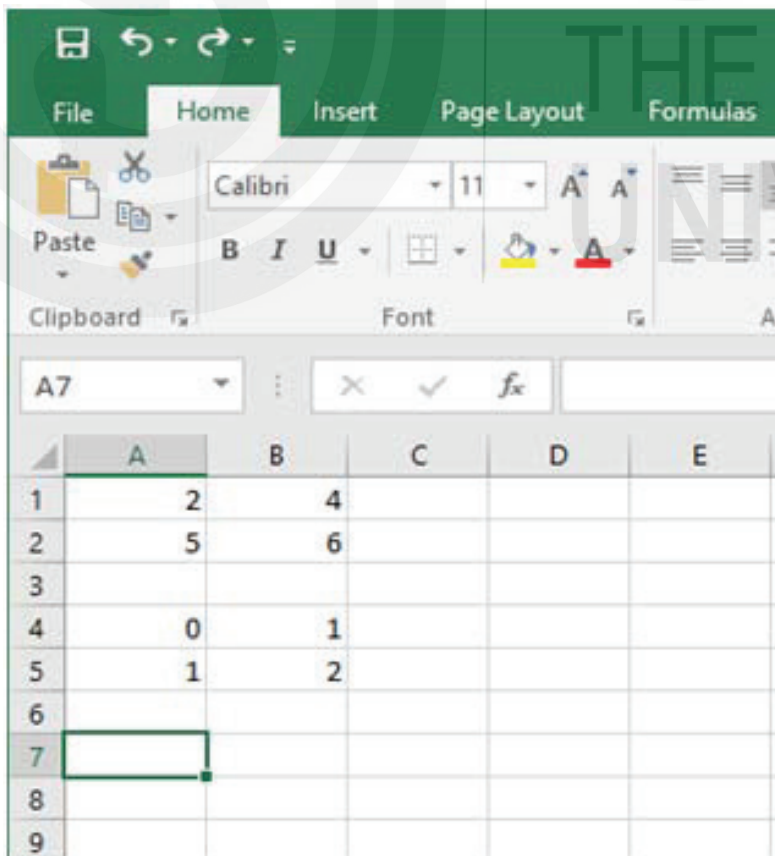


Fig. 17.27: Matrices

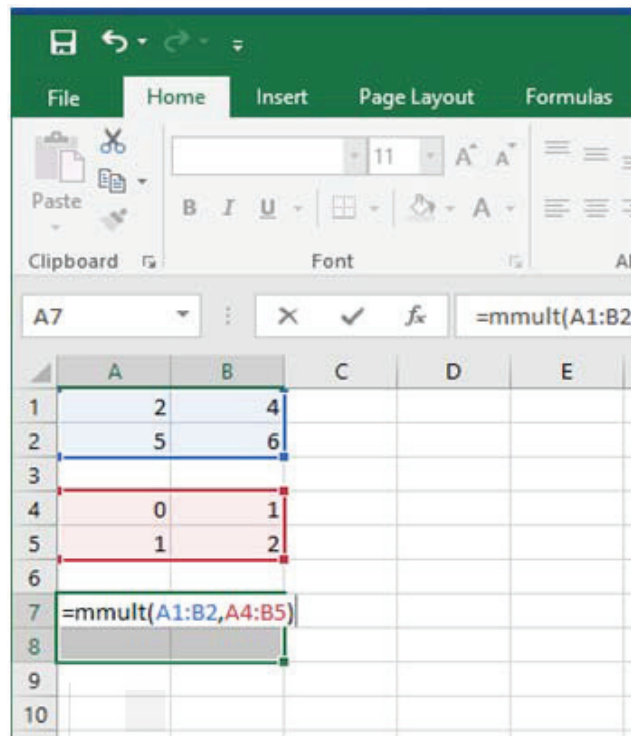


Fig. 17.28: MMULT Function

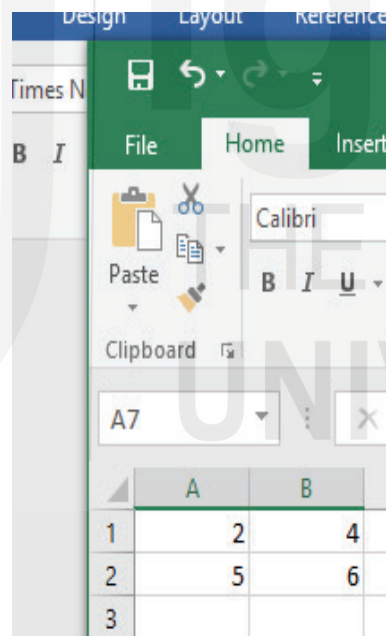


Fig. 17.29: Matrix Multiplication

The first matrix describes products and customer going to purchase them, second matrix showcase the attributes of the products in the form of product price and its weight. Finally, the third matrix where computation with MMULT (Array1, Array2) taken place with matrix formula.

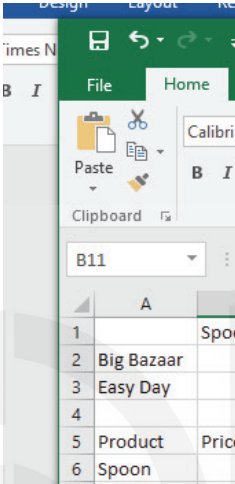
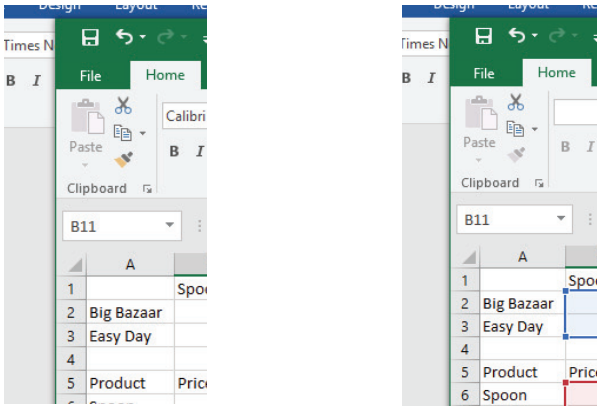


Fig. 17.30: MMULT Example

**Check Your Progress A**

1) What do you understand by Array Formulas?

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2) Give some examples of financial functions.

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- 3) “OR” is a type of .....
  - a) Financial function
  - b) Logical function
  - c) Text function
  - d) Date & Time function
- 4) Choose a TEXT Function from below options:
  - a) VLOOKUP
  - b) SUM
  - c) CONCATENATE
  - d) PMT
- 5) What is the usage of “MMULT” formula?

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## 17.5 STATISTICAL FUNCTIONS

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### AVERAGE

The average() function results in the arithmetic mean of the numbers entered as arguments to the function eg. A2:A10 holds the values in numbers than the formula =AVERAGE(A2:A10) provides the average of the given numbers.

For example, the marks secured by 5 students out of 20 are mentioned below, now for calculating average of the same is calculated by [=average(B2:B6)] which results in 13.8

**Table 17.3: Dataset for AVERAGE**

Student Name	Marks [20]	Functions
Arun	15	
Amit	12	
Ashu	14	
Aslam	15	Average(B2:B6)
Akash	13	13.8

### COUNT

The count() function works as it spells, it counts the number of arguments passed as range to the function.

For example, the number of items mentioned in the range for count() provides the count of items in that range [=count(B:B6)] results in 5.

**Table 17.4: Dataset for COUNT**

Student Name	Marks [20]	Functions
Arun	15	
Amit	12	
Ashu	14	
Aslam	15	Count(B2:B6)
Akash	13	5

### COUNTIF

The countif() function works as it spells, it counts the number of arguments passed as range as per the criteria along with to the function.

For example the number of items mentioned in the range for count() provides the count of items in that range [=countif(B:B6,">13")] results in 3, as it counts only those values which are more than 13 as the logical operator applied in criteria i.e. ">13".

**Table 17.5: Dataset for COUNTIF**

Student Name	Marks [20]	Functions
Arun	15	
Amit	12	
Ashu	14	
Aslam	15	Countif(B2:B6,">13")
Akash	13	3

### FREQUENCY

The frequency() function is an array based function, it works as it spells, it counts the number of arguments passed as range as per the criteria along with to the function.

For example, the number of items mentioned in the range for frequency() provides the count of items in data\_array arguments as bins\_array.  
=frequency (data\_array, bins\_array)

The count of items upto the number mentioned in bins\_array is reflected as outcome of the function. For example, you can find 2 numbers from 0 to 15 in the list of data\_array and 1 from 15 to 20, whereas 5 numbers from 20 to 30.

**Table 17.6: Dataset for FREQUENCY**

35	15	2
32	20	1
30	30	5
25		
21		
15		
16		
43		
40		
45		
46		
38		
25		
29		
10		

**MAX, MIN**

These two functions are providing the maximum or minimum out of the range of input values.

Maximum number can be derived as outcome of =max(range) function.

Minimum number can be derived as outcome of =min(range) function.

**Table 17.7: Dataset for MAX, MIN**

Name	Marks [50]	Function
Arun	35	Maximum
Akash	32	=max(b2:b16)
Aslam	30	46
Amit	25	
Ashu	21	Minimum
Akbar	15	=min(b2:b16)
Aisha	16	10
Aruna	43	
Ananya	40	
Anvita	45	
Ashi	46	
Ashok	38	
Asha	25	
Ashna	29	
Advita	10	

## 17.6 FINANCIAL FUNCTIONS

### PMT

This function calculates the amount to be paid against a loan calculated on fixed number of payments and a rate of interest. This function has got following syntax:

PMT(Rate, Nper, Pv, [Fv], [Type])

- **Rate** (required): Signifies rate of interest for the loan.
- **Nper** (required): Signifies the number of payments for the loan.
- **Pv** (required): The present value for a series of future payments worth currently (principal amount).
- **Fv** (optional): The future value to attain after the last payment is made. It is assumed to be 0 (zero) if omitted.
- **Type** (optional): If 0 (zero) than beginning of period or 1 (one) indicates payments are due at end of period.

The outcome of this formula for Rate of 8%, installment to be paid for the loan as 12, and the present value of the future payment known as principal amount is shown in the figure below:

	A	B	C	D	E	F	G
1	Rate	8%					
2	Nper	12					
3	PV	100000					
4	PMT	₹ -8,698.84					
5							
6							
7							

Fig. 17.31: PMT Function

### DB & SLN

Both these functions used for calculating the depreciating value of an asset.

DB function is used to calculate and returns the amount of depreciation against an asset for a defined period using the written down value method, whereas SLN function returns the calculated values using straight line depreciation method of values of an asset for a period, i.e. depreciation amount remains same for every period.

Syntax for DB is DB(cost, salvage, life, period, [month])

**Cost (required):** The buying/ purchased cost of the asset.

**Salvage (required):** It defines the value calculated at the end of the depreciation.

**Life (required):** The number of periods over which the asset is being depreciated.

**Period (required):** The time period for which the calculation of the depreciation has been done. Period must use the same units as life.

**Month (optional):** The number of months in the first year. If the month is omitted, it is assumed to be 12.

The written down value method computes depreciation at a fixed rate. DB uses the following formulas to calculate depreciation for a period:

**Cost:** total depreciation calculated from past periods) \* rate

where:

rate =  $1 - ((\text{salvage} / \text{cost}) ^ (1 / \text{life}))$  [calculated till 3 places of decimal]

Depreciation for the first and last periods is a different case. For the first period, DB uses this formula:

$(\text{Cost} * \text{rate} * \text{month}) / 12$

For the last period, DB uses this formula:

$((\text{cost} - \text{total depreciation calculated from past periods}) * \text{rate} * (12 - \text{month})) / 12$

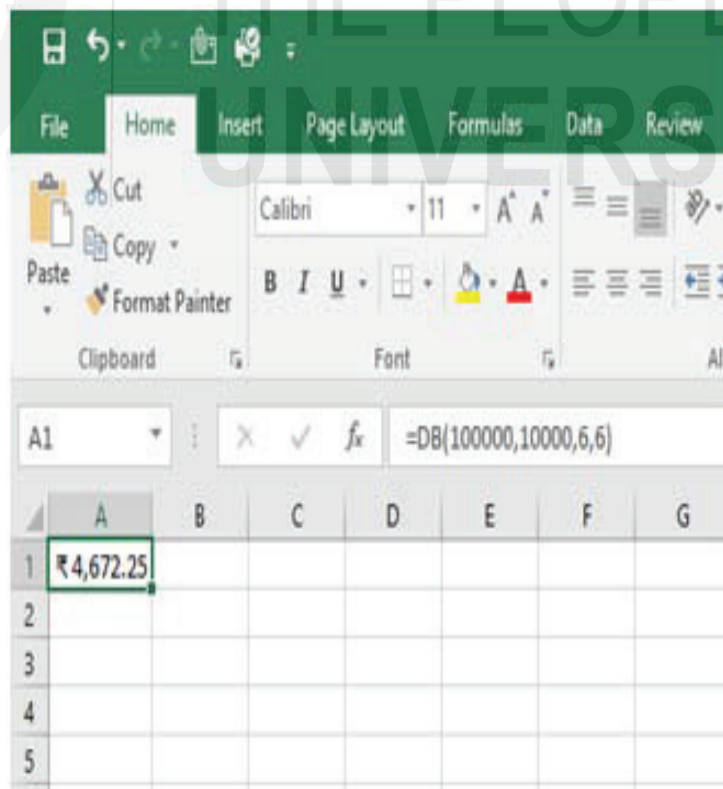


Fig. 17.32: DB Function

=DB(100000,10000,6,6) generates an outcome of ₹ 4,672.25

## FV & NPV

To calculate the future value of any amount as an investment using fixed interest rate. You can use FV with either periodic, constant payments, or a single lump sum payment.

Syntax for the formula is FV(rate,nper,pmt,[pv],[type]) has the following arguments:

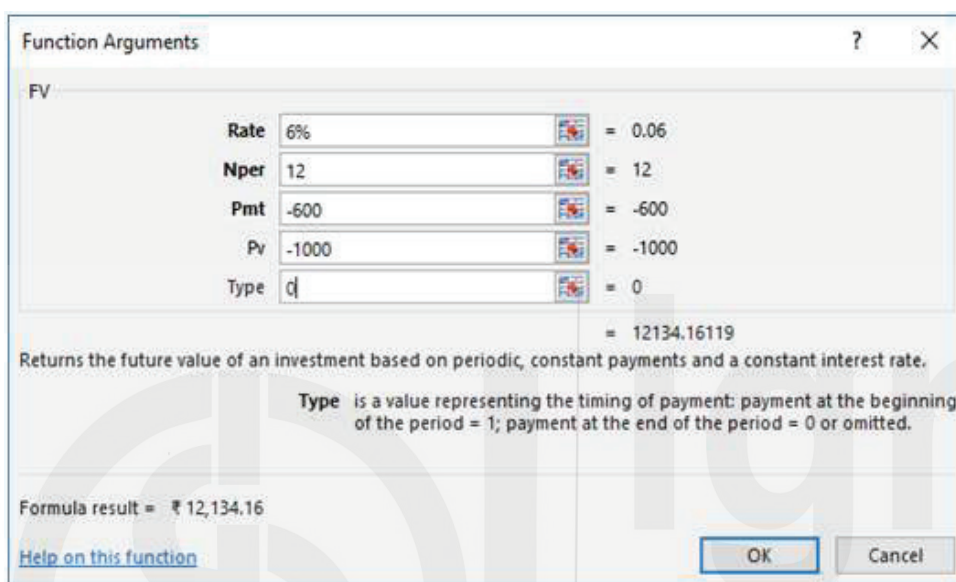


Fig. 17.33: Future Value Arguments Dialog Box

=FV(6%,12,-600,-1000,0) generates an outcome of ₹ 12,134.16

NPV: This function is used to calculate the net present value of any amount as an investment by providing a discount rate and a set of future payments (to be provided as negative values) and receipt of income generated (to be provided as positive values).

NPV(rate,value1,[value2],...)

The function NPV is dependent over the order of input of values as arguments to calculate the order of cash flows. Only numbers in an array or reference are used.

The formula to calculate NPV for n number of cash flows in the list of values is given below:

$$NPV = \sum_{i=1}^n \frac{values_i}{(1 + rate)^i}$$

NPV is similar to the PV function (present value).

NPV is related to the IRR function (internal rate of return). Where IRR reflects the rate of return at which NPV equals zero: NPV(IRR(...), ...) = 0

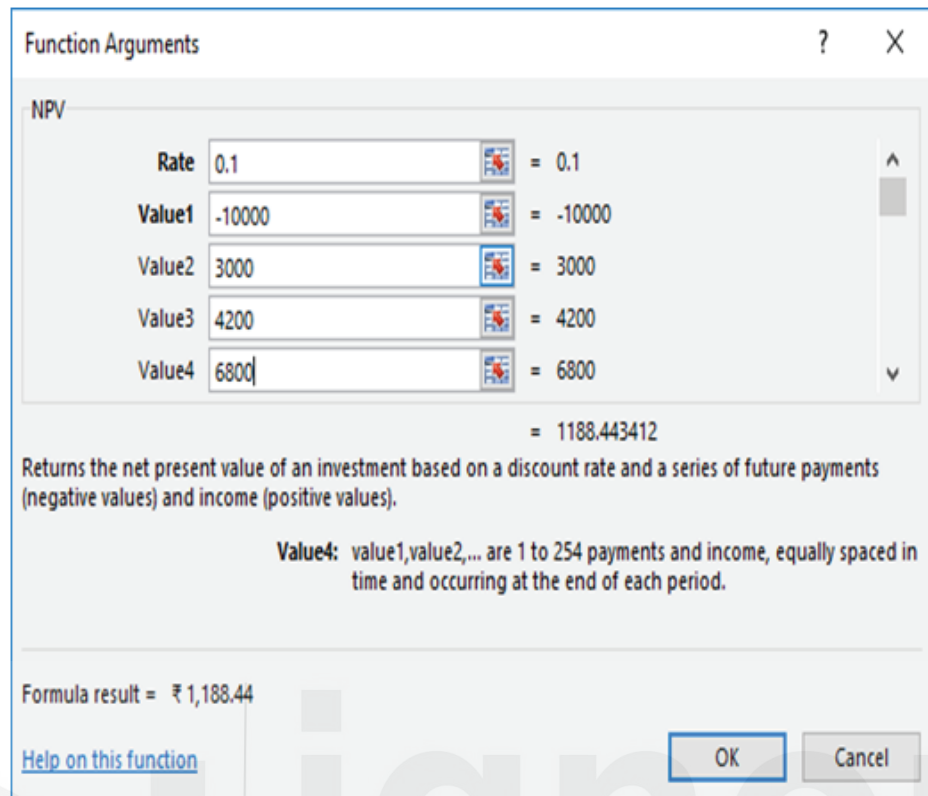


Fig. 17.34: NPV Arguments Dialog Box

The below example is provided to better understand the application of “NPV” in MS Excel.

Table 17.8: Dataset for NPV

Data	Description	
0.1	Discount rate [Yearly]	
-10000	Initial cost of investment [Yearly]	
3000	Return on investment [I <sup>st</sup> year]	
4200	Return on investment [II <sup>nd</sup> year]	
6800	Return on investment [III <sup>rd</sup> year]	
Formula	Description	Result
=NPV(A2, A3, A4, A5, A6)	Net present value of this investment	₹ 1,188.44

### IRR

It returns the internal rate of return for a series of cash flows represented by the numbers in values. It is not necessary for these cash flows to be even, as required for an annuity. However, the cash flows must occur at regular intervals, like monthly or annually.

### Syntax: IRR(values, [guess])

Values (required) - An array or a reference to cells that contain numbers for which you want to calculate the internal rate of return. Values must contain at least one positive value and one negative value for the calculation. IRR uses

the order of values to interpret the order of cash flows. If an array or reference argument contains text, logical values, or empty cells, those values are ignored.

Guess (optional) - A number that you guess is close to the result of IRR.

## RATE

It returns the annual rate of interest.

Syntax - RATE(nper, pmt, pv, [fv], [type], [guess])

The following table would help us to understand the “RATE” Function better:

**Table17.9: Dataset for RATE**

Data	Description	
5	Years	
-750	EMI	
20000	Loan Amount	
Formula	Description	Result
=RATE(A2*12, A3, A4)	EMI.	3.18%
=RATE(A2*12, A3, A4)*12	Annual rate of interest.	38.10%

## YIELD

It returns the yield against an amount as security looking forward to pay interest in a defined period of time.

