

UNIT - I

Basics of MS Excel : Features of MS Excel , Worksheets and Workbooks: Definition of Worksheets and Workbooks, Opening, Labeling and Naming Worksheets and Workbooks , Adding, Deleting and Saving Worksheets and Workbooks, Format Worksheet Tabs, Reposition Worksheets, Inserting, Deleting, and Renaming Worksheets, Copy Worksheets,

Printing a Workbook: Set Print Titles, Headers/Footers, Page Margins, Page Orientation, Page Breaks.

Formatting a Worksheet: Cell, Cellpointer, Cell address, Change Font Styles and Sizes, Adding Borders and Colors to Cells, Changing Column Width and Row Height, Merge Cells.

Introduction

Microsoft Excel is a spreadsheet program that is used to record and analyze numerical data. Think of a spreadsheet as a collection of columns and rows that form a table. MS Excel is a Windows-based application package that can be used to automate tasks such as calculation and analysis of data, automate financial statements, business forecasting, transaction registers, inventory control, etc. It provides multiple facilities, such as making graphs and charts, analyzing situations, and helps users at the managerial level in taking decisions.

FEATURES OF MS EXCEL

The features provided by Excel are very useful for managers as well as the supervisors in any type of organization and help them to execute their complex tasks with a minimum effort. It is extensively used in financial organizations. The features of MS Excel are as follows:

- 1. Functions and formulas:** The built-in formulas are called functions. MS Excel provides analyzing data and manipulating text by using different functions. Users can easily calculate sum, interest, average, etc. by using built-in functions. This can be done either by typing in the function-based formulas or by using function wizards. Formulas are widely used in simple computing (such as addition, subtraction, multiplication, division) and advanced computing. They provide the power to analyze data extensively.
- 2. Auto-calculation:** MS Excel spreadsheet allows a user to automatically recalculate the whole worksheet every time a change is made in a single cell.
- 3. Charts & Graphs:** One of the most important features of MS Excel is a chart. MS Excel allows users to view data entered as tables in a graphical form as charts, which helps a user to easily understand, analyze, and compare data.

4. **Entering Data in Series:** A user can fill a range of cells either with the same value or with the series of values. This can be done using the Autofill handle (small square on the bottom-right corner of the active cell).
5. **Sorting:** This feature allows the data to be sorted either in ascending or descending order.
6. **Filtering:** Using AutoFilter to filter data is a quick and easy way to find and work with a subset of data in a range of cells or table column
7. **Pivot Table & Pivot Charts:** Use a PivotTable report to summarize, analyze, explore, and present summary data. Use a PivotChart report to visualize this summary data in a PivotTable report, and to easily see comparisons, patterns, and trends. Both a PivotTable report and a PivotChart report enable you to make informed decisions about critical data in your enterprise.
8. **Data Validation:** Prevents invalid data entry in a worksheet.

Basic Terms:

Workbook: when you open Excel, a new file is created called Book 1 (until you name it differently). It is called “workbook” and it is initially made up of three Worksheets. When MS Excel is opened, by default a workbook is opened with three worksheets named sheet1, sheet2, sheet3.

Worksheet: A worksheet consists of cells organized into columns and rows and is always a part of workbook also called as spread sheet. In Microsoft excel a workbook is a file in which we can store the data.

Cell: The worksheet is divided into number of columns and rows with labels. **The intersection of a column and a row is a cell.** A cell can be identified by its cell reference composed of the column name followed by the row number. Eg: D4 where D is column name and 4 is row number.