Syntax: YIELD(settlement, maturity, rate, pr, redemption, frequency, [basis])

Settlement (required): The settlement date for security.

Maturity(required) The maturity date of security.

Rate(required) The annual rate of interest for security.

Pr (required) The face value of security.

Redemption (required) The redemption value of security.

Frequency (required) The number of payments per year.

Basis (optional) The type of day count basis to use.

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## 17.7 LOGICAL FUNCTIONS

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Logical functions are the repository to implement the logical relationships amongst cell ranges included in the formula.

### IF()

This function performs branching operations during the decision-making. There are 3 arguments passed to this function.

- logical\_test (required): for a binary outcome in the form of true or false.

- value\_if\_true (required): branching operation when logical\_test return true.
- value\_if\_false (optional): branching operation when logical\_test return false.

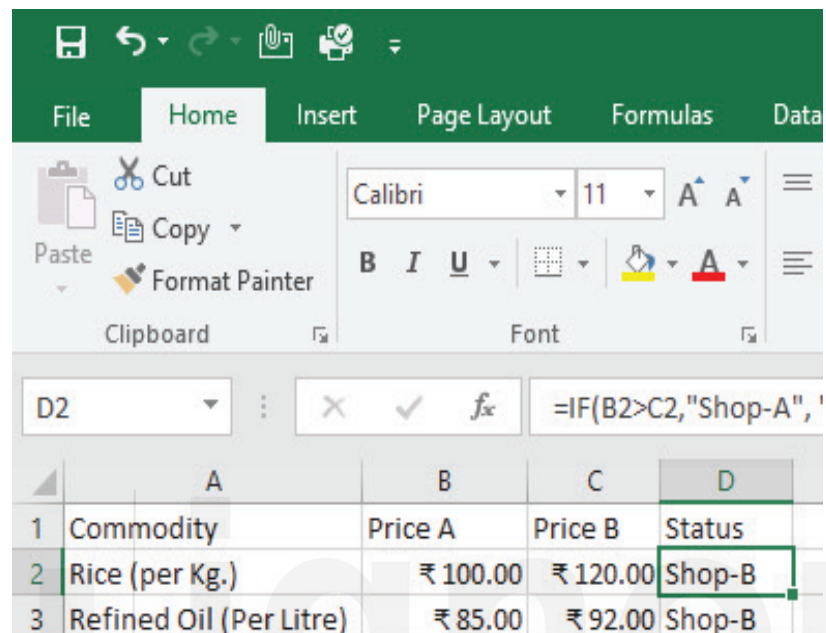


Fig. 17.35: IF Function

In above example the customer uses a logical test amongst the prices of commodities to purchase from two different shops. The status reflects the choice of shop for the commodities.

#### AND

This logical test requires at least 2 input arguments for its functionality, it checks the binary outcome from the conditions placed as arguments in the function TRUE[1] or FALSE[0]. Once all the arguments reflect TRUE [1] as outcome, only then this function provides TRUE [1] as output.

Table 17.10: Dataset for AND

Con1	Con2	Con3	Result
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

In above example 3 different conditions with logical inputs are mentioned as Con1, Con2, Con3 and Result is based on logical inputs to the function as

=AND(Cond1, Cond2, Cond3). Once it gets all three conditions TRUE, the result becomes TRUE.

For Example: Using the formula in D11 as relative cell address and copied it in all the other cells in the same column, we can easily mark that whether that entity can Vote in India or not.

=AND(A11>=18,B11="Indian",C11="Active")

**Table 17.11: Dataset 2 for AND**

Age	Citizenship	Status	Vote in India
17	Indian	Active	FALSE
18	Indian	Active	TRUE
25	Not Indian	Active	FALSE
27	Indian	Inactive	FALSE
23	Not Indian	Inactive	FALSE
27	Indian	Active	TRUE
35	Indian	Active	TRUE
37	Not Indian	Active	FALSE

### TRUE & FALSE

These two functions TRUE() and FALSE() returns the logical values TRUE and FALSE respectively and they are used primarily for checking compatibility with other spreadsheets of the workbook.

## 17.8 TEXT AND FORMATTING FUNCTIONS

Text and formatting functions are mostly required for string handling in Excel Datasets.

### LEFT & RIGHT

These two formulas require two input arguments namely 'Text' and 'Num\_chars' for returning specified number of characters from the beginning or from the last of defined string in the formulas as an argument. If the second argument is not passed then the function returns a character according to the function used. Starting character of the string if Left() function is used and last character if Right() function is used.

=LEFT(Text, Num\_chars)

=RIGHT(Text, Num\_chars)

For example, the strings mentioned in table below shall be processed depending upon the formula applied over them and outcomes are reflected in third column.

**Table 17.12: Dataset for LEFT, RIGHT**

Input String	Formula	Outcome
Small Talk	=Left(A2,5)	Small
Small Talk	=Right(A2,4)	Talk
Small Talk	=Left(A2)	S
Small Talk	=Right(A2)	k

### CLEAN

This function removes all the non-printable characters from the text provided as argument to this function. This text is any information from the worksheet from the removal of non-printable characters is desirable.

### CONCATENATE

This function plays an important role while joining various text strings into a single text string. The text strings provided as cell reference to them, or typed with in the function for joining in the outcome of this function.

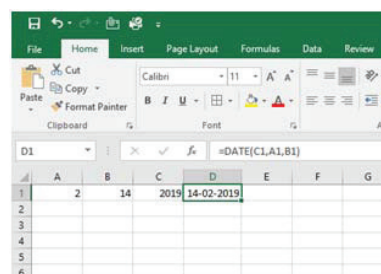
### LOWER & UPPER

These two functions changes the case of the input string to lower or upper case as per use case of the functions according to the requirement.

## 17.9 DATE AND TIME FUNCTIONS

### DATE

This function incorporates three different components from different cell addresses and convert them into a single outcome in the form of a date. As shown in the figure below, date function is collecting attributes from C1 as Year, A1, as Month and B1 as Day and finally shows the Date as 14-02-2019.



**Fig. 17.36: Date Function**

### DAY

This formula reflects the day of the date provided to the function as outcome of this function. As mentioned in figure below, the date 14-02-2019 is passed

as argument to =Day(A2) the outcome to this function is 14, which is day of the date.

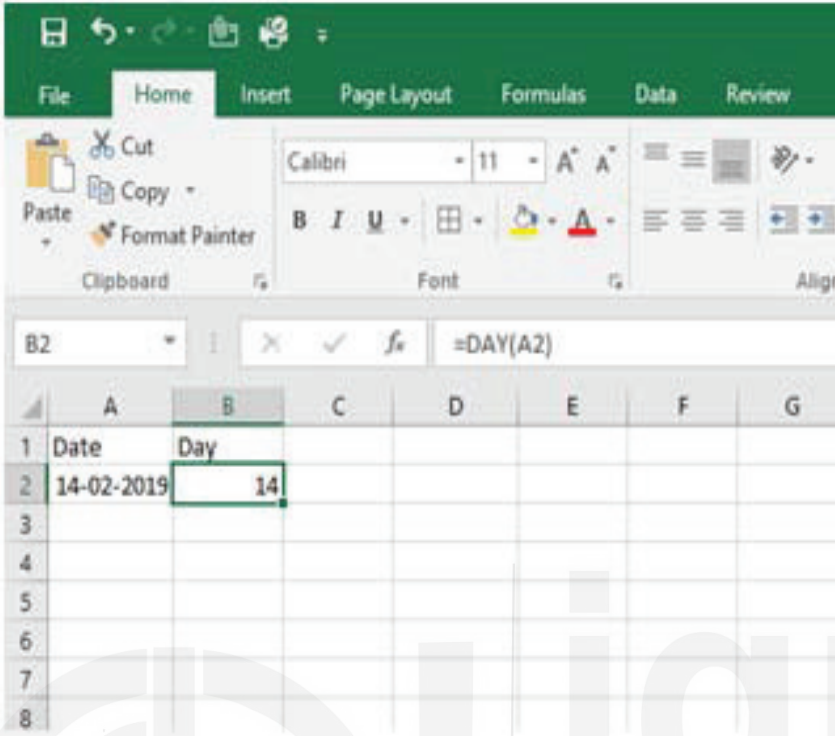


Fig. 17.37: Day Function

**TODAY & NOW**

These two functions work without any arguments in the function. They return the system date for Today() and System Date and Time for Now().

**Check Your Progress B**

1) Write the syntax for DB.

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2) Distinguish between COUNT and COUNTIF function.

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3) What is Clean function.

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4) Write the syntax for RATE.

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## 17.10 LET US SUM UP

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Microsoft Excel consists of many powerful formulas and functions, which can be used for various problems, whether it be financial, logical, statistical or mathematical. A Formula, in MS Excel, is an expression, which consists of values, operators and conditions, applied over a cell or a range of cells.

An array is a combination of either a row of values, column of values or both the row and column of values. An array formula can perform multiple no. of calculations on one or more cells of an array. It can give both the single and multiple cell results. They are also known as CSE (Control + Shift + Enter) Formula.

There are different types of functions and formulae in MS Excel, which can be used efficiently for solving problems in Finance and Commerce. It is a very powerful software and is widely regarded as the best available Spreadsheet Tool all over the world. Functions like “IF”, “VLOOKUP” and “CONCATENATE” are vastly utilized in financial jobs and they are the basic requirement of the industry.

A function, in MS Excel, can be termed as a pre-structured or pre-defined formula that can calculate certain results using the selected specific values. A function is based on a certain basic syntax. It includes an equal sign “=”, the name of the function, like SUM, PRODUCT, IF and at last, the argument(s). Statistical Functions, Financial Functions, Logical Functions, Date & Time Functions , Number & Text Function, Lookup & Reference Functions, Math & Trig Functions etc.

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## 17.11 KEY WORDS

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**Array Formulas:** An array formula is a formula that can perform multiple calculations on one or more items in an array. An array can be as a row or column of values, or a combination of rows and columns of values. Array formulas can return either multiple results, or a single result. They are also known as CSE (Control + Shift + Enter) Formula.

**Financial Functions:** Financial functions calculate financial information and have been made available to execute a variety of financial calculations such as, payment, present value, calculations of yield, investment valuations, interest rates, internal rate of return, asset depreciation, and payments.

**Logical Functions:** Logical functions are some of the most popular and useful in Excel. They can test values in other cells and perform actions dependent upon the result of the test. This helps us to automate tasks in our spreadsheets. The functions are AND, OR, XOR and NOT etc.

**Mathematical Functions:** Mathematical formulas in excel are used to perform various arithmetic operations like adding the values in a range of cells, finding an average of selected cells. The most commonly used mathematical functions in excel are Average, Int, Round, Mod, Rand etc.

**Statistical Functions:** Statistical functions apply a mathematical process to a group of cells in a worksheet. For example, the SUM function is used to add the values contained in a range of cells. COUNT function to count cell locations with numerical values, AVERAGE function to calculate the arithmetic mean, MAX and MIN functions to find the highest and lowest values in a range of cells.

**Text Functions:** The Excel text Function is used to convert numbers to text within a spreadsheet. Text is available in all versions of Excel. We use this function in the circumstances; when we want to display dates in a specified format, when we wish to display numbers in a specified format or in a more legible way or When we wish to combine numbers with text or characters.

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## 17.12 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress A

- 3) b) Logical function
- 4) c) CONCATENATE

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## 17.13 TERMINAL QUESTIONS

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- 1) What is the key combination used to find the result for an Array Formula? Why is it used?
- 2) Define Functions in MS Excel.
- 3) Name the formula categories shown under the Formulas Tab in MS Excel.
- 4) Why does the “#VALUE!” error come up when adding or subtracting the cells in MS Excel?
- 5) What is the difference between PV and NPV formulae in MS Excel?

**Note:** These questions are helpful to understand this unit. Do efforts for writing the answer of these questions but do not send your answer to university. It is only for your practice.



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# UNIT 18 GRAPHICAL PRESENTATIONS OF DATA

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## Structure

- 18.0 Objectives
- 18.1 Introduction
- 18.2 Charts and Its Types
- 18.3 Preparing Your Data
- 18.4 Transforming Your Data into Charts
- 18.5 Cross Tabulation and Charting
- 18.6 Let Us Sum up
- 18.7 Key Words
- 18.8 Terminal Questions

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## 18.0 OBJECTIVES

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After completing this unit, you should be able to:

- understand the basic features for charts generation using excel;
- create worksheets and computation of data;
- understand the data handling through Excel;
- prepare data; and
- visualise data using charts.

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## 18.1 INTRODUCTION

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Every transaction related to any activity of a process generates relevant data. Once this data is properly recorded using Microsoft Excel, the same shall be visualized through various options available in charts. Different stages related to data preparation and creations of charts are discussed in this unit.

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## 18.2 CHARTS AND ITS TYPES

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Charts are a set of display tools used to present datasets varied in their size depending upon the problem at hand. Its objective is to create easy to understand chart formats that helps in easily inferring of data. There are various chart types available to visualize the data collected for a better and meaningful understanding.

You can create charts using MS Excel by following steps:

- Click on dataset prepared for data visualization
- Select option insert from tabs and then choose recommended charts for a set of auto chart.
- Select a chart from the recommended charts and preview the same
- Choose a best fit as per your requirements for data presentation

If you want to create a trendline then following steps are to be taken

- Click on dataset prepared for creating trend line
- Select design to add the chart element.
- Select a trendline
- Choose the type for trendline from its different types like linear, exponential, moving average etc.

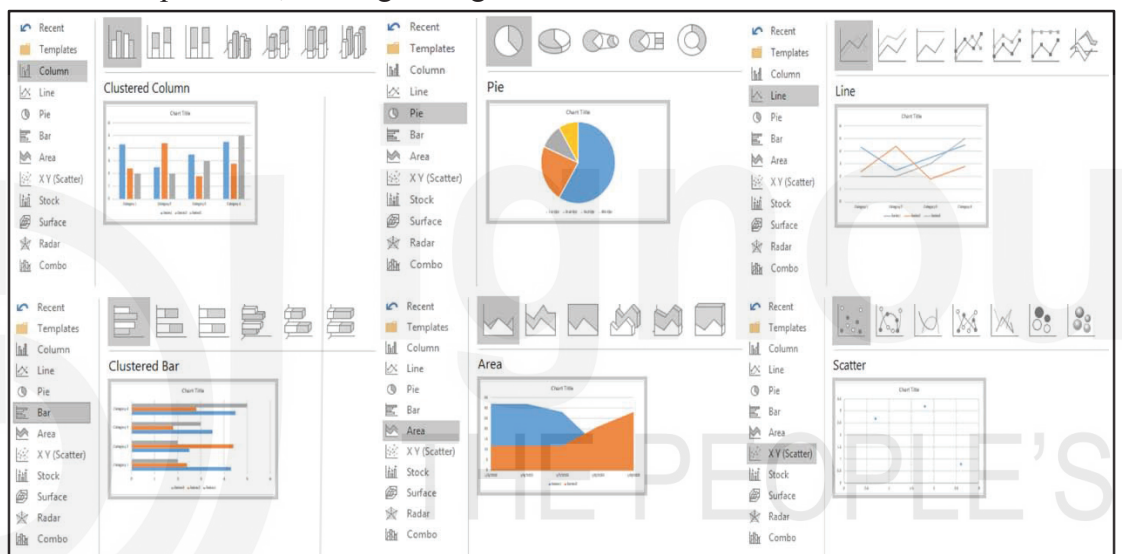


Fig. 18.1: Different types of charts

User can choose from following types of charts for data visualization as per the requirement

- 1) **Column Charts:** There are many kinds available in MS Excel like clustered column, stacked column and 3-D visualisation available for the same kind of charts.
- 2) **Line Charts:** There are various examples of Line charts like stacked line, marked line charts and 3-D visualisation available for the same.
- 3) **Pie Charts:** Variety of pie charts are available in MS Excel such as Pie of pie, Doughnut and 3-D visualisation for the same.
- 4) **Bar Charts:** Similar to column charts, these charts are horizontally spreaded. Charts like clustered, stacked and 3-D visualisation of these charts are available.
- 5) **Area Charts:** Various area charts are provided in MS Excel. Like Stacked Area charts, 3D visualisations of the same are also available.

- 6) **X Y Scatter Charts:** Scatter charts are a nice addition to the pool of charts available in MS Excel. Charts such as Smooth lines, or with markers, straight lines and Bubble charts.
- 7) **Stock Charts:** These charts come into use when we need to interpret data related to Stocks and Securities. Various kinds are available like, High-Low-Close, Open-High-Low-Close, Volume-High-Low-Close and Volume-Open-High-Low-Close.
- 8) **Surface Charts:** These charts can be used to showcase a dataset in a more visual way. Charts such as 3D surface, wireframe, contour and Wireframe Contour are available in MS Excel.

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## 18.3 PREPARING YOUR DATA

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Data generated through various activities need to be prepared for presentation using charts. Although simple processes lead to the preparation of data, which transforms it into graphical representation used towards further analysis and related generation of inference. It requires further understanding of points to prepare datasets such as variables used along with transactional outcomes and finally the data generated. These points help towards the exchange of data, which in turn generates related information in planning, and outcomes of the process. Importance of the data identification emerges and leads towards a clear description of data using charts and graphs. The correct identification of data types and their respective tabulation and preparation influence the inference through its graphical representation.

Data collection shall happen by means of systematic observations of problem statement related tests. A set of correct data collected supports to perform better statistical analysis. Data collection happens through planned observations for carrying out measurements of one or more variables. These variables constituted by data bear measurable characteristics or attributes. These variables are divided into two large groups of categorical (qualitative) and numerical (quantitative) variables.

- 1) Categorical or qualitative variables further divides in dichotomous, nominal and (cardinal or ordinal) variables.
  - a) Dichotomous variables are binary in nature means having 2 states to record.
  - b) Cardinal or Ordinal variables are having 3 or more states or categories but they are in order.
  - c) Nominal variables are also having 3 or more categories but no order like color coding of eye-lens black, brown, blue, green, grey or blood groups A, B, AB, O
- 2) Numerical or quantitative variables further divides into continuous and discrete variables.

- a) Continuous variables measured through continuous scale; they have decimal places depending upon the measuring capacity of the instrument like weighing scale, length measuring tapes, and stopwatch.
- b) Discrete variables measured through numerical values stored against some mathematical functions used for aggregation of some whole numbers as if count of students attended the class.

Column charts, Bar charts or Line charts for single or multiple data sets are drawn using two axis charts where x-axis constitutes of independent variables and y-axis reflects the data constituted with dependent variable. In case of multiple data sets column or bar charts shown as clustered charts mainly used to display the comparison amongst competitive items with the same range for measure. These types of charts used for comparative analysis for different datasets belong to same category.

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## 18.4 TRANSFORMING YOUR DATA INTO CHARTS

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As discussed in previous section, data collection happens through variables. Data collection through planned observations is stored as datasets via one or more variables. These datasets usually displayed with the help of charts or graphs depending upon the type of data used for display.

You are required to transform the required data before displaying it as chart or graph. For example, the dataset having a survey about type of food most liked by people while dining out. The same shall be stored as frequency or count of opted food choice, bar chart and pie chart are most suitable to display as information.

**Table 18.1: Aggregate Data for Display**

Chinese	Spanish	Korean	Mughlai	Italian	Indian
27	5	12	35	15	45

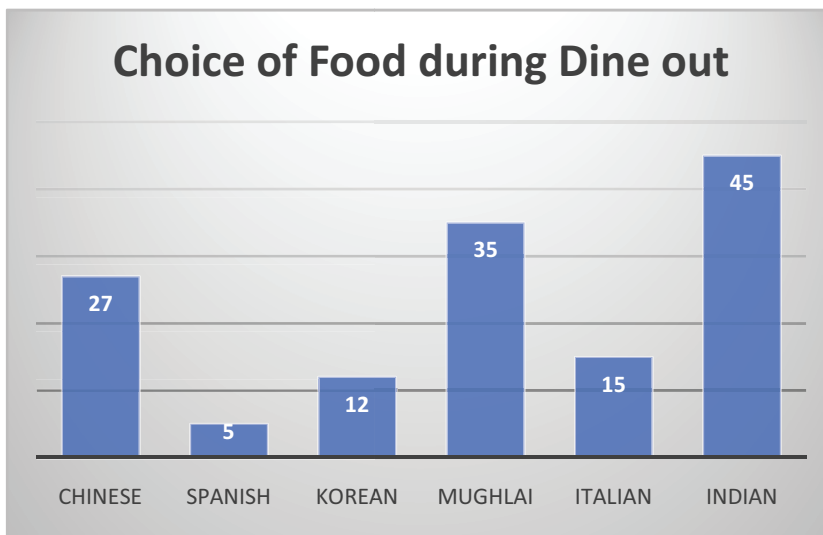


Fig. 18.2: Bar Chart for Table 18.1

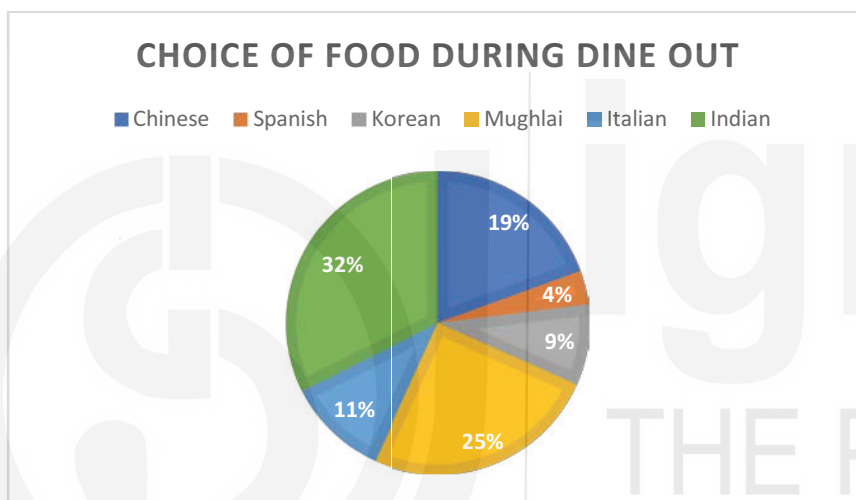


Fig. 18.3: Pie Chart for Table 18.1

Furthermore, dichotomous variables are having two states to record and hence, the same are displayed using pie charts in a better way as compared to bar chart.

In case of cardinal or ordinal dataset, the outcome displayed using either using bar charts or histogram depending upon the interval of range. Continuous data like collection of student's height displayed using histogram and discrete data as counted strength of students in a class acquired in bits of data range or categories displayed using bar chart or column chart.

While displaying nominal data like count of people having different blood groups shall also be displayed using bar chart or pie chart. Pie chart provides best results when data is calculated in percentages.

While transforming the available data for creating charts following steps shall provide better results.

- 1) **Identification of Variables:** Identify all the variables under which the data is classified for a better presentation of data and inference generation.

- 2) **Missing Values:** Treatment of various cells with missing values.
- 3) **Outliers:** Identification of outliers with respective treatment leads to better inference.

Following steps are used for creating a chart or graph:

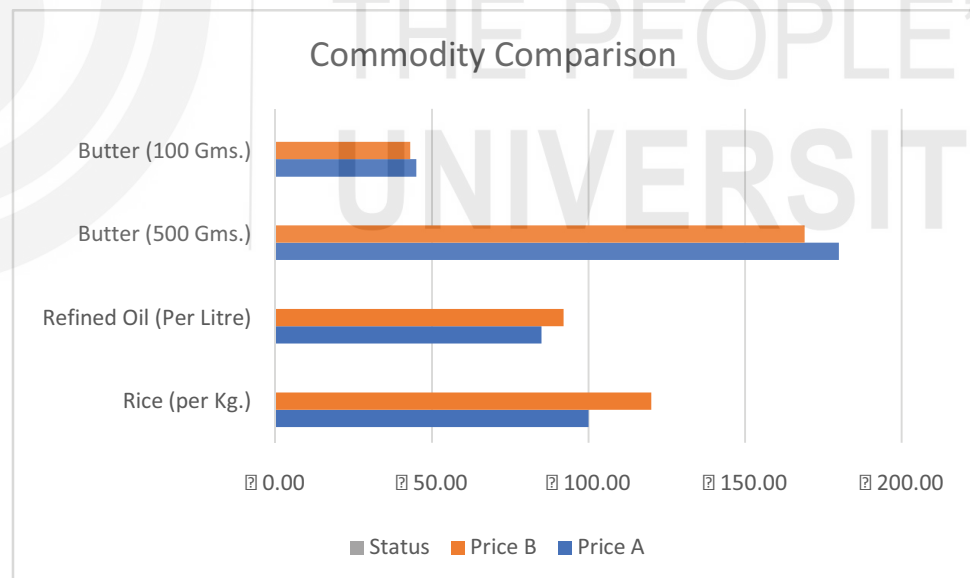
- 1) Data acquisition
- 2) Variable mapping
- 3) Select variables for chart preparation
- 4) Click Insert → Charts → Recommended Charts
- 5) Customize Chart Title, Legends, Charts axis as per requirement

The dataset below is comparing the prices of commodities at Shop-A and Shop-B

**Table 18.2: Commodity Price**

Commodity	Price A	Price B	Status
Rice (per Kg.)	100.00	120.00	Shop-B
Refined Oil (Per Litre)	85.00	92.00	Shop-B
Butter (500 Gms.)	180.00	169.00	Shop-A
Butter (100 Gms.)	45.00	43.00	Shop-A

The charts for above data set shall be displayed as follows:



**Fig. 18.4: Commodity Price Comparison**

While customizing the chart, there are following provisions available:

- 1) Layout options helps in choosing the layout of chart and its interaction with the text around it.
- 2) Title, legends, grid lines and data labels can be added or removed from existing charts using chart elements section of customization.

- 3) While displaying the chart, there are style options available to choose.
- 4) There is an option of filtering amongst all the elements and data labels available for display.

## 18.5 CROSS TABULATION AND CHARTING

Pivot tables are used for cross tabulation of data, and pivot charts are used in charting the cross tabulated data. It is a process to validate the relationship amongst various variables; it helps in setting up correlations amongst them. Pivot table are used to rearrange different variables having data in respective columns; furthermore, they are analyzed to generate required report.

Steps for using pivot table:

- Arrange data in rows and columns in a worksheet.
- Insert → Pivot Table → Select the rows and column to be used

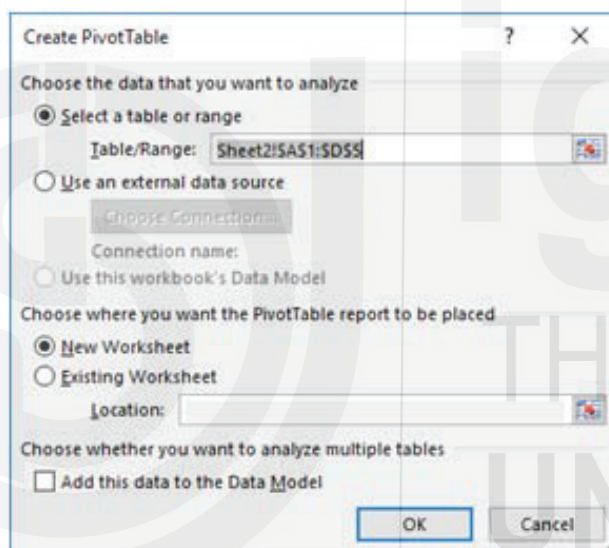


Fig. 18.5: Cross Tab - Pivot Table

- A new worksheet generated with interface of generating Pivot Table.

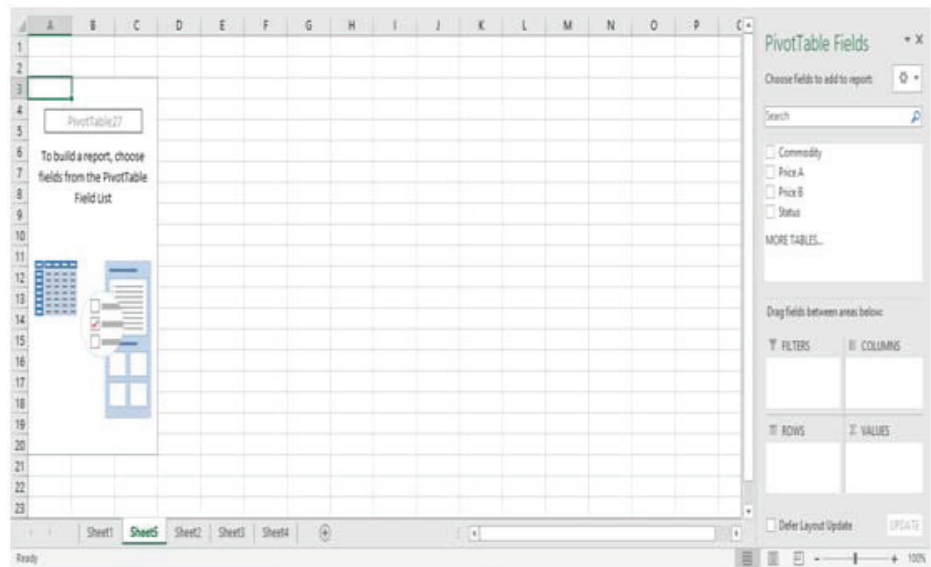


Fig. 18.6: Interface of Pivot Table Generation

- Select the fields for drag and drop as filters, columns or rows.
- Fine-tune your calculations by choosing aggregation functions in values.
- Automatically, the pivot table starts getting shaped up

Detailed outcomes for selected criteria are shown in Figure 18.7.

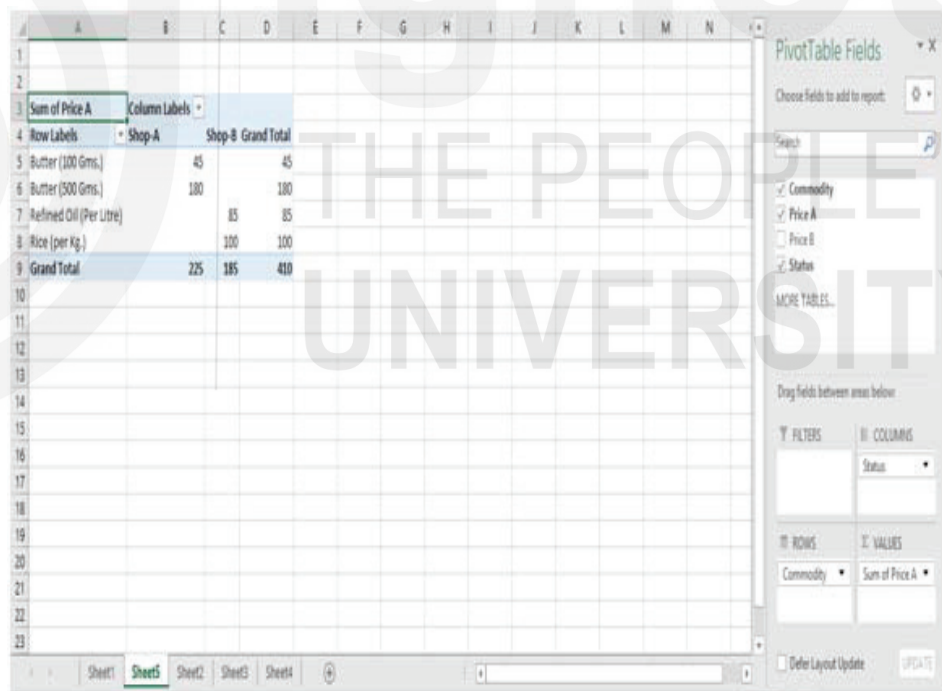


Fig. 18.7: Pivot Table

### Check Your Progress A

1) What are charts in MS Excel?

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2) What are the two basic types of data variables?

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3) While displaying percentages as data, which kind of chart is the best possible way to visualize the dataset?

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4) What is the role of Pivot Tables?

.....

.....

.....

.....

## 18.6 LET US SUM UP

Graphical representation is important for any kind of presentation. It makes the dataset look more readable and understandable for the audience. Pivot tables and Pivot charts are a necessity in today's Analytics Industry. These are the basic requirements from any person who wants to enter this kind of industry. They help interpreting the data in a more effective and efficient way. Check and complete the below case study to understand the topic, better:

Date	Day	Staff Name	Job Name	Category	TaskLabel	Time
4-Feb-19	Monday	Andrew	Maxell	N/A	Project Management	1:45
4-Feb-19	Monday	Andrew	Maxell	N/A	Release & DevOps	4:50
4-Feb-19	Monday	Betty	[PMT] Project Monitoring Tool	Technical Planning	Tech Management	0:30
4-Feb-19	Monday	Betty	General - day to day activities	Project Management	Meetings, Outings, Team catch-ups	2:00
4-Feb-19	Monday	Betty	PI FAM - RMM Tool	Requirement Gathering & Analysis	Development/Testing/Deployment of Interactive Flowchart	2:00
4-Feb-19	Monday	Calvin	Pre-Sales	Requirement Gathering & Analysis	Miscellaneous pre-sales	1:00
4-Feb-19	Monday	Daniel	#Unmissable Website Phase 2	FED	Deployment	6:30
4-Feb-19	Monday	Jamie	Hovis Design & Development Build	Design	Design	5:31
4-Feb-19	Monday	John	General - day to day activities	N/A	HR Functions (Recruitment, Interview, PR etc.)	0:45
4-Feb-19	Monday	John	General - day to day activities	Internal Meetings / DSM	Meetings, Outings, Team catch-ups	1:00
4-Feb-19	Monday	John	Maxell	Testing	Testing & feedback implementation	2:00
4-Feb-19	Monday	Kerry	General - day to day activities	Internal Meetings / DSM	Meetings, Outings, Team catch-ups	1:00
4-Feb-19	Monday	Kerry	General - day to day activities	Internal Meetings / DSM	Meetings, Outings, Team catch-ups	1:10
4-Feb-19	Monday	Marvel	Maxell	Development	Core Development	5:00
4-Feb-19	Monday	Marvel	Maxell	DevOps	Planning & setup	3:00
4-Feb-19	Monday	Neal	Maxell	Development	Core Development	6:00
4-Feb-19	Monday	Oscar	SecuEnvoy Support - Feb - March 19	N/A	Account Management	0:20
4-Feb-19	Monday	Stacy	General - day to day activities	N/A	Meetings, Outings, Team catch-ups	0:30
4-Feb-19	Monday	Stacy	General - day to day activities	Project Management	Meetings, Outings, Team catch-ups	0:40
4-Feb-19	Monday	Stacy	Pre-Sales	Project Management	Miscellaneous pre-sales	0:30
4-Feb-19	Monday	Stacy	Pre-Sales	Project Management	Miscellaneous pre-sales	0:30
4-Feb-19	Monday	Tony	General - day to day activities	Internal Meetings / DSM	Meetings, Outings, Team catch-ups	1:10

Fig.18.8: Example - Pivot Table and Charts

Now insert a pivot table for the given dataset and a pivot chart for the same. Then try to analyze your findings.

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## 18.7 KEY WORDS

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**Charts:** Charts are the set of display tools used to present datasets varied in their size depending upon the problem and its objective is to easy-to-understand chart formats to reflect the inference.

**Continuous Variables:** These variables are measured through continuous scale; they have decimal places depending upon the measuring capacity of the instrument like weighing scale, length measuring tapes, and stopwatch.

**Discrete Variables:** These variables are measured through numerical values stored against some mathematical functions used for aggregation of some whole numbers as if the count of students attended the class.

**Dichotomous Variables:** A dichotomous variable is one that takes on one of only two possible values when observed or measured. The value is most often a representation for a measured variable. These variables are binary in nature means having two states to record.

**Pivot Table:** Pivot table is used to rearrange different variables having data in respective columns; furthermore, they are analyzed to generate required report.

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## 18.8 TERMINAL QUESTIONS

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- 1) Explain the usage of different charts in provision of information using data sets in Excel.
- 2) How does a cross tab query can be generated in Excel?
- 3) How do Pivot charts help in understanding the outcome of cross tabulation of data set?
- 4) Explain the following types of charts:
  - 1) Pie Charts
  - 2) Histogram
  - 3) Stock Charts

**Note:** These questions are helpful to understand this unit. Do efforts for writing the answer of these questions but do not send your answer to university. It is only for yours practice.

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## UNIT 19 ADVANCED OPTIONS IN SPREADSHEETS

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### Structure

- 19.0 Objectives
- 19.1 Introduction
- 19.2 Sorting Data
- 19.3 Filtering Data
- 19.4 Searching Data
  - 19.4.1 Lookup
  - 19.4.2 Referencing
- 19.5 Frequency Distribution Using Array Formulas
- 19.6 Loading Data analysis ToolPak
- 19.7 Descriptive Statistics
- 19.8 Correlation & Regression
- 19.9 Hypothesis Testing
- 19.10 Let Us Sum Up
- 19.11 Key Words
- 19.12 Terminal Questions

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### 19.0 OBJECTIVES

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After completing this unit, you should be able to:

- understand the process to sort the data in Excel;
- understand the basic features of Excel such as sorting of data in worksheets and computation of data with formulas;
- understand the filtering of data as per the parameters provided;
- search the data using lookup tables;
- analyze the data using descriptive statistics;
- use correlation and regression for decision making for the given dataset;  
and
- solve the problems using hypothesis testing.

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## 19.1 INTRODUCTION

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Spreadsheets are grid-based files designed to organize information and perform calculations with scalable entries. People all around the world use spreadsheets to create tables for any personal or business need. However, spreadsheets have grown from simple grids to powerful tools, functioning like databases or apps that perform numerous calculations on a single sheet. In businesses spreadsheets can be used to determine mortgage payments over time or to help in calculating the depreciation of assets and to see how it will affect business taxes. The data between several sheets can be combined to visualize it in color coded tables for an at-a-glance understanding.

With over 400 functions, MS Excel is more or less the most comprehensive spreadsheet option when it comes to pure calculations. It also has strong visualization abilities, including conditional formatting, Pivot Tables, SmartArt, graphs, and charts. Home and business users alike can create powerful spreadsheets and reports to track data and inform their decisions. Advanced options in spreadsheets such as data searching, filtering, sorting, frequency distribution, descriptive statistics, referencing etc. as explained in detail in the further sections of this unit helps businesses greatly in speedy calculations.

Various advanced, spreadsheet features are required for those aspirants who would like to go for office automation. Organizations need most of the work is to be done without any human errors, thus task automation is the only way out. Thus, understanding and implementation of processes and formulas in this chapter shall help the users.

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## 19.2 SORTING DATA

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Sorting is a basic but, an important feature in MS Excel. The raw data is always required to be sorted, before it can be analysed and interpreted further. To apply sorting on data, there are numerous ways available in MS Excel. Sorting can be done, either on the whole sheet or on some specific cell range. Different kinds of Sorting like Alphabetical, Chronological or by Color are available in MS Excel.

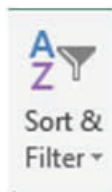
To sort a particular set of data, follow the below steps:

- 1) Select the range of data to be sorted.

	A	B	C	D	E	F
1	Product	Quantity	Price	Amount		
2	Laptop	8	35000	280000		
3	Desktop	5	30000	150000		
4	Smart Phones	10	25000	250000		
5	Ear Phones	20	600	12000		
6	Head Phones	10	1000	10000		
7	Covers & Cases	20	300	6000		
8	Chargers & Data Cables	20	200	4000		
9						
10						
11						

Fig. 19.1: Selecting the Data

2) Click on the Sort & Filter Button under the Menu Ribbon.



3) Once clicked, a drop-down list would appear, stating the order of sorting to be applied on the data, whether “A to Z”, “Z to A” or a Custom List. Select the desired type. Let’s choose “A to Z”.