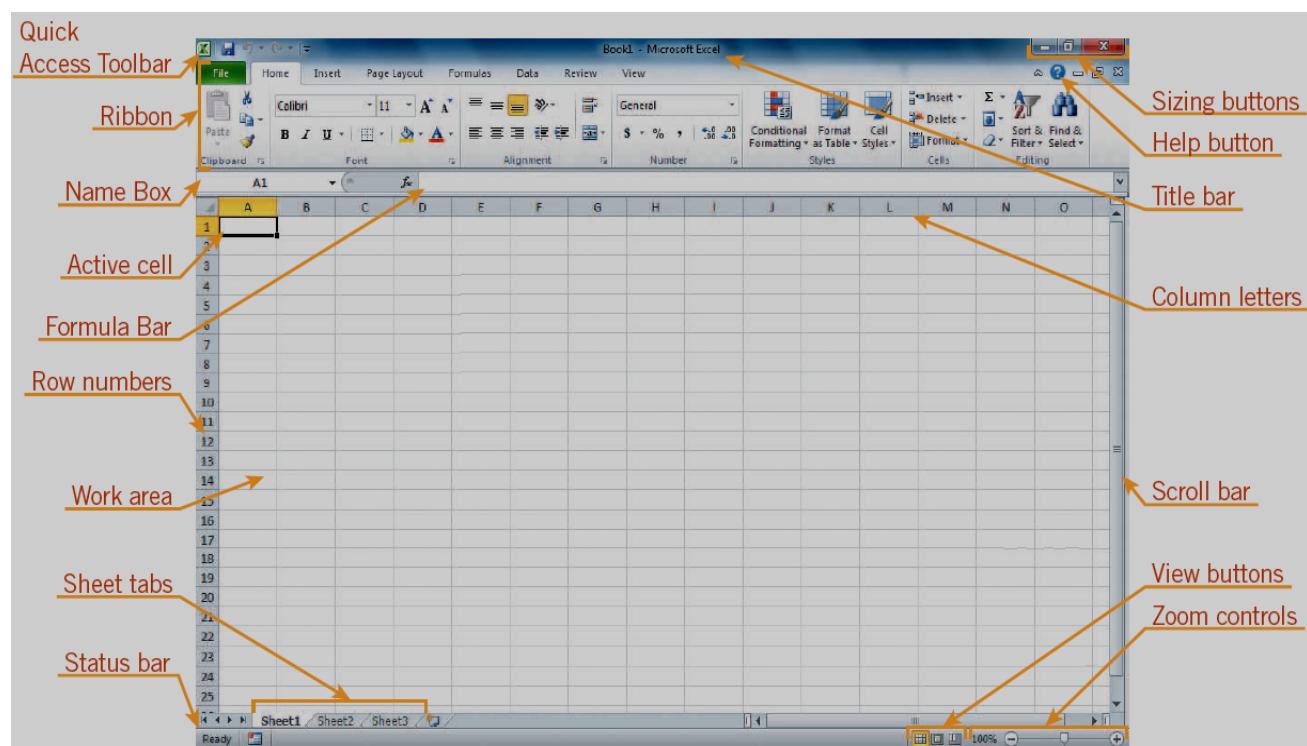
- A workbook contains 3 worksheets by default. We can add any number of worksheets to a workbook.
- There are 16,384 columns (from A to XFD) and **1,048,576 rows** (from 1 to 1048576) in an Excel worksheet.
- Cells = 16384×1048576
- Column width is 255 characters and row height can be up to 409 points.
- A cell can contain 32,767 characters.

Spreadsheet: A spreadsheet is a grid of rows and columns in which you enter text, numbers, and the results of calculations. In Excel, a computerized spreadsheet is called a worksheet. The file used to store worksheets is called a workbook.

PARTS OF MS EXCEL WINDOW

The Application Window

The Excel window is like other Office applications.



The **Title** bar displays the name of the application running and the name of the file you have open. On the far right you will see the **Minimize**, **Restore** or **Maximize**, and **Close** buttons to control the window.

Excel Menus

Along the top of the screen is the Menu Bar. Each word represents a different menu of Excel commands. If a command is also on the toolbar then the toolbar icon appears alongside it. Some commands will also feature the keyboard shortcut alongside it.

Excel Toolbars

Excel displays the Standard and Formatting toolbars by default. These are found below the menu bar at the top of the screen and provide a faster method of performing commands.