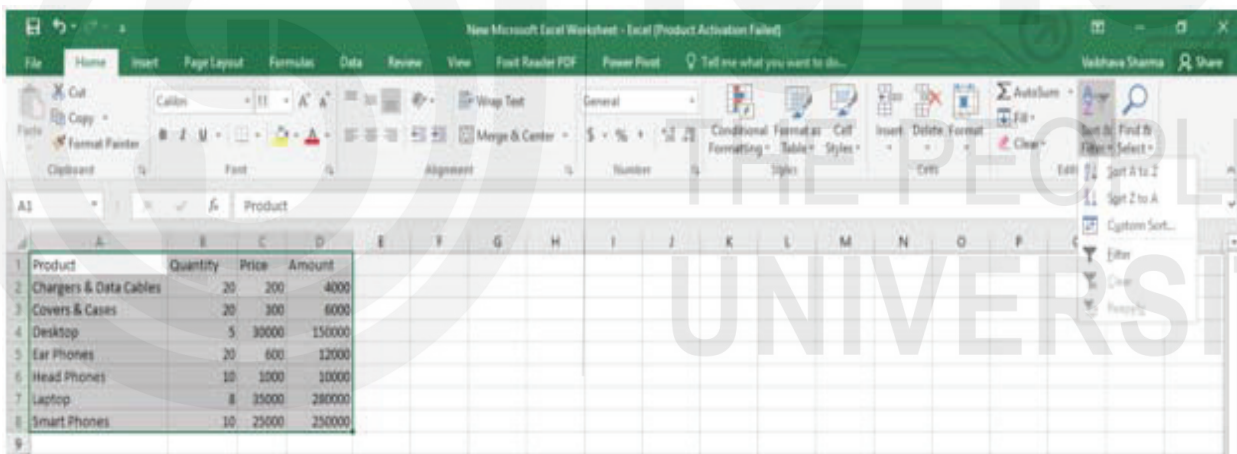


Fig. 19.2: Drop-Down List of Sort & Filter

4) The data would then appear like in Figure 19.3.

	A	B	C	D	E
1	Product	Quantity	Price	Amount	
2	Chargers & Data Cables	20	200	4000	
3	Covers & Cases	20	300	6000	
4	Desktop	5	30000	150000	
5	Ear Phones	20	600	12000	
6	Head Phones	10	1000	10000	
7	Laptop	8	35000	280000	
8	Smart Phones	10	25000	250000	
9					
10					
11					

Fig. 19.3: Result of Sort A to Z

- 5) Alternatively, a keyboard shortcut of “Ctrl+Shift+L” can also be used after Step 1.
- 6) Then each column of the header row would get separate drop-down list. Then using that list, the data can be sorted according to any column head, whether Smallest to Largest or Largest to Smallest.

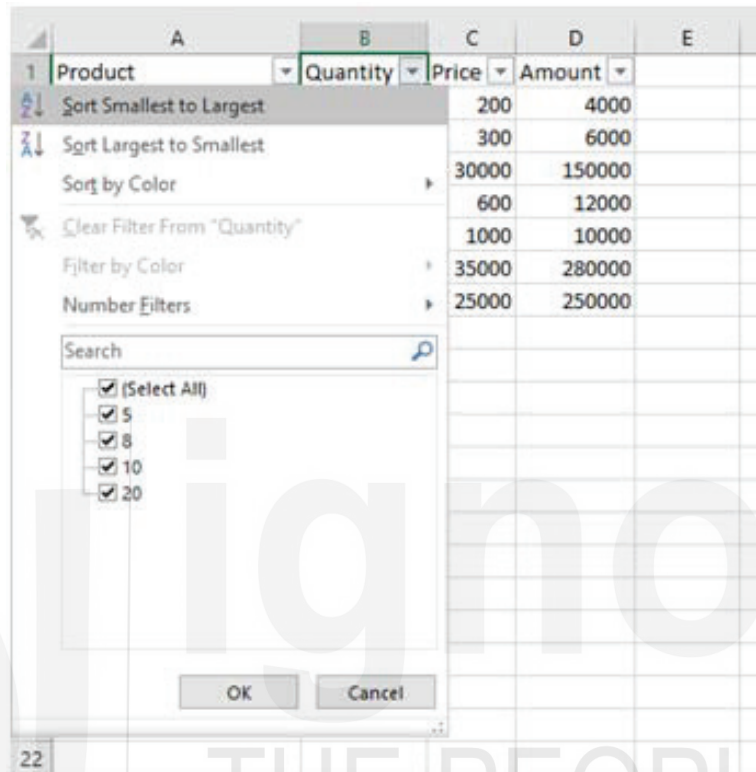


Fig. 19.4: Sort using "Ctrl+Shift+L"

### 19.3 FILTERING DATA

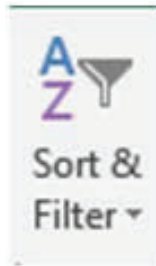
Like sorting, filtering the data is equally important for analyzing it effectively. Sort & Filter go hand in hand. They are usually used together. The ways to apply a filter are same as applying a sort on the data. Similar to sorting, there are some other filter options also available, like Number Filters and Text Color Filters and Cell Color Filters.

Product	Quantity	Price	Amount
Laptop	8	35000	280000
Desktop	5	30000	150000
Smart Phones	10	25000	250000
Ear Phones	20	600	12000
Head Phones	10	1000	10000
Covers & Cases	20	300	6000
Chargers & Data Cables	20	200	4000

Fig. 19.5: Selecting the data

To filter a particular set of data, follow the below steps:

- 1) Select the range of data to be sorted.
- 2) Click on the Sort & Filter Button under the Menu Ribbon.



- 3) Once clicked, a drop-down list would appear, an option for Filter would appear, click that option for applying filter on your dataset.

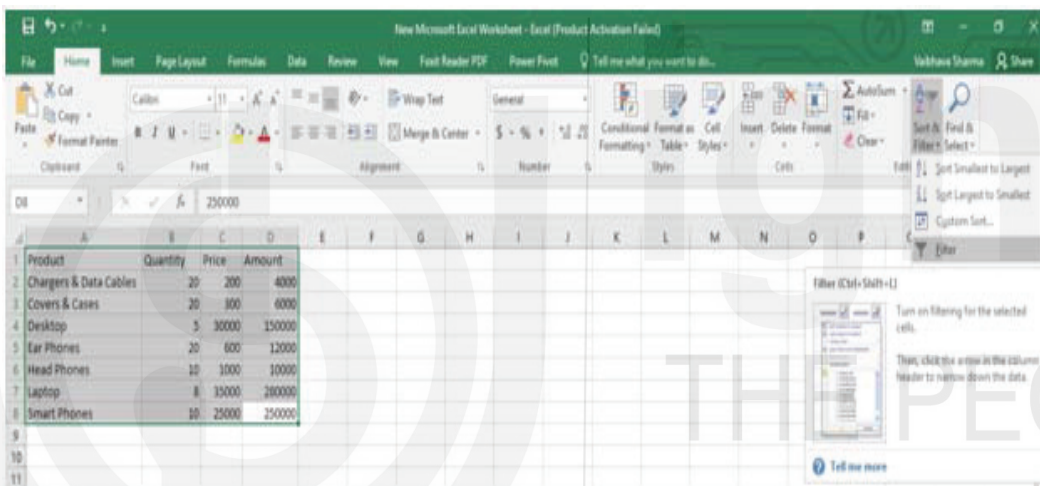


Fig. 19.6: Drop-Down list of Sort & Filter

- 4) Once clicked, the dataset would appear like in figure 19.7 below:

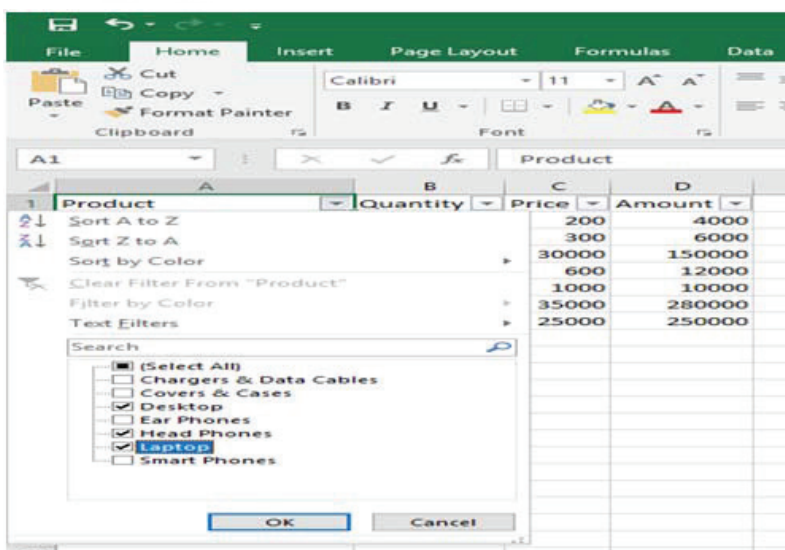


Fig. 19.7: Result of Sort & Filter Option

- 5) Then we can use the drop-down list on the header row of the data set to filter the data accordingly. For example, as shown in figure 19.8 below:

	A	B	C	D
1	Product	Quantity	Price	Amount
2	Chargers & Data Cables	20	200	4000
3	Covers & Cases	20	300	6000
4	Desktop	5	30000	150000
5	Ear Phones	20	600	12000
6	Head Phones	10	1000	10000
7	Laptop	8	35000	280000
8	Smart Phones	10	25000	250000
9				
10				
11				
12				

Fig. 19.8: Selected Items to filter

- 6) As the items are selected in figure 19.8, this will result as in figure 19.9 given below:

	A	B	C	D
1	Product	Quantity	Price	Amount
4	Desktop	5	30000	150000
6	Head Phones	10	1000	10000
7	Laptop	8	35000	280000
9				
10				

Fig. 19.9: Result of Filter

- 7) Alternatively, a keyboard shortcut of “Ctrl+Shift+L” can also be used to apply filters to a dataset.

## 19.4 SEARCHING DATA

The dataset in MS Excel are usually large and the analysis becomes cumbersome as the dataset increases. If we need to search for some particular item in the whole dataset, MS Excel includes an option to find.

Use the following steps to find an item in the dataset:

- 1) The dataset consists of the “ID” of students and their respective marks in each of the three subjects.
- 2) Now, for example if we need to find the marks for a particular student, we can use Find option in MS Excel for that.
- 3) Use the Find & Select option provided in the Menu Ribbon under the Home Tab.

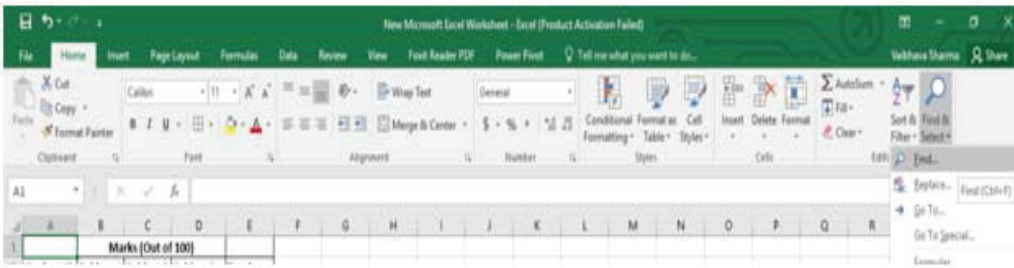


Fig. 19.10: Find & Select Option

- 4) Click on the Find option. A dialog box would appear as shown in figure 19.11 below:

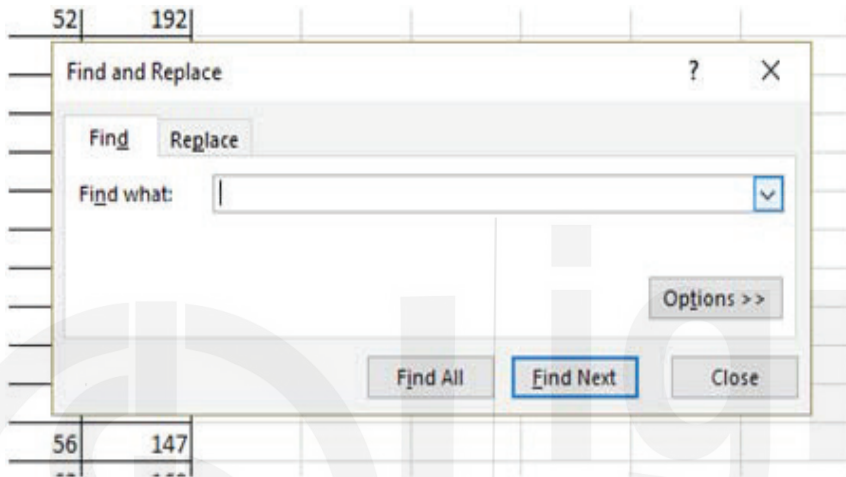


Fig. 19.11: Find & Replace Dialog Box

- 5) Now we can search for whatever we want to find. Say, we need to know the marks of the student with ID – 4776. We will type in “4776” in the search bar of the dialog box.

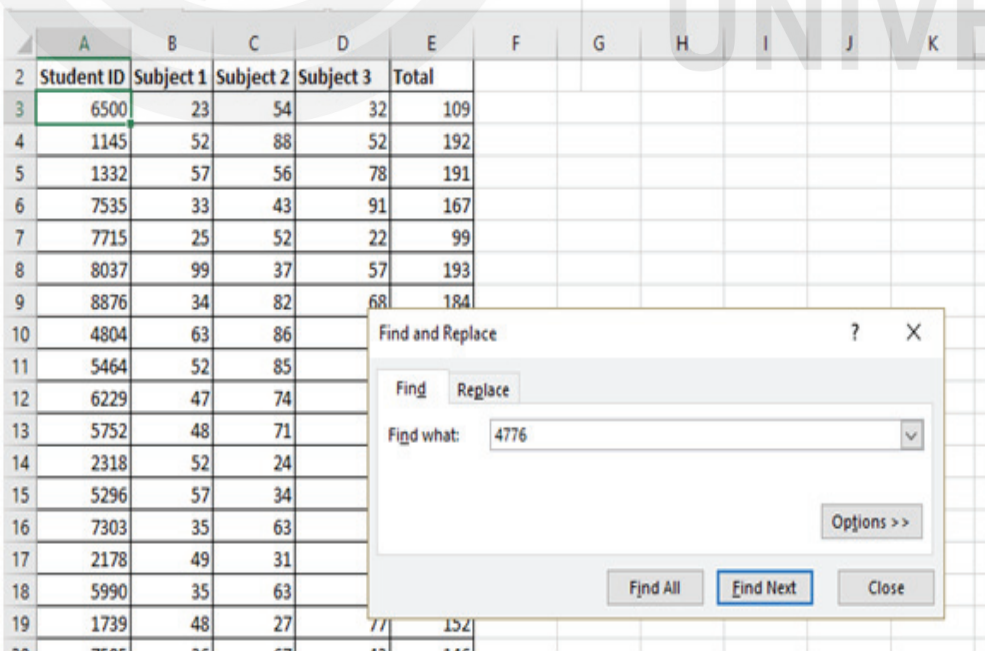


Fig. 19.12: Searching in Find & Replace

- 6) Once we press “Find Next”, it will search for the item in the dataset. If the item exists in the dataset, it will show that item, as in figure 19.13 below:

82	2329	94	79	95	268
83	3585	96	86	90	272
84	4054	100	42	28	170
85	6352	76	21	71	168
86	2462	66	86	47	199
87	2618	38	81	55	174
88	4776	55	74	27	156
89	1625	81	68	83	232
90	7309	22	86	94	202
91	5637	37	91	25	153
92	2827	64	53	31	148
93	6819	83	32	79	194
94	4174	75	58	72	206

Fig. 19.13: Search results

- 7) If the item does not exist in the dataset, it will return with an error prompt as in figure 19.14 below:

The screenshot shows a Microsoft Excel spreadsheet with columns A through O. Column A is labeled 'Student ID', B is 'Subject 1', C is 'Subject 2', D is 'Subject 3', and E is 'Total'. The data rows are numbered 3 to 21. An error prompt dialog box is displayed over the spreadsheet, stating 'Microsoft Excel' and 'We couldn't find what you were looking for. Click Options for more ways to search.' Below the error prompt, the 'Find and Replace' dialog box is open, showing 'Find what: 4776' and 'Find Next' is highlighted.

Fig. 19.14: Search Error Prompt

- 8) Alternatively, we can use a keyboard shortcut “Ctrl+F”, to trigger the Find & Replace dialog box and find an item from the dataset.

### 19.4.1 Lookup

LOOKUP function in MS Excel is used to look in a single row or a column and to find a value from the same position in another row or a column. Its functionality is limited, because it is not entirely eligible to handle situations where an array is involved. Therefore, we use the other two powerful LOOKUP functions. There are mainly two types of Lookup functions in MS

Excel, namely “HLOOKUP” and “VLOOKUP”. HLOOKUP is the Horizontal Lookup and VLOOKUP is the Vertical Lookup.

Below is an example of “VLOOKUP”. Let us say we want to look for the total marks for a particular Student ID. We will use the formula as shown in figure 19.15 below:

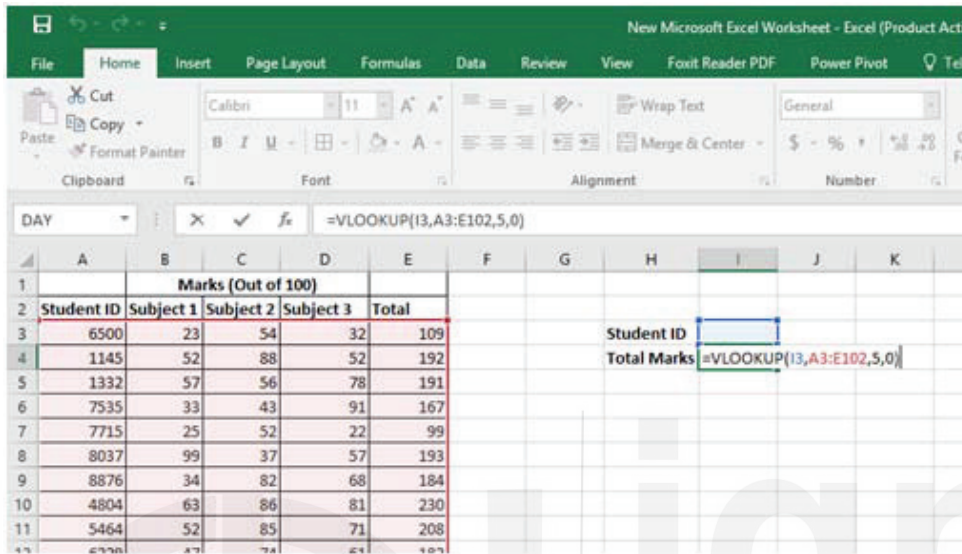


Fig. 19.15: VLOOKUP Formula

The syntax for VLOOKUP is as follows:

`=VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])`

The formula will return the total marks in cell “I4”, referring to the Student ID entered in Cell “I3”. For example, we put in “1073” as student ID. It returned with the total marks as it can be seen in the figure 19.16 below:

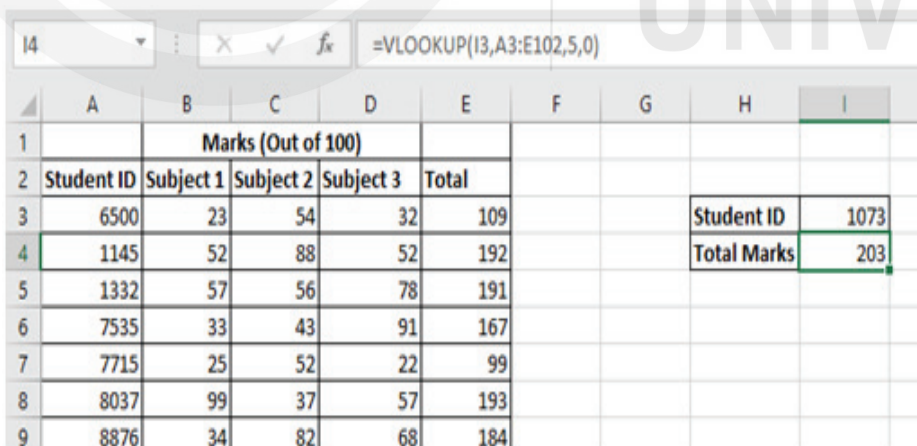


Fig. 19.16: Result of VLOOKUP

## 19.4.2 Referencing

Cell referencing is an important feature of MS Excel. It refers to a cell or a range of cells on a sheet, which is to be used in a formula so that MS Excel can find those values, that is required by the formula to be used.

A cell reference can be used to refer to:

- 1) Data from one or more contiguous cells on the worksheet
- 2) Data contained in different areas of a worksheet.
- 3) Data on the other worksheets in the same workbook.

Below are some examples of the cell referencing formulas that are used in MS Excel:

**Table 19.1: Cell Referencing Formulas**

Formula	Refers to	returns
<b>=b4</b>	Cell B4	The value in the Cell B4.
<b>=a4:c8</b>	Cells from A4 through C8	Values in all the cells. To use this referencing, we need to press “Ctrl+Shift+Enter” when the formula is entered.
<b>=Sheet2!B1</b>	Cell B1 on Sheet2	The value in B1 on Sheet2.

The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G
1		Marks (Out of 100)					
2	Student ID	Subject 1	Subject 2	Subject 3	Total		
3	6500	23	54	32	109		52
4	1145	52	88	52	192		
5	1332	57	56	78	191		
6	7535	33	43	91	167		
7	7715	25	52	22	99		
8	8037	99	37	57	193		

**Fig. 19.17: "=B4"**

- 1) “=B4” :-
- 2) “=A4:C8” :-

For using this cell reference, we first need to select the area in which we need the array to fill the values. Since it is A4:C8, it means three columns and four

rows. Therefore, we will select such an area with three columns and four rows.

The screenshot shows an Excel spreadsheet with a table of marks. The table has columns for Student ID, Subject 1, Subject 2, Subject 3, and Total. A range of cells (G3:H6) is selected, containing the values 1145, 52, 88, 1332, 57, 56, 7535, 33, 43, and 7715, 25, 52.

Marks (Out of 100)				
Student ID	Subject 1	Subject 2	Subject 3	Total
6500	23	54	32	109
1145	52	88	52	192
1332	57	56	78	191
7535	33	43	91	167
7715	25	52	22	99
8037	99	37	57	193
8876	34	82	68	184

Fig. 19.18: "={A4:C8}"

3) "={Sheet2!B1}" :-

The screenshot shows the same table of marks as in Fig. 19.18. A single cell (G3) is selected, containing the value 1.

Marks (Out of 100)				
Student ID	Subject 1	Subject 2	Subject 3	Total
6500	23	54	32	109
1145	52	88	52	192
1332	57	56	78	191

Fig. 19.19: "={Sheet2!B1}"

## 19.5 FREQUENCY DISTRIBUTION USING ARRAY FORMULAS

Frequency distribution table is a useful statistic that shows the separate values for various outcomes in a sample data set. The values are the number of times that particular outcome has occurred in the sample data set. Using MS Excel's formula "FREQUENCY", we can create a frequency distribution table for a particular data set.

For example, let us take the below data set in figure 19.20 as a sample.

The screenshot shows an Excel spreadsheet with a larger table of marks. The table has columns for Student ID, Subject 1, Subject 2, Subject 3, and Total. The data is as follows:

Marks (Out of 100)				
Student ID	Subject 1	Subject 2	Subject 3	Total
6500	23	54	32	109
1145	52	88	52	192
1332	57	56	78	191
7535	33	43	91	167
7715	25	52	22	99
8037	99	37	57	193
8876	34	82	68	184
4804	63	86	81	230
5464	52	85	71	208
6229	47	74	61	182

Fig. 19.20: Sample dataset

Now we will use the “FREQUENCY” Formula on this data set. Remember we need to use the array formula here, that is, we need to select the area of cells for the frequency table to set in and use “Ctrl+Shift+Enter” to enter the formula.

Syntax for FREQUENCY is as follows:

=FREQUENCY(data\_array, bins\_array)

Marks (Out of 100)					Class	Frequency
Student ID	Subject 1	Subject 2	Subject 3	Total	20	0
6500	23	54	32	109	30	3
1145	52	88	52	192	40	4
1332	57	56	78	191	50	2
7535	33	43	91	167	60	8
7715	25	52	22	99	70	3
8037	99	37	57	193	80	3
8876	34	82	68	184	90	5
4804	63	86	81	230		
5464	52	85	71	208		
6229	47	74	61	182		

Fig. 19.21: Frequency Table

As we can see in the figure 19.21, a frequency table is created with class in the first column and frequency of that class in the second column.

**Check Your Progress A**

1) What are the various data filter options available in MS Excel?

.....

.....

.....

2) What is the syntax for VLOOKUP?

.....

.....

.....

.....

3) Give some examples of cell referencing.

.....

.....

.....

4) Write the syntax for FREQUENCY.

.....

.....

.....

.....

.....

## 19.6 LOADING DATA ANALYSIS TOOLPAK

Data Analysis ToolPak is available in MS Excel to develop and solve complex and more detailed statistical problems. We provide the data set and parameters to the system and it uses the appropriate statistical or engineering tool to solve the problem.

Some tools also make the use of charts for better analysis and the best possible solution for that particular problem. Data analysis can only be used on one worksheet at a time.

See the figure 19.22 for where to find the Data Analysis ToolPak in MS Excel.

- 1) Go To Data tab from the Menu Ribbon
- 2) Click on the “Data Analysis” Option.

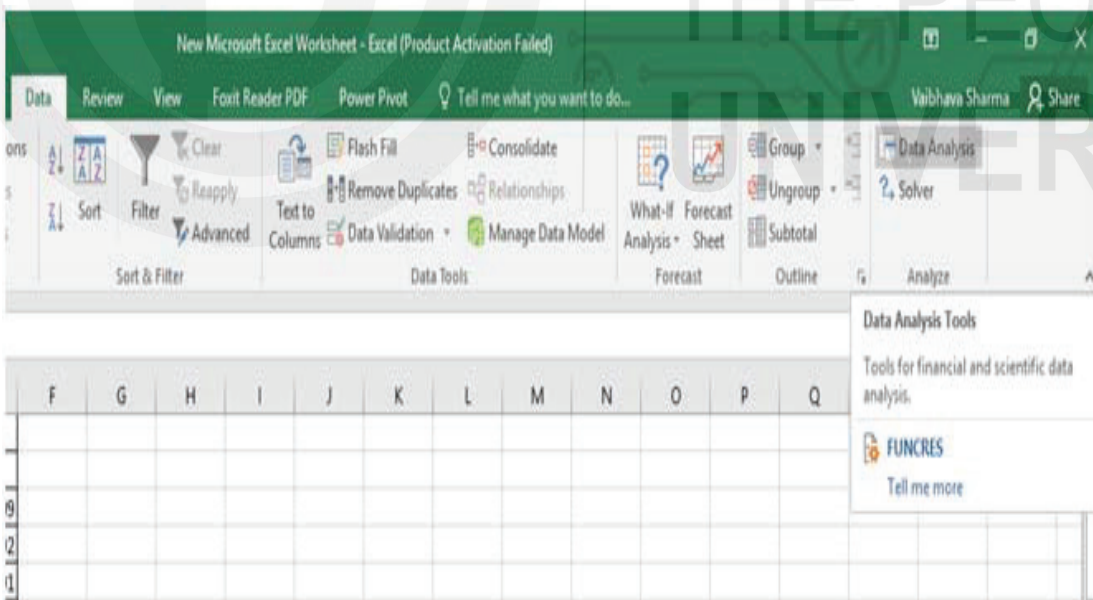


Fig.19.22: Data Analysis ToolPak

3) After clicking on that option, a dialog box appears, as shown in the below figure 19.23.

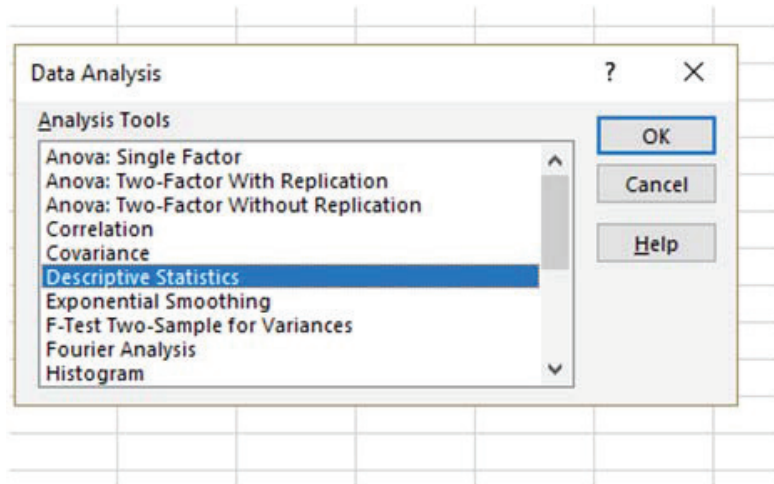


Fig. 19.23: Data Analysis Toolpak Dialog Box

- 4) From here, we can select the statistical tool that we want to apply on our data set.

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## 19.7 DESCRIPTIVE STATISTICS

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Descriptive statistics is a summary of statistical methods, which quantitatively describes or summarizes a sample data set. In MS Excel, it includes methods such as Mean, Standard Deviation, Median, Mode, Range, and Sample Variance and so on.

For example, we want to apply descriptive statistics on the below data set (Figurer. 19.24):-

	A
1	Player Runs in last 20 matches
2	154
3	180
4	118
5	182
6	135
7	70
8	126
9	21
10	158
11	24
12	86
13	49
14	158
15	123
16	21
17	26
18	90
19	5
20	137
21	109
22	

Fig. 19.24: Sample data set for Descriptive statistics

- 1) Click on Data Analysis tab from Data Tab in Menu Ribbon.

- 2) Then select “Descriptive Statistics” from the dialog box that appears on screen.
- 3) After that, following dialog box would appear.

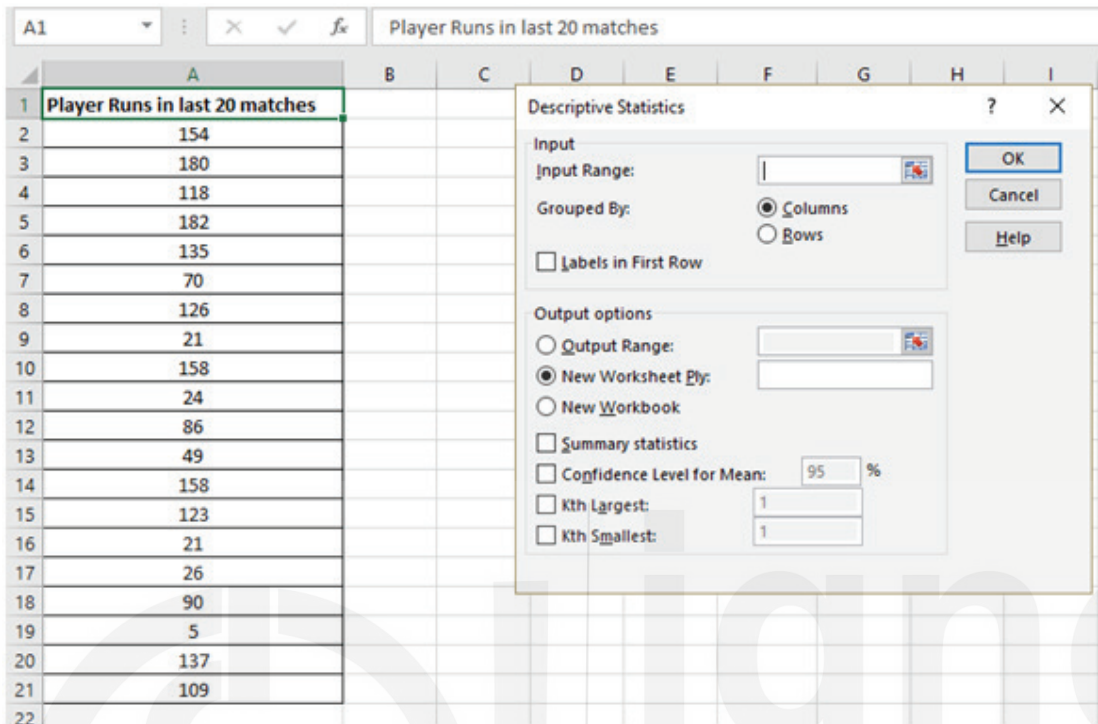


Fig. 19.25: Descriptive Statistics Dialog box

- 4) Then put in the set of options or as required for the analysis. For example, we have applied the below stated options for this analysis example.

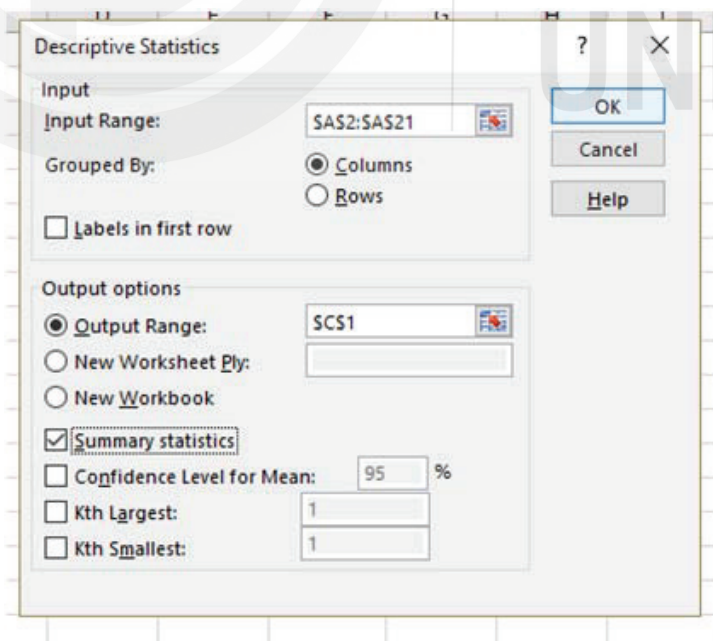


Fig. 19.26: Descriptive Statistics Options

- 5) After pressing OK, following table will be created.

	A	B	C	D
1	Player Runs in last 20 matches		Column1	
2	154			
3	180		Mean	98.6
4	118		Standard Error	12.92578003
5	182		Median	113.5
6	135		Mode	21
7	70		Standard Deviation	57.80584563
8	126		Sample Variance	3341.515789
9	21		Kurtosis	-1.29819608
10	158		Skewness	-0.255357765
11	24		Range	177
12	86		Minimum	5
13	49		Maximum	182
14	158		Sum	1972
15	123		Count	20
16	21			
17	26			
18	90			
19	5			
20	137			
21	109			
22				

Fig. 19.27: Descriptive Statistics Result

## 19.8 CORRELATION & REGRESSION

Correlation & Regression are also applied through the Data Analysis ToolPak from MS Excel.

To assess the strength of the linear relationship between a pair of variables, correlation coefficients are put to use. Similarly, to assess that how many of the independent variables are related to the dependent variable, and the strength of their bond, Regression Analysis is put to use.

### Correlation:

- 1) Let us take the below stated example.

	A	B
1	Player Runs in last 20 matches	Team Total Runs
2	154	394
3	180	389
4	118	256
5	182	354
6	135	198
7	70	300
8	126	259
9	21	364
10	158	301
11	24	145
12	86	246
13	49	288
14	158	267
15	123	308
16	21	360
17	26	234
18	90	239
19	5	201
20	137	350
21	109	295
22		

Fig. 19.28: Example for Correlation

- 2) Now, similar to Descriptive Statistics we will use the Data Analysis ToolPak.
- 3) This time the following dialog box would show up.

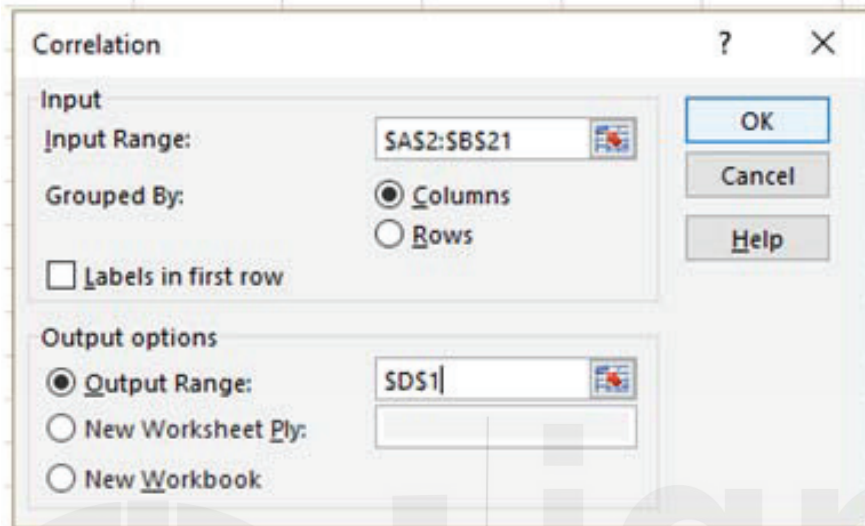


Fig. 19.29: Correlation Dialog Box

- 4) You can choose to keep the same settings as in Fig.19.29, or choose your own settings according to the requirements.
- 5) This would result in the following result (Fig.19.30)

	Column 1	Column 2
Column 1	1	
Column 2	0.394	1

Fig. 19.30: Correlation Result

- 6) The result shows a positive correlation of 0.394 in the Runs scored by the Player in a match and the Total runs of the team in that match.

### Regression:

- 1) Let us take the below stated example. We want to predict the Team score if we know the runs scored by Player 1 and Player 2.

	A	B	C
1	Player 1	Player 2	Team Total Runs
2	41	42	394
3	45	30	389
4	45	76	256
5	16	30	354
6	61	93	198
7	108	10	300
8	17	28	259
9	70	64	364
10	113	2	301
11	87	30	145
12	62	2	246
13	60	64	288
14	62	89	267
15	116	45	308
16	49	76	360
17	20	84	234
18	83	114	239
19	48	92	201
20	19	46	350
21	12	26	295
22			

Fig. 19.31: Regression Example

- 2) Similar to Correlation, we will follow the same process to reach the below given dialog box. (Fig.19.32)

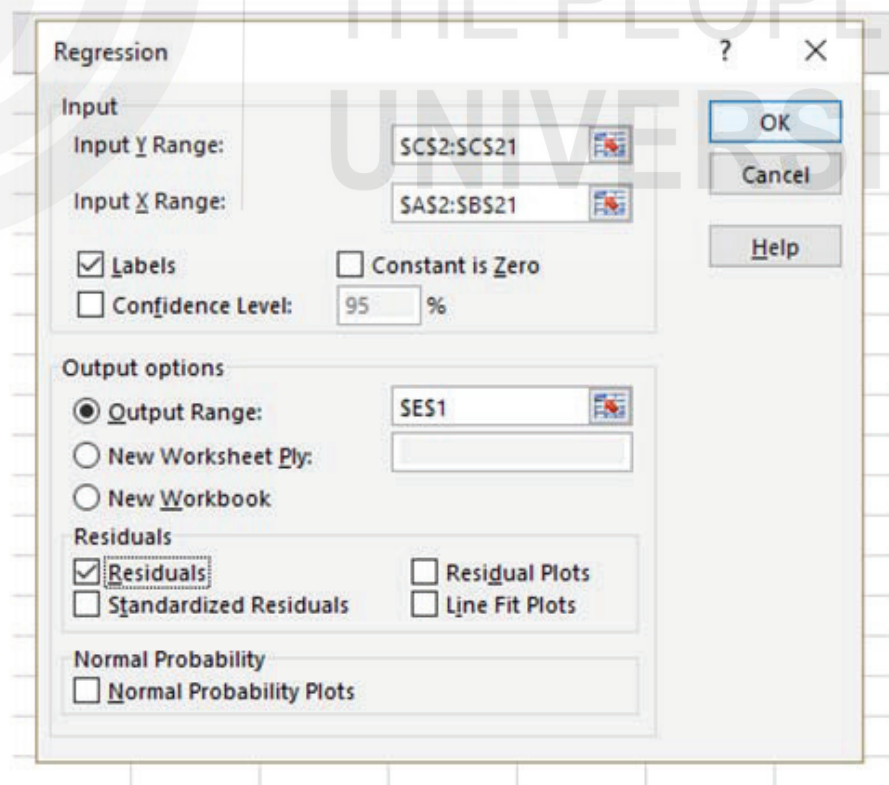


Fig. 19.32: Regression Dialog Box

- 3) You can choose to keep the same settings as in Fig.19.32, or choose your own settings according to the requirements.
- 4) After clicking OK, it will result in the following figure (Fig.19.33 & 19.34).
- 5) There will be two kinds of output.

a. Summary Output

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.319							
R Square	0.102							
Adjusted R Square	-0.010							
Standard Error	64.835							
Observations	19							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	2	7638.212	3819.106	0.909	0.423			
Residual	16	67256.946	4203.559					
Total	18	74895.158						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	331.158	41.133	8.051	0.000	243.960	418.356	243.960	418.356
41	-0.355	0.467	-0.759	0.459	-1.345	0.636	-1.345	0.636
42	-0.550	0.457	-1.204	0.246	-1.518	0.419	-1.518	0.419

Fig. 19.33: Summary Output

b. Residual Output

RESIDUAL OUTPUT		
<i>Observation</i>	<i>Predicted 394</i>	<i>Residuals</i>
1	299	90
2	273	-17
3	309	45
4	258	-60
5	287	13
6	310	-51
7	271	93
8	290	11
9	284	-139
10	308	-62
11	275	13
12	260	7
13	265	43
14	272	88
15	278	-44
16	239	0
17	264	-63
18	299	51
19	313	-18

Fig. 19.34: Residual Output

## 19.9 HYPOTHESIS TESTING

Hypothesis testing in MS Excel are available in various types (figure 19.35):

- t-Test: Paired two sample for means
- t-Test: Two-Sample Assuming Equal Variances
- t-Test: Two-Sample Assuming Unequal Variances
- z-Test: Two-Sample for Means

Hypothesis Testing is used when we need to check whether the solution is moving in the correct direction according to the problem, or not. It is a statistical method used to make decisions by using sample data, out of the population.

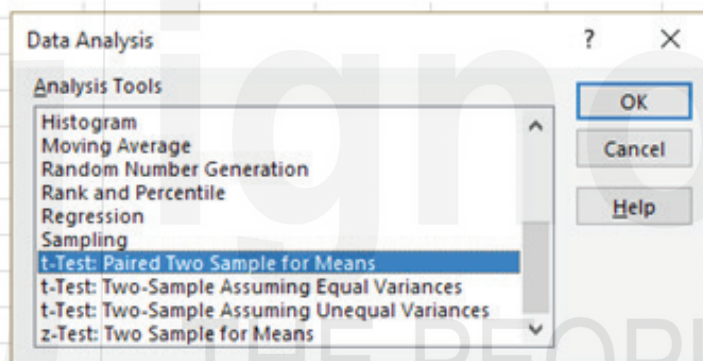


Fig. 19.35: Types of Hypothesis Testing

We will take the same example as taken for Regression in figure 19.31. We will use the t-Test: Paired Two Sample for Means for this example. After we select this option from the Data Analysis ToolPak, following dialog box would appear as shown in figure 19.36.

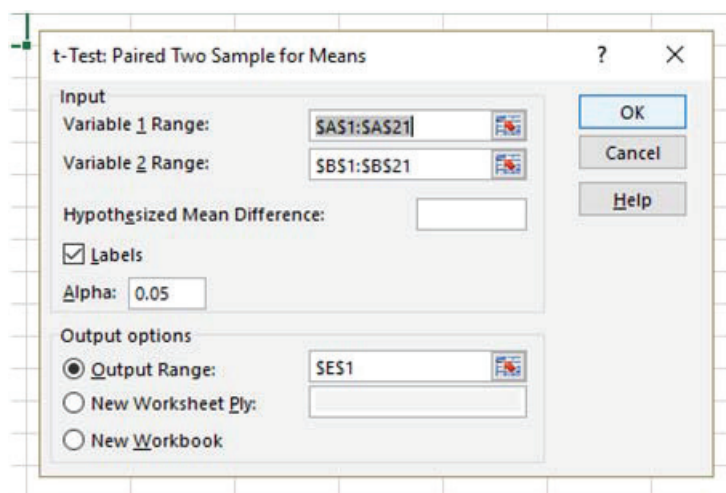


Fig. 19.36: Hypothesis Testing Dialog Box

The result of this selection would appear as follows: (Fig 19.37)

t-Test: Paired Two Sample for Means		
	Player 1	Player 2
Mean	56.700	52.150
Variance	1044.432	1084.766
Observations	20.000	20.000
Pearson Correlation	-0.121	
Hypothesized Mean Difference	0.000	
df	19.000	
t Stat	0.416	
P(T<=t) one-tail	0.341	
t Critical one-tail	1.729	
P(T<=t) two-tail	0.682	
t Critical two-tail	2.093	

Fig. 19.37: Result of Hypothesis Testing

It results that the Mean Runs scored by Player 1 is 56.7 and Player 2 has 52.15. The Pearson correlation is -0.121, which depicts that they have a weak inverse relation with each other.

**Check Your Progress B**

1) What is Data Analysis ToolPak?

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2) What do you understand by descriptive statistics?

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3) Distinguish between correlation & regression?

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4) What do you understand by hypothesis testing?

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### 19.10 LET US SUM UP

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Sorting is a basic but, an important feature in MS Excel. The raw data is always required to be sorted, before it can be analysed and interpreted further. To apply sorting on data, there are numerous ways available in MS Excel. Like sorting, filtering the data is equally important for analyzing it effectively. Sort & Filter go hand in hand. They are usually used together.

LOOKUP function in MS Excel is used to look in a single row or a column and to find a value from the same position in another row or a column. There are mainly two types of Lookup functions in MS Excel, namely “HLOOKUP” and “VLOOKUP”. HLOOKUP is the Horizontal Lookup and VLOOKUP is the Vertical Lookup.

Data Analysis ToolPak is available in MS Excel to develop and solve complex and more detailed statistical problems. Descriptive statistics is a summary of statistical methods, which quantitatively describes or summarizes a sample data set. In MS Excel, it includes methods such as Mean, Standard Deviation, Median, Mode, Range, and Sample Variance and so on.

Correlation & Regression are applied through the Data Analysis ToolPak from MS Excel. To assess the strength of the linear relationship between a pair of variables, correlation coefficients are put to use. Similarly, to assess that how many of the independent variables are related to the dependent variable, and the strength of their bond, Regression Analysis is put to use.

Hypothesis Testing is used when we need to check whether the solution is moving in the correct direction according to the problem, or not. In MS Excel various types of Hypothesis testing are available; such as t-Test for Paired two sample for means, t-Test for Two-Sample Assuming Equal Variances, t-

Test for Two-Sample Assuming Unequal Variances, z-Test for Two-Sample for Means.

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## 19.11 KEY WORDS

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**Lookup:** LOOKUP function in MS Excel is used to look in a single row or a column and to find a value from the same position in another row or a column. HLOOKUP is the Horizontal Lookup and VLOOKUP is the Vertical Lookup.

**Cell Referencing:** Cell referencing is an important feature of MS Excel. It refers to a cell or a range of cells on a sheet, which is to be used in a formula so that MS Excel can find those values, that is required by the formula to be used.

**Descriptive Statistics:** Descriptive statistics is a summary of statistical methods, which quantitatively describes or summarizes a sample data set. They can be broken down into measures of central tendency and measures of variability (spread).

**Frequency Distribution:** Frequency distribution table is a useful statistic that shows the separate values for various outcomes in a sample data set. The values are the number of times that particular outcome has occurred in the sample data set.

**Correlation:** Correlation analysis is a method of statistical evaluation used to study the strength of a relationship between two, numerically measured, continuous variables. This particular type of analysis is useful when a researcher wants to establish if there are possible connections between variables.

**Regression:** Regression analysis is a set of statistical methods used for the estimation of relationships between a dependent variable and one or more independent variables. It can be utilized to assess the strength of the relationship between variables and for modeling the future relationship between them.

**Hypothesis:** Hypothesis Testing is used when we need to check whether the solution is moving in the correct direction according to the problem, or not. It is a statistical method used to make decisions by using sample data, out of the population.

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## 19.12 TERMINAL QUESTIONS

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- 1) Explain LOOKUP, VLOOKUP and HLOOKUP with examples.
- 2) What are various steps involved in data sorting?
- 3) Explain frequency distribution using array formulas.

- 4) Complete the following table for regression analysis. Write down the appropriate formula in the relevant cells.

	A	B	C	D	E
1	Year	Output	Estimated Output	Slope	?
2	2001	100	?	Intercept	?
3	2002	125	?		
4	2003	190	?		
5	2004	210	?		

- 5) What are the various types available in Excel for hypothesis testing?  
6) What is the significance of Data Analysis ToolPak in MS Excel?

**Note:** These questions are helpful to understand this unit. Do efforts for writing the answer of these questions but do not send your answer to university. It is only for your practice.

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## UNIT 20 CREATING BUSINESS SPREADSHEETS

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### Structure

- 20.0 Objectives
- 20.1 Introduction
- 20.2 Loan & Lease Statements
- 20.3 Ratio analysis
- 20.4 Payroll Statements
- 20.5 Capital Budgeting
- 20.6 Depreciation Accounting
- 20.7 Let Us Sum up
- 20.8 Key Words
- 20.9 Answers to Check Your Progress
- 20.10 Terminal Questions

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### 20.0 OBJECTIVES

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After completing this unit, you should be able to:

- understand the basic features of Excel such as the creation of worksheet and computation of data;
- understand the various reporting implementations of MS Excel in real-time world;
- learn about the industry level reporting requirements;
- know more about loan statements, payroll statements and project management; and
- learn how to analyze data through Ratios and various other financial statements.

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### 20.1 INTRODUCTION

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Business Spreadsheets are becoming a necessity in today's corporate world. Almost every reporting, every analysis and interpretation goes through MS Excel, and it has become a pivot for every single company. Loan Statements, Payroll Statements, Project Management, Risk Analysis and many more reporting statements can be easily prepared in MS Excel. This unit explains almost all the basic kinds of reporting and analysis sheets which can be prepared with the help of MS Excel. From banking sector to manufacturing

sector MS Excel can be utilized to its fullest potential. It makes interpreting easier for the management which helps in taking the efficient decisions.

## 20.2 LOAN & LEASE STATEMENTS

A Loan Statement is a document recorded by the lender, a bank, financial institution. It includes all the information related to the loan, such as, Loan Amount, Interest Rate, Time Period of the Loan, Number of Installments and so on. It is provided to the borrower at every installment period, so that they can make payments before the due date to the lender. It is a legal communication between the lender and the borrower.

A Lease can be defined as a contract between the lessee and the lessor, in which the lessor (landlord) rents the property owned by him/her to the lessee (tenant). The lease statement also includes the information related to the periodical payments to be made by the lessee to the lessor. The asset/property rented is to be returned to the lessor at the end of the contract.

Now let us see how can these statements be prepared in excel. Let us take an example:

A borrowed a loan of Rs.100000 from B, for a period of 5 years to be repaid in equated quarterly installments at an interest rate of 15% p.a. You are required to prepare a loan repayment schedule as per given format:

Amount of Loan	100000			
Periodicity	4			
Years	5			
Rate of Interest	15%			
Amount of Installment				
Installment No.	Opening Balance	Interest	Installment	Closing Balance

Fig. 20.1: Loan & Lease Statement Format

We have 5 columns, which are basic to every loan/lease statement:

- 1) Installment Number
- 2) Opening Balance
- 3) Interest Amount
- 4) Installment Amount
- 5) Closing Balance

First of all, let us have a look at what does Periodicity means.

Periodicity is the repetitive number of time periods, in a year, at the end/at the beginning of which the installment has to be made. In the above example, periodicity is given as 4. It means that the installments are to be made Quarterly, i.e, in every 3 months. Similarly the Interest Rate is also calculated according to the periodicity. Like, in this example, interest will be calculated in every 3 months, i.e:

	A	B	C	D	E	F	G	H
1	Amount of Loan	₹ 100,000.00				Yearly	1	
2	Periodicity	4	Quarterly			Half-Yearly	2	
3	Years	5				Quarterly	4	
4	Rate of Interest	15%				Bi-Monthly	6	
5	Amount of Installment	₹ 7,196.21				Monthly	12	
6								
7	Installment No.	Opening Balance	Interest	Principal	Installment	Closing Balance		
8								
9								
10								
11								
12								
13								
14								

Fig. 20.2: Basic Structure - Loan Statement

**Interest (Quarterly) = (Balance at the end of every installment)\*(Rate of Interest/Periodicity)**

Interest is basically compounded, whenever the installment period ends.

To prepare the Loan/Lease Statement in Excel, we will be following the below steps:

- 1) Create the basic structure in Excel, as given in Figure 20.2.
- 2) Fill in the Number of Installments under Column Installment No.

**Total No. of Installments = Total No. of Years\*Periodicity**

- 3) Then fill in the Opening Balance in, which will be same as the Amount of Loan at the first Installment.
- 4) After that, under the Interest Column, put in the formula, as shown in Figure 20.3.

It states that **Interest =Opening Balance\*(Interest Rate/Periodicity)**

	A	B	C
1	Amount of Loan	₹ 100,000.00	
2	Periodicity	4	Quarterly
3	Years	5	
4	Rate of Interest	15%	
5	Amount of Installment	₹ 7,196.21	
6			
7	Installment No.	Opening Balance	Interest
8	1	₹ 100,000.00	₹ 3,750.00
9			

Fig. 20.3: Formula for Interest Calculation

5) Following that, fill-in the Principal and Installment Column. Installment is already calculated using the following steps:-

- a) We will use the formula –  $\text{PMT}(\text{rate}, \text{nper}, \text{pv}, [\text{fv}], [\text{type}])$  – This is the syntax for the PMT Formula in excel.
  - i) Rate – Interest Rate
  - ii) Nper – No. of Periods
  - iii) Pv – Present Value
  - iv) [fv] – Future Value, it is optional to fill-in
  - v) [type] – Type of Installment payments, i.e, Beginning of period or End of period, it is optional to fill-in.
- b) Select a cell, type in “=PMT(B4/B2, B3\*B2, -B1,0,0)”.
- c) This formula can be explained as
  - i)  $B4/B2$  = Rate of Interest/Periodicity
  - ii)  $B3*B2$  = Years\*Periodicity
  - iii)  $-B1$  = Amount of Loan
- d) This is how the Amount of installment will be calculated.

	A	B	C	D
1	Amount of Loan	₹ 100,000.00		
2	Periodicity	4	Quarterly	
3	Years	5		
4	Rate of Interest	15%		
5	Amount of Installment	₹ 7,196.21		

Fig. 20.4: Installment Amount Calculation

6) Principal is calculated as follows:-

$$\text{Principal} = \text{Installment Amount} - \text{Interest Amount}$$

	A	B	C	D	E
1	Amount of Loan	₹ 100,000.00			
2	Periodicity	4	Quarterly		
3	Years	5			
4	Rate of Interest	15%			
5	Amount of Installment	₹ 7,196.21			
6					
7	Installment No.	Opening Balance	Interest	Principal	Installment
8	1	₹ 100,000.00	₹ 3,750.00	₹ 3,446.21	₹ 7,196.21

Fig. 20.5: Principal Calculation

7) Finally, closing balance is calculated as:

$$\text{Closing Balance} = \text{Opening Balance} - \text{Principal Amount}$$

A	B	C	D	E	F	G
1	Amount of Loan	₹ 100,000.00			Yearly	1
2	Periodicity	4	Quarterly		Half-Yearly	2
3	Years	5			Quarterly	4
4	Rate of Interest	15%			Bi-Monthly	6
5	Amount of Installment	₹ 7,196.21			Monthly	12
6						
7	Installment No.	Opening Balance	Interest	Principal	Installment	Closing Balance
8	1	₹ 100,000.00	₹ 3,750.00	₹ 3,446.21	₹ 7,196.21	₹ 96,553.79

Fig. 20.6: Closing Balance Calculation

8) Now just repeat the above steps and a bank statement like in Figure 20.7 will be created.

7	Installment No.	Opening Balance	Interest	Principal	Installment	Closing Balance
8	1	₹ 100,000.00	₹ 3,750.00	₹ 3,446.21	₹ 7,196.21	₹ 96,553.79
9	2	₹ 96,553.79	₹ 3,620.77	₹ 3,575.44	₹ 7,196.21	₹ 92,978.35
10	3	₹ 92,978.35	₹ 3,486.69	₹ 3,709.52	₹ 7,196.21	₹ 89,268.83
11	4	₹ 89,268.83	₹ 3,347.58	₹ 3,848.63	₹ 7,196.21	₹ 85,420.20
12	5	₹ 85,420.20	₹ 3,203.26	₹ 3,992.95	₹ 7,196.21	₹ 81,427.24
13	6	₹ 81,427.24	₹ 3,053.52	₹ 4,142.69	₹ 7,196.21	₹ 77,284.56
14	7	₹ 77,284.56	₹ 2,898.17	₹ 4,298.04	₹ 7,196.21	₹ 72,986.52
15	8	₹ 72,986.52	₹ 2,736.99	₹ 4,459.22	₹ 7,196.21	₹ 68,527.30
16	9	₹ 68,527.30	₹ 2,569.77	₹ 4,626.44	₹ 7,196.21	₹ 63,900.87
17	10	₹ 63,900.87	₹ 2,396.28	₹ 4,799.93	₹ 7,196.21	₹ 59,100.94
18	11	₹ 59,100.94	₹ 2,216.29	₹ 4,979.92	₹ 7,196.21	₹ 54,121.02
19	12	₹ 54,121.02	₹ 2,029.54	₹ 5,166.67	₹ 7,196.21	₹ 48,954.34
20	13	₹ 48,954.34	₹ 1,835.79	₹ 5,360.42	₹ 7,196.21	₹ 43,593.92
21	14	₹ 43,593.92	₹ 1,634.77	₹ 5,561.44	₹ 7,196.21	₹ 38,032.48
22	15	₹ 38,032.48	₹ 1,426.22	₹ 5,769.99	₹ 7,196.21	₹ 32,262.49
23	16	₹ 32,262.49	₹ 1,209.84	₹ 5,986.37	₹ 7,196.21	₹ 26,276.13
24	17	₹ 26,276.13	₹ 985.35	₹ 6,210.86	₹ 7,196.21	₹ 20,065.27
25	18	₹ 20,065.27	₹ 752.45	₹ 6,443.76	₹ 7,196.21	₹ 13,621.51
26	19	₹ 13,621.51	₹ 510.81	₹ 6,685.40	₹ 7,196.21	₹ 6,936.11
27	20	₹ 6,936.11	₹ 260.10	₹ 6,936.11	₹ 7,196.21	₹ 0.00

Fig. 20.7: Bank Statement

9) Finally, we need to apply one more formula in the statement. This process is called Garbage Cleaning. This is done to limit the bank statement to not letting the Closing Balance to get below zero, into negative amount. It is applied so that the statement is stopped, whenever the closing balance is zero. The formula has to be applied at every row, barring the first row of the statement. Figure 20.8 shows the reason of it's application.

	A	B	C	D	E	F	G
10	3	₹ 92,978.35	₹ 3,486.69	₹ 3,709.52	₹ 7,196.21	₹ 89,268.83	
11	4	₹ 89,268.83	₹ 3,347.58	₹ 3,848.63	₹ 7,196.21	₹ 85,420.20	
12	5	₹ 85,420.20	₹ 3,203.26	₹ 3,992.95	₹ 7,196.21	₹ 81,427.24	
13	6	₹ 81,427.24	₹ 3,053.52	₹ 4,142.69	₹ 7,196.21	₹ 77,284.56	
14	7	₹ 77,284.56	₹ 2,898.17	₹ 4,298.04	₹ 7,196.21	₹ 72,986.52	
15	8	₹ 72,986.52	₹ 2,736.99	₹ 4,459.22	₹ 7,196.21	₹ 68,527.30	
16	9	₹ 68,527.30	₹ 2,569.77	₹ 4,626.44	₹ 7,196.21	₹ 63,900.87	
17	10	₹ 63,900.87	₹ 2,396.28	₹ 4,799.93	₹ 7,196.21	₹ 59,100.94	
18	11	₹ 59,100.94	₹ 2,216.29	₹ 4,979.92	₹ 7,196.21	₹ 54,121.02	
19	12	₹ 54,121.02	₹ 2,029.54	₹ 5,166.67	₹ 7,196.21	₹ 48,954.34	
20	13	₹ 48,954.34	₹ 1,835.79	₹ 5,360.42	₹ 7,196.21	₹ 43,593.92	
21	14	₹ 43,593.92	₹ 1,634.77	₹ 5,561.44	₹ 7,196.21	₹ 38,032.48	
22	15	₹ 38,032.48	₹ 1,426.22	₹ 5,769.99	₹ 7,196.21	₹ 32,262.49	
23	16	₹ 32,262.49	₹ 1,209.84	₹ 5,986.37	₹ 7,196.21	₹ 26,276.13	
24	17	₹ 26,276.13	₹ 985.35	₹ 6,210.86	₹ 7,196.21	₹ 20,065.27	
25	18	₹ 20,065.27	₹ 752.45	₹ 6,443.76	₹ 7,196.21	₹ 13,621.51	
26	19	₹ 13,621.51	₹ 510.81	₹ 6,685.40	₹ 7,196.21	₹ 6,936.11	
27	20	₹ 6,936.11	₹ 260.10	₹ 6,936.11	₹ 7,196.21	₹ 0.00	
28	21	₹ 0.00	₹ 0.00	₹ 7,196.21	₹ 7,196.21	-₹ 7,196.21	
29	22	-₹ 7,196.21	-₹ 269.86	₹ 7,466.07	₹ 7,196.21	-₹ 14,662.28	
30	23	-₹ 14,662.28	-₹ 549.84	₹ 7,746.05	₹ 7,196.21	-₹ 22,408.32	
31	24	-₹ 22,408.32	-₹ 840.31	₹ 8,036.52	₹ 7,196.21	-₹ 30,444.84	
32	25	-₹ 30,444.84	-₹ 1,141.68	₹ 8,337.89	₹ 7,196.21	-₹ 38,782.74	

Fig. 20.8: Reason for Garbage Cleaning

10) As we can see in Figure 20.8, there are some negative values in the statement, and the closing balance goes down below zero, to negative values. To stop this from happening, we will apply Garbage Cleaning. Figure 20.9 shows the syntax for Garbage Cleaning and the full fledged Bank Statement.

	A	B	C	D	E	F	G
6							
7	Installment No.	Opening Balance	Interest	Principal	Installment	Closing Balance	
8	1	₹ 100,000.00	₹ 3,750.00	₹ 3,446.21	₹ 7,196.21	₹ 96,553.79	
9	2	₹ 96,553.79	₹ 3,620.77	₹ 3,575.44	₹ 7,196.21	₹ 92,978.35	
10	3	₹ 92,978.35	₹ 3,486.69	₹ 3,709.52	₹ 7,196.21	₹ 89,268.83	
11	4	₹ 89,268.83	₹ 3,347.58	₹ 3,848.63	₹ 7,196.21	₹ 85,420.20	
12	5	₹ 85,420.20	₹ 3,203.26	₹ 3,992.95	₹ 7,196.21	₹ 81,427.24	
13	6	₹ 81,427.24	₹ 3,053.52	₹ 4,142.69	₹ 7,196.21	₹ 77,284.56	
14	7	₹ 77,284.56	₹ 2,898.17	₹ 4,298.04	₹ 7,196.21	₹ 72,986.52	
15	8	₹ 72,986.52	₹ 2,736.99	₹ 4,459.22	₹ 7,196.21	₹ 68,527.30	
16	9	₹ 68,527.30	₹ 2,569.77	₹ 4,626.44	₹ 7,196.21	₹ 63,900.87	
17	10	₹ 63,900.87	₹ 2,396.28	₹ 4,799.93	₹ 7,196.21	₹ 59,100.94	
18	11	₹ 59,100.94	₹ 2,216.29	₹ 4,979.92	₹ 7,196.21	₹ 54,121.02	
19	12	₹ 54,121.02	₹ 2,029.54	₹ 5,166.67	₹ 7,196.21	₹ 48,954.34	
20	13	₹ 48,954.34	₹ 1,835.79	₹ 5,360.42	₹ 7,196.21	₹ 43,593.92	
21	14	₹ 43,593.92	₹ 1,634.77	₹ 5,561.44	₹ 7,196.21	₹ 38,032.48	
22	15	₹ 38,032.48	₹ 1,426.22	₹ 5,769.99	₹ 7,196.21	₹ 32,262.49	
23	16	₹ 32,262.49	₹ 1,209.84	₹ 5,986.37	₹ 7,196.21	₹ 26,276.13	
24	17	₹ 26,276.13	₹ 985.35	₹ 6,210.86	₹ 7,196.21	₹ 20,065.27	
25	18	₹ 20,065.27	₹ 752.45	₹ 6,443.76	₹ 7,196.21	₹ 13,621.51	
26	19	₹ 13,621.51	₹ 510.81	₹ 6,685.40	₹ 7,196.21	₹ 6,936.11	
27	20	₹ 6,936.11	₹ 260.10	₹ 6,936.11	₹ 7,196.21	₹ 0.00	

Fig. 20.9: Final Bank Statement

**Syntax Used :-**

Topic	Syntax	
Periodicity	VLOOKUP(C2, F1:G5, 2, FALSE)	
Installment Amount	PMT(B4/B2, B3*B2, -B1, 0, 0)	
Opening Balance	IF(A8<\$B\$3*\$B\$2, F8, "")	All syntax include garbage cleaning
Interest	IF(A8<\$B\$3*\$B\$2, B9*(B\$4/B\$2), "")	
Installment	IF(A8<\$B\$3*\$B\$2, B\$5, "")	
Principal	IF(A8<\$B\$2*\$B\$3, E9-C9, "")	
Closing Balance	IF(A8<\$B\$3*\$B\$2, B9-D9, "")	
Installment No.	IF(A8<\$B\$3*\$B\$2, A8+1, "")	

Fig. 20.10: Loan Statement Syntax

## 20.3 RATIO ANALYSIS

Ratio Analysis is one of the most important factors in the decision-making for the goodwill of an organization. There are certain ratios, which depict the present/future situation of an organization, based on which the management should take decisions. The ratio calculation is based upon the Trading Account, Profit & Loss Statement and the Balance Sheet of the organization. We will be discussing the following ratios in this chapter: -

- 1) **Current Ratio:** This ratio compares the Current Assets and the Current Liabilities of an organization. It measures the organization's ability to pay short-term obligations. Current Assets include Cash, Bank Balance, Accounts/Bills Receivables, and Current Liabilities includes Accounts/Bills Payables, Wages Payable, Current Proportion of a long-term debt, etc. An efficient current ratio for an organization is 2:1 (Current Assets: Current Liabilities).
- 2) **Quick Ratio:** Like current ratio, quick ratio also depicts the short-term capabilities of an organization, but it involves Liquid Assets instead of Current Assets. Liquid Assets includes all the current assets except inventories and prepaid expenses. It shows how efficiently the organization can pay-off their short-term obligations of upto 3 months. An efficient quick ratio for an organization is 1:1 (Quick Assets: Current Liabilities).
- 3) **Debt/Equity Ratio:** Debt/Equity Ratio is used to calculate the financial leverage of an organization. It is calculated by dividing an organization's total long-term debt by shareholders' funds. Long-term debt includes the loans (more than 1 year) and advances both secured and unsecured. Shareholders' funds can be calculated in two different ways, whether subtracting the total liabilities from the total assets or adding up the shareholder's funds, which includes Shareholder's Capital, Balance from

P&L Account, Reserves & Surplus, etc. A 2:1 D/E Ratio for Capital-Intensive industries, such as Automobile industry, is considered good. Whereas, a 0.5:1 D/E Ratio is considered efficient for Services/Tech Organizations.

- 4) **Gross Profit Ratio:** This ratio depicts the percentage of income/revenue that exceeds the COGS (Cost of Goods Sold). It is a measure of financial profitability. Higher the ratio better is the firm's profitability and executive management. It is calculated by dividing the difference of Sales and COGS by total revenue or sales.
- 5) **Net Profit Ratio:** This depicts the ratio of net profit of the organization and its revenue. It shows how much of each rupee collected by the organization as revenue converts into profit. This ratio is important, since an increase in revenue does not actually mean an increase in profit. It is calculated as follows:  
$$\frac{\text{Gross Profit} - (\text{Indirect or Operational Expenses}) + \text{Indirect Income}}{\text{Total Revenue or Sales}}$$
- 6) **Operating Cost Ratio:** It shows the efficiency of the management of the organization by comparing the Operating Expenses to Net Sales. It is calculated by dividing the Operating Cost by Net Sales. Operating Cost includes the Operating Expenses plus the COGS (Cost of Goods Sold).
- 7) **Return on Working Capital:** This ratio determines the return received by the organization in exchange of the working capital employed by them. It is calculated by dividing the Net profit by Working Capital. Working Capital equals to the difference between Current Assets and Current Liabilities.
- 8) **Return on Capital Employed:** This ratio shows the relation between the Net Profit (before interest, tax and preference dividend) and the capital employed in the organization. It is calculated by dividing Net Profit (before interest, tax and preference dividend) and Capital Employed. Capital employed can be found by two approaches:
  - a) **Liabilities Approach:** By adding Shareholder's funds, Non-Current/Long-term liabilities.
  - b) **Assets Approach:** By adding Non-Current Assets, i.e. Fixed Assets, Non-Current Trade Investments and Long-term Loans and Advances and Working Capital.
- 9) **Inventory Turnover Ratio:** This ratio is calculated by dividing Cost of Goods Sold and Average Inventory. Average inventory equals to opening inventory + closing inventory, whole divided by 2. This depicts

the number of times the inventory of the organization is converted into sales.

- 10) **Working Capital Turnover Ratio:** This ratio depicts the number of times, working capital of the organization has been rotated to generate sales. It equals to Net Sales divided by the Working Capital. Working Capital equals to the difference of Current Assets – Current Liabilities.

Let us see the below stated Trading Account, Profit & Loss Statement and Balance Sheet, and calculate the discussed ratios:

Balance Sheet of M/s ABC Ltd.			
As on 31/3/2016			
Liabilities	Amount	Assets	Amount
Capital Account:		Fixed Assets:	₹ 3,067,500
Reserves & Surplus	₹ 500,000	Furniture	₹ 292,500
Capital A/c	₹ 1,800,000	Land&Building	₹ 2,300,000
Loans(Liability):	₹ 3,000,000	P&M	₹ 475,000
Secured Loans	₹ 2,500,000	Investments:	₹ 0
Unsecured Loans	₹ 500,000	Investments	₹ 0
Current Liabilities:	₹ 690,600	Current Assets:	₹ 3,151,807
Provisions	₹ 240,000	Closing Stock	₹ 1,429,407
Sundry Creditors	₹ 250,600	Sundry Debtors	₹ 397,000
BP	₹ 100,000	Cash-in-Hand	₹ 20,000
Rent O/S	₹ 50,000	Bank Accounts	₹ 1,247,600
Salaries O/S	₹ 50,000	BR	₹ 50,000
Profit&Loss A/c:	₹ 228,707	Prepaid Insurance	₹ 7,800
Opening Balance	₹ 300,000		
Current Period Profit	₹ 148,707		
Less: Transferred	-₹ 220,000		
<b>Total</b>	<b>₹ 6,219,307</b>	<b>Total</b>	<b>₹ 6,219,307</b>

Fig. 20.11: Trading and P&L Account

Now, we will calculate the above-discussed ratios, based on the data provided in figure 20.11 and figure 20.12.

Trading and Profit&Loss A/c of M/s ABC Ltd.			
For the Financial Year ending on 31/3/2016			
Particulars	Amount	Particulars	Amount
Opening Stock	₹ 1,729,800	Sales Accounts	₹ 625,000
Purchase Accounts	₹ 43,000	Closing Stock	₹ 1,429,407
Gross Profits c/d	₹ 281,607		
<b>Total</b>	<b>₹ 2,054,407</b>	<b>Total</b>	<b>₹ 2,054,407</b>
Indirect Expenses:	₹ 253,100	Gross Profit b/f	₹ 281,607
Depreciation	₹ 57,500	Indirect Incomes:	₹ 120,200
Discount Allowed	₹ 20,000	Discount Received	₹ 200
Electricity	₹ 10,000	Profit on Sale of Investment	₹ 120,000
Insurance Premiums	₹ 15,600		
Rent	₹ 60,000		
Salaries	₹ 85,000		
Telephone	₹ 5,000		
Net Profit	₹ 148,707		
<b>Total</b>	<b>₹ 401,807</b>	<b>Total</b>	<b>₹ 401,807</b>

Fig. 20.12: Balance Sheet

**1) Current Ratio :**

For current ratio, we require the value of Current assets and Current liabilities.

Current Assets = ₹ 31,51,807

Current Liabilities = ₹ 6,90,600

Current Ratio = Current Assets/Current Liabilities =  
(31,51,807/6,90,600) = **4.56**

**2) Quick Ratio :**

For quick ratio, we require the value of Liquid Assets and Current liabilities.

Liquid Assets = Sundry Debtors + Cash-in-hand + Bank Accounts + BR  
= ₹ 17,14,600

Current Liabilities = ₹ 6,90,600

Quick Ratio = Liquid Assets/Current Liabilities = (17,14,600/6,90,600)  
= **2.48**

**3) Debt/Equity Ratio :**

For debt/equity ratio, we require the value of Total Long-term debts and Shareholder's funds.

Long-term Debt = Secured Loans + Unsecured Loans = ₹ 30,00,000

Shareholder's Funds = Reserves & Surplus + Capital A/C + P & L A/C =  
25,28,707

D/E Ratio = Long-term Debt/Shareholder's Funds =  
(30,00,000/25,28,707) = **1.19**

**4) Gross Profit Ratio :**

For gross profit ratio, we require the value of Gross Profit and Total Sales.

Gross Profit = Sales – COGS = ₹ 2,81,607

Sales = ₹ 6,25,000

Gross Profit Ratio = Gross Profit/Sales = (2,81,607/6,25,000) = **0.45**

**5) Net Profit Ratio :**

For net profit ratio, we require the value of Net Profit and Total Sales.

Net Profit = Gross Profit - (Indirect or Operational Expenses) + Indirect  
Income = ₹ 1,48,707

Sales = ₹ 6,25,000

Net Profit Ratio = Net Profit/Sales = (1,48,707/6,25,000) = **0.24**

**6) Operating Cost Ratio :**

For operating cost ratio, we require the value of Operating Cost and Sales.

$$\text{Operating Cost} = \text{Operating Expenses} + \text{COGS} = \text{Rs. } 5,96,493$$

$$\text{Sales} = \text{Rs. } 6,25,000$$

$$\text{Operating Cost Ratio} = \text{Operating Cost/Sales} = (5,96,493/6,25,000) = \mathbf{0.95}$$

**7) Return on Working Capital :**

For return on working capital, we require the value of Net Profit and Working Capital.

$$\text{Net Profit} = \text{Gross Profit} - (\text{Indirect or Operational Expenses}) + \text{Indirect Income} = \text{Rs. } 1,48,707$$

$$\text{Working Capital} = \text{Current Assets} - \text{Current Liabilities} = \text{Rs. } 24,61,207$$

$$\text{Return on Working Capital} = \text{Net Profit/Working Capital} = (1,48,707/24,61,207) = \mathbf{0.06}$$

**8) Return on Capital Employed :**

For return on capital employed, we require the value of Net Profit and Capital Employed.

$$\text{Net Profit} = \text{Gross Profit} - (\text{Indirect or Operational Expenses}) + \text{Indirect Income} = \text{Rs. } 1,48,707$$

$$\text{Capital Employed} = \text{Reserves \& Surplus} + \text{Capital A/C} + \text{P \& L A/C} = 25,28,707$$

$$\text{Return on Capital Employed} = \text{Net Profit/Capital Employed} = (1,48,707/25,28,707) = \mathbf{0.06}$$

**9) Inventory Turnover Ratio :**

For inventory turnover ratio, we require the value of COGS and Average Inventory.

$$\text{COGS} = \text{Opening Stock} - \text{Closing Stock} + \text{Purchases} = \text{Rs. } 3,43,393$$

$$\text{Average Inventory} = (\text{Opening Inventory} + \text{Closing Inventory})/2 = \text{Rs. } 15,79,603.5$$

$$\text{Inventory Turnover Ratio} = \text{Cost of Goods Sold/Average Inventory} = \mathbf{0.22}$$

**10) Working Capital Turnover Ratio :**

For working capital turnover ratio, we require the value of Net Sales and Average Working Capital.

$$\text{Sales} = \text{Rs. } 6,25,000$$

$$\text{Average Working Capital} = \text{Current Assets} - \text{Current Liabilities} = \text{Rs. } 24,61,207$$

$$\text{Working Capital Turnover Ratio} = \text{Net Sales/Average Working Capital} = \mathbf{0.25}$$

### Check Your Progress A

- 1) .....is the repetitive number of time periods in Loan Statements.
- 2) What is the efficient Current Ratio for a company is .....?
  - a) 1:1
  - b) 3:2
  - c) 2:1
  - d) 5:3
- 3) What is the difference between Net Profit and Gross Profit?

.....  
.....  
.....  
.....  
.....

- 4) What is the formula for Debt/Equity ratio?

.....  
.....  
.....  
.....  
.....

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## 20.4 PAYROLL STATEMENTS

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Payroll refers to the amount paid by an organization to its employees. It is an important part of an organization, since if they keep their employees' morale high on the monetary terms; they will work effectively and efficiently. It is the responsibility of the payroll department to release correct and timely salaries, bonuses or incentives to their employees. To accomplish this task positively, it is always effective to maintain a Payroll Statement.

A Payroll Statement includes the data of all the employees of the organization. It includes the details like:

- Employee Name and Employee Code
- Employee Category
- Basic Pay
- Perquisites and Allowances
- Tax Slabs

- Eligibility Status for certain Perquisites and Allowances
- Deductions and Rebate Slabs
- Net Salary

Once this statement is fully prepared and verified, the Net Payment is finally released in batches, as per the organization’s policies. The verifier needs to make sure that the payment is released correctly and the employees are content with the pay. If there is any kind of discrepancies such as decreased payments, wrong deductions of leaves or incorrect bonus/incentive release.

Let us take an example as follows:

M/s Alpha Ltd pays to its employees the salary on the basis of category. The gross salary of an employee consists of Basic salary + Dearness Pay + DA + HRA + TA + CCA. The GPF and IT are the two Deductions. The components of salary are computed according to the following terms of contract of service:

Rules for payment of Basic Salary, TA and CCA are as under:

Category	Basic Salary	TA	CCA
A	25000	5000	1000
B	20000	4000	800
C	15000	3000	500

Rules for payment of DP, DA and HRA are as under:

DP	50% of Basic
DA	41% of (Basic + DP)
HRA	30% of (Basic + DP)

Rules for payment of GPF and IT are as under:

GPF	10% of Gross
IT	8% of Gross

Fig. 20.13: Payroll Statement Example

The question in figure 20.13 states the rules for the payment/deduction of the following items:

- Basic Salary, TA (Transport Allowance) and CCA (City Compensatory Allowance).
- DP (Dearness Pay), DA (Dearness Allowance) and HRA (House Rent Allowance).
- GPF (General Provident Fund) and IT (Income Tax)

As it can be seen that the employees are categorized in three groups, namely, A, B and C. Basic Salary, TA and CCA are paid, based on these categories. The statement is prepared in MS Excel in a format as shown in figure 20.14.

You are required to prepare a payroll statement in the given format making maximum use of cell referencing facility.

Code	Name	Category	Is HRA to be paid	Basic	DP	DA	HRA	TA	CCA	Gross	IT	GPF	Total Deduction	Net
			Y											
			N											
		Total												

Fig. 20.14: Payroll Statement Template

We have the Employee Code and Employee Name as their only personal details, there can be more, but there is not much need in the payroll statement for that. As shown in Figure 20.15, this is the sample data chosen for this example; randomly Employees are categorized in three categories, A, B and C. Whether the employee receives the HRA or not, is also mentioned.

A	B	C	D
Code	Name	Category	Is HRA to be paid
631	Akash	A	Yes
965	Akshay	B	No
240	Babita	C	Yes
140	Disha	B	Yes
263	Farooq	C	Yes
471	Gagandeep	A	No
550	Lokesh	C	No
997	Priya	A	No
561	Ranjan	B	Yes
987	Sudeep	A	Yes
	Total		

Fig. 20.15: Sample Employee Data

The next step is to fill in the details in the “Basic” Column of the statement. Since, every other column is calculated through Basic Salary (as shown in figure 20.13). The data should be filled carefully because it is the backbone of whole payroll statement.

The data is filled in by using the syntax shown in figure 20.16 below.

2     =VLOOKUP(C2, Data1, 2, FALSE)

A	B	C	D	E	F	G	H
Code	Name	Category	Is HRA to be paid	Basic	DP	DA	
631	Akash	A	Yes	25000			
965	Akshay	B	No	20000			
240	Babita	C	Yes	15000			
140	Disha	B	Yes	20000			
263	Farooq	C	Yes	15000			
471	Gagandeep	A	No	25000			
550	Lokesh	C	No	15000			
997	Priya	A	No	25000			
561	Ranjan	B	Yes	20000			
987	Sudeep	A	Yes	25000			
	Total			205000			

Fig. 20.16: Basic Salary Syntax

In the above stated syntax in figure 20.16:

- 1) “C2” is the cell reference of the value that has to be located in Data1.

- 2) “Data1” refers to Rules for payment of Basic Salary, TA and CCA as shown in Fig. 20.13. Therefore, the basic salary differentiates according to the Category of the employee.
- 3) “2” refers to the column no. of Data1, from which the value has to be extracted and shown.
- 4) “FALSE” means that an EXACT MATCH is required to be shown.

In a similar way the other columns – DP, DA, HRA, TA and CCA are filled. The syntax for these allowances are given below:

DP	$0.5 * E2$
DA	$ROUND(0.41 * (E2 + F2), 0)$
HRA	$IF(D2 = "Yes", 0.3 * (E2 + F2), 0)$
TA	$VLOOKUP(C2, Data1, 3, FALSE)$
CCA	$VLOOKUP(C2, Data1, 4, FALSE)$

Fig. 20.17: Syntax for DP, DA, HRA, TA and CCA

- 1) **DP:** It equals to 50% of Basic Salary.
- 2) **DA:** It equals to 41% of (Basic + DP). Since the resulting amount required rounding-off, “ROUND” was applied. “0” is used because the amount is rounded off to the nearest whole number.
- 3) **HRA:** It equals to the 30% of (Basic + DP). It also includes a condition, that whether the employee is eligible for HRA or not, therefore we used “IF” function. If Column “D” shows Yes, only then the HRA would be calculated, otherwise it would result “0”.
- 4) **TA & CCA:** These allowances are calculated in the same way as Basic Salary, as they are shown in the same table as Basic. Refer to the figure 20.13.

Once all the Allowances are filled in, the statement would show like this:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Code	Name	Category	Is HRA to be paid	Basic	DP	DA	HRA	TA	CCA	Gross	IT	GPF	Total Deduction	Net
631	Akash	A	Yes	25000	12500	15375	11250	5000	1000					
965	Akshay	B	No	20000	10000	12300	0	4000	800					
240	Babita	C	Yes	15000	7500	9225	6750	3000	500					
140	Disha	B	Yes	20000	10000	12300	9000	4000	800					
263	Farooq	C	Yes	15000	7500	9225	6750	3000	500					
471	Gagandeep	A	No	25000	12500	15375	0	5000	1000					
550	Lokesh	C	No	15000	7500	9225	0	3000	500					
997	Priya	A	No	25000	12500	15375	0	5000	1000					
561	Ranjan	B	Yes	20000	10000	12300	9000	4000	800					
987	Sudeep	A	Yes	25000	12500	15375	11250	5000	1000					
	Total			205000	102500	126075	54000	41000	7900					

Fig. 20.18: Payroll Statement with Allowances

The last part of the statement is to calculate the Gross Salary, Tax & Deductions and Net Salary. The syntax is given below:

Gross	SUM(E2:J2)
IT	0.08*K2
GPF	0.1*K2
Total Deduction	SUM(L2:M2)
Net	K2-N2
Total	SUM(E2:E11)

Fig. 20.19: Syntax for Gross, Net and Tax & Deductions

- 1) **Gross:** It is the sum of Basic Salary and all the Allowances. Therefore, “SUM” function is used from column E to J, which includes Basic Salary and all the Allowances.
- 2) **IT (Income Tax):** It is 8% of Gross Salary. Refer to the Fig. 20.13. Refer to the Fig. 20.13.
- 3) **GPF:** It is 10 % of Gross Salary. Refer to the Fig. 20.13.
- 4) **Total Deduction:** It equals to the sum of IT and GPF.
- 5) **Net:** It equals to the difference between Gross Salary and Total Deduction.

The final payroll statement would look like this:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Code	Name	Category	Is HRA to be paid	Basic	DP	DA	HRA	TA	CCA	Gross	IT	GPF	Total Deduction	Net
2	631	Akash	A	Yes	25000	12500	15375	11250	5000	1000	70125	5610	7013	12623	57502
3	965	Akshay	B	No	20000	10000	12300	0	4000	800	47100	3768	4710	8478	38622
4	240	Babita	C	Yes	15000	7500	9225	6750	3000	500	41975	3358	4198	7556	34419
5	140	Disha	B	Yes	20000	10000	12300	9000	4000	800	56100	4488	5610	10098	46002
6	263	Farooq	C	Yes	15000	7500	9225	6750	3000	500	41975	3358	4198	7556	34419
7	471	Gagandeep	A	No	25000	12500	15375	0	5000	1000	58875	4710	5888	10598	48277
8	550	Lokesh	C	No	15000	7500	9225	0	3000	500	35225	2818	3523	6341	28884
9	997	Priya	A	No	25000	12500	15375	0	5000	1000	58875	4710	5888	10598	48277
10	561	Ranjan	B	Yes	20000	10000	12300	9000	4000	800	56100	4488	5610	10098	46002
11	987	Sudeep	A	Yes	25000	12500	15375	11250	5000	1000	70125	5610	7013	12623	57502
12	Total				205000	102500	126075	54000	41000	7900	536475	42918	53651	96569	439906

Fig. 20.20: Final Payroll Statement

## 20.5 CAPITAL BUDGETING

Capital Budgeting is a process where an organization evaluates a project, mostly long-term. The evaluation takes in many perspectives of the project, which may include construction of a new plant or a factory or a long-term investment made in a business model. It includes the assessment of all the possible cash inflows and cash outflows of the project. It is to determine

whether the actual return on the investment received matches the expected return from the project and the expenses made are exceeded by the actual return from the project.

Now, to perform capital budgeting on MS Excel, we will take help of certain formulae to make the analysis of the project easier to understand and interpret. We will use the below stated example (figure 20.21) to understand the concept better.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	The ABC Ltd is in the process of selecting a capital project. The detailsof 2 Capital projects A and B identified by the company are provided below:														
2		<b>Particulars</b>	<b>Project A</b>	<b>Project B</b>											
3		Rate of Interest	12%	12%											
4		Cost of Project	-₹ 500,000.00	-₹ 550,000.00											
5		Cash Inflows:													
6		Year 1	₹ 400,000.00	₹ 20,000.00											
7		Year 2	₹ 60,000.00	₹ 500,000.00											
8		Year 3	₹ 50,000.00	₹ 60,000.00											
9		Year 4	₹ 70,000.00	₹ 70,000.00											
10		Year 5	₹ 80,000.00	₹ 80,000.00											
11	You are required to:														
12	1 Evaluate the above capital budgeting projects and recommend the project to be implemented so that the company earns maximum profit on the basis of:														
13	1 IRR Method														
14	2 NPV Method using 12% Interest Rate														

Fig. 20.21: Capital Budgeting Example

The question states that there are projects, which need to be compared with each other. Both of them have different Cost of the project and the Cash Inflows. They are to be evaluated based on two methods:

- 1) **IRR Method:** Internal Rate of Return is a rate at which the NPV – Net Present Value of both the kinds of cash flows (inflow and outflow) equals to zero. The project is desirable if the IRR exceeds the Expected Rate of Return from the project.
- 2) **NPV Method:** It is the difference between the PV – Present Value of the Cash Inflow and Present Value of the Cash Outflow, given a period of time.

Now, we will use formulae for IRR and NPV. In MS Excel, there are direct formulae for such kind of financial functions. The syntax used is as follows in figure 20.22:

Topic	Syntax
IRR	IRR(\$B\$3:\$B\$9,\$B\$2)
NPV	NPV(\$B\$2,\$B\$3,\$B\$5:\$B\$9)
Recommendation	IF(B13>C13,"Project A","Project B")

Fig. 20.22: Syntax for IRR & NPV

Cell References (Refer to figure 20.21):

- B3 – Cost of Project A
- B9 –Cash Inflow in Last Year for Project A
- B2 – Required Rate of Return for Project A
- B5 – Cash Inflow in First Year for Project A
- B13 & C13 – Final Recommendation for the selection of a Project.

(Replace “B” with “C” to see cell references for Project B)

Results after applying the “IRR” and “NPV” formulae are as follows:

	Project A	Project B	Recommended Project
IRR Method	16%	12%	Project A
NPV Method	₹ 27,182.07	-₹ 855.97	Project A

Fig. 20.23: IRR and NPV Results

figure 20.23 shows that it is recommended to choose Project A, since it exceeds Project B in both the methods.

Project A has an IRR of 16% whereas Project B has 12%.

Project A provides a positive result in NPV as Rs. 27,182.07 and Project B gives a negative result as Rs.855.97.

Now, what if NPV and IRR give conflicting results. For example, Project A has a better IRR, though Project B has a higher NPV. What should we choose?

Well, it is always better to choose NPV over IRR, since it is more realistic than IRR, and provides a result in amount rather than in percentage. NPV is also advantageous in the cases of Non-Normal Cash flows in a project. Non-Normal cash flows means that there is large cash outflow in between or at the end of the project period. NPV is also better when there is a comparison between projects, which have cash flows at different point of time, and are distinct in size.

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## 20.6 DEPRECIATION ACCOUNTING

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Any asset purchased faces a decrease in value, after a certain time span, like in every 6 months or a year; mostly it is a yearly depreciation. The value of the asset has to be depreciated, according to accounting norms, in the balance sheet of the company. For tangible assets, it is called Depreciation, though for non-tangible assets it is called Amortization.

There are two types of depreciation that will be discussed in this unit:

- 1) **Straight Line Method (SLN):** In this type of depreciation, the value of the asset decreases by the same value every year (assuming yearly depreciation). For example, if the value of the asset is Rs. 50,000 and depreciation is 10%. Then at the end of every year, the depreciation value that is deducted will be Rs. 5,000, until the asset is sold or fully depreciated.
- 2) **Written Down Value Method or Diminishing Balance Method (DB):** In this type of depreciation, the value of the asset decreases by a decreasing value of depreciation. Every year, there is a new value of depreciation calculated for the asset. For example, if the value of the asset is Rs. 50,000 and depreciation is 10%. Then at the end of first year, depreciation value will be Rs. 5,000. After that, in the second year it will be Rs. 4,500 {10 % of (Rs. 50,000 - Rs. 5,000)}. Similarly, in the third year 10% of Rs. 40,500, i.e. Rs. 4,050.

There are direct formulae for both the kind of depreciation techniques in MS Excel. We will use the following example (Refer figure 20.24) for understanding the topic:

Prepare a spreadsheet in MS EXCEL which accepts Cost of Asset, Life of Asset, Rate of Depreciation and Months in the first year the as input and produces a comparative schedule of Depreciation as output in the following format:

Cost of Asset -  
Life of Asset -  
Salvage Value -  
Months in 1st year -

Fixed Asset A/C(SLN)			
Year	Opening Balance	Depreciation	Closing Balance

Fixed Asset A/C(DB)			
Year	Opening Balance	Depreciation	Closing Balance

Fig. 20.24: Depreciation Example

We will be following the format shown in figure 20.24. The details are in figure 20.25 below:

Cost of Asset	₹ 60,000.00	Depreciation Rate	20%
Life of Asset(in years)	3		
Salvage Value	₹ 15,000.00		
Months in the 1st year	9		

Fig. 20.25: Question Details

The details in the figure 20.25 shows the asset details, the cost, the life span, rate of depreciation and more. We need to compare both Straight Line Method and Written Down Value Method.

Formula for Straight Line Method – SLN (cost, salvage, life)

Formula for Written Down Value Method – DB (cost, salvage, life, period, [month])

- Cost – Cost of Asset
- Salvage – Salvage Value of Asset
- Life – Life of Asset
- Period – Year Number
- [Month] – Number of months in First Year

Now let us look at the answers, refer to figure 20.26 & figure 20.27.

Fixed Asset A/C(SLN)			
Year	Opening Balance	Depreciation	Closing Balance
1	₹ 60,000.00	₹ 11,250.00	₹ 48,750.00
2	₹ 48,750.00	₹ 15,000.00	₹ 33,750.00
3	₹ 33,750.00	₹ 15,000.00	₹ 18,750.00

Fig. 20.26: SLN Method

Fixed Asset A/C(DB)			
Year	Opening Balance	Depreciation	Closing Balance
1	₹ 60,000.00	₹ 16,650.00	₹ 43,350.00
2	₹ 43,350.00	₹ 16,039.50	₹ 27,310.50
3	₹ 27,310.50	₹ 10,104.89	₹ 17,205.62

Fig. 20.27: WDV or DB Method

As it can be seen from the above two figures, the asset value at the end of the third year for:

- SLN - Rs. 18,750
- WDV - Rs. 17,205.62

Therefore, the comparison states that, through SLN the asset value is higher than through WDV method, at the end of third year.

### Check Your Progress B

1) What do you understand by capital budgeting?

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2) What is the syntax for DP (Dearness Pay)?

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3) What are the two types of Depreciation Formulae used in this chapter?  
And what is the syntax for both of them?

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4) Name the logical function used in making Payroll Statements in this chapter.

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### 20.7 LET US SUM UP

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A Loan Statement is a document recorded by the lender, a bank, financial institution. It includes all the information related to the loan, such as, Loan Amount, Interest Rate, Time Period of the Loan, Number of Installments and so on. And, a Lease can be defined as a contract between the lessee and the lessor, in which the lessor (landlord) rents the property owned by him/her to the lessee (tenant). The lease statement also includes the information related to the periodical payments to be made by the lessee to the lessor.

Ratio Analysis is one of the most important decisive factors in the decision-making for the goodwill of an organization. There are certain ratios, which depict the present/future situation of an organization, based on which the management should take decisions. The ratio calculation is based upon the Trading Account, Profit & Loss Statement and the Balance Sheet of the organization.

Payroll refers to the amount paid by an organization to its employees. It is an important part of an organization, since if they keep their employees' morale high on the monetary terms. A Payroll Statement includes the data of all the employees of the organization. It includes the details like Employee Name, Employee Code, Employee Category, Basic Pay, Perquisites and Allowances, Tax Slabs, Eligibility Status for certain Perquisites and Allowances, Deductions and Rebate Slabs, Net Salary etc.

Capital Budgeting is a process where an organization evaluates a project, mostly long-term. The evaluation takes in many perspectives of the project, which may include construction of a new plant or a factory or a long-term investment made in a business model. It includes the assessment of all the possible cash inflows and cash outflows of the project. It is to determine whether the actual return on the investment received matches the expected return from the project and the expenses made are exceeded by the actual return from the project.

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## 20.8 KEY WORDS

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**Loan Statements:** A Loan Statement is a document recorded by the lender, a bank, financial institution. It includes all the information related to the loan, such as, Loan Amount, Interest Rate, Time Period of the Loan, Number of Installments and so on.

**Depreciation:** Depreciation is an accounting method of allocating the cost of a tangible or physical asset over its useful life or life expectancy. It represents how much of an asset's value has been used up.

**Ratios:** Ratio Analysis is one of the most important decisive factors in the decision-making for the goodwill of an organization. There are certain ratios, which depict the present/future situation of an organization, based on which the management should take decisions.

**Capital Budgeting:** Capital Budgeting is a process where an organization evaluates a project, mostly long-term. The evaluation takes in many perspectives of the project, which may include construction of a new plant or a factory or a long-term investment made in a business model.

**Payroll Statement:** Payroll is the total of all compensation a business must pay to its employees for a set period of time or on a given date. It is usually

managed by the accounting or human resources department of a business; small-business payrolls may be handled directly by the owner or an associate.

**IRR Method:** Internal rate of return (IRR) is the interest rate at which the net present value of all the cash flows from a project or investment equal zero. It is used to evaluate the attractiveness of a project. If the IRR of a project exceeds a company's required rate of return, that project is desirable. If IRR falls below the required rate of return, the project should be rejected.

**NPV Method:** Net present value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. NPV is used in capital budgeting and investment planning to analyze the profitability of a projected investment or project.

## 20.9 ANSWERS TO CHECK YOUR PROGRESS

### Check Your Progress A

- 1) Nper
- 2) c) 2: 1

## 20.10 TERMINAL QUESTIONS

- 1) Explain the steps to create a Loan Statement.
- 2) What is the difference between NPV approach and IRR approach? Which approach should be chosen when their results do not match?
- 3) What is the difference between SLN and DB Method of Depreciation? How are they implemented in MS Excel?
- 4) What is capital budgeting? Explain its two methods.
- 5) Explain the components of a Payroll Statements.

### Case Study:

The XYZ Ltd is in the process of selecting a capital project. The details of 3 Capital projects X, Y and Z identified by the company are provided below:

Particulars	Project X	Project Y	Project Z
Rate of Interest	14%	14%	14%
Cost of Project	-₹ 300,000.00	-₹ 450,000.00	-₹ 350,000.00
Cash Inflows:			
Year 1	₹ 200,000.00	₹ 20,000.00	₹ 15,000.00
Year 2	₹ 30,000.00	₹ 300,000.00	₹ 25,000.00
Year 3	₹ 50,000.00	₹ 60,000.00	₹ 250,000.00
Year 4	₹ 60,000.00	₹ 55,000.00	₹ 35,000.00
Year 5	₹ 65,000.00	₹ 60,000.00	₹ 40,000.00

You are required to:

- 1 Evaluate the above capital budgeting projects and recommend the project to be implemented so that the company earns maximum profit on the basis of:
  - 1 IRR Method
  - 2 NPV Method using 14% Interest Rate

**Spreadsheets and  
Business  
Applications**

- 1) How do I change the layout in Excel?
- 2) How do I make Excel fit the screen?
- 3) What is page layout in Excel?
- 4) What are the elements of Excel screen?

**Note:** These questions are helpful to understand this unit. Do efforts for writing the answer of these questions but do not send your answer to university. It is only for yours practice.



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## SOME USEFUL BOOKS

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- Fundamentals of Computers, “Balagurusamy”, Mcgraw Hill, 2009.
- Computing Fundamentals: Introduction to Computers, “FaitheWempen”, Wiley, 2014.
- Fundamentals of Computers, “Rajaraman V and Adabala N”, Prentice Hall of India, 2014.
- Fundamentals of Computers and Information System, “Niranjan Shrivastava”, DreamTech Press, 2013.
- Computer Fundamentals, “Anita Goel”, Pearson, 2010.
- Microsoft Excel Data Analysis and Business Modeling, “Wayne Winston”, Microsoft Press, 2016.
- YouTube Black Book: How to Create a Channel, Build an Audience and Make Money on YouTube, “Christopher Sharpe”, Kindle Edition, Amazon Asia-Pacific Holdings, 2020.
- Microsoft PowerPoint, “Lambert Joan”, Microsoft Press, 2016.
- Excel 2019 All-in-One for Dummies, “Greg Harvey”, Wiley, 2020.
- Mastering MS Office: Computer Skill Development - Be Future Ready, “Bittu Kumar”, V&S Publishers, 2017.
- Computers for Beginners/The Basics, wiki books, online <https://en.wikibooks.org>.
- Computer Business, “Ankush Gupta”, Amazon Asia-Pacific Holdings, 2020.

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