(i) The Standard Toolbar



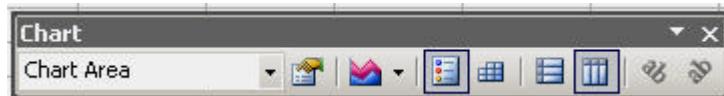
(ii) The Formatting Toolbar



(iii) Picture Toolbar



(iv) Chart Toolbar



SAVING, OPENING AND CLOSING WORKBOOK

Creating a new workbook

- On starting Excel 2003 you will be presented with a new blank workbook named *Book1*. The new workbook will contain 3 sheets identified by the sheet tabs in the bottom left of the worksheet.
- To create a new blank workbook, click the new icon on the Standard toolbar or press **Ctrl + N**.
- Every time a new blank workbook is created it is named *Book1*, *Book2*, *Book3* and so on until saved under a more appropriate name.

Saving a Workbook

- It is good practice to save your workbook as soon as you can, and then to regularly save it to protect against data loss.
- To save your document click **Save** under the **File** menu or press **Ctrl + S**. Select a location to save the workbook in and an appropriate name and click **Save**.

Opening an Existing Workbook

If you have a workbook that you have already been working on, you can open it from Excel. You can do so in three ways;

- Click **File > Open**
- Click the Open toolbar icon 
- Press **Ctrl + O**

Closing Excel and the workbook: There are 3 ways to close a workbook:

- Click **File > Close**
- Click the lower **X** in the top right corner of the window
- Or Press **Ctrl + W**

These methods will close the workbook and leave Excel open.

There are also 3 ways to exit Excel:

- Click **File > Exit**
- Click the upper **X** in the top right corner of the window
- Or press **Alt + F4**

These methods will close Excel and all open workbooks.

Entering and Editing Data:

To enter data into Excel, click on the cell, type in your data and press Enter.

After pressing Enter the cell below the current one then becomes the active cell. Other alternatives are:

Tab key: Enters the data and the cell to the right of the current cell becomes the active cell

Arrow keys: Enters the data and the cell dependent on the direction of the arrow key pressed becomes the active cell

Mouse click: Enters the data and the cell clicked becomes the active cell

Esc key: Cancels the entry

Adding, Deleting, Labeling Worksheet:

When you open a new workbook, or add new worksheets to an existing workbook, Excel uses a generic name for each sheet. Sheet1, Sheet2, Sheet3, and so on.

Adding/Inserting a worksheet

- To insert a new worksheet in front of an existing worksheet, select the existing worksheet and then, click **Home > Insert** option in cells group > select **Insert Sheet** option.

The new worksheet is named according to the number of worksheets you currently have.

For example if you have 3 sheets, then the new worksheet is named sheet4.

- **Another way** to insert a worksheet - click the “New Sheet” button (+) at the right end of the spreadsheet name tabs.
- **Alternatively**, Right-click a sheet tab, choose the Insert... command from the shortcut menu, select Worksheet from the Insert dialog box, and then click OK.

Deleting a worksheet

- Select the worksheet that you wish to delete. Click the “Delete” button in the “Cells” button group on the “Home” tab of the Ribbon - Then choose the “Delete Sheet” choice in the button’s drop-down menu.
- Another way is Right click on the desired sheet tab which you wish to delete - Select Delete option form the context menu.

Rename a worksheet

- The easiest way to rename a worksheet is to **double click** its name. This will highlight the text of the name, and you can then type a new name. Press enter to confirm the change.
- You can also right click on a worksheet and choose **Rename from the menu**.
- Select the worksheet that you wish to rename. Click the “format” button in the “Cells” button group on the “Home” tab of the Ribbon - Then choose the “rename sheet” choice in the button’s drop-down menu.

Reposition a worksheet

- Moving a worksheet is quite simple. All you need to do is to select the worksheet, drag the worksheet tab to the new position and drop it.
- Alternatively click on “format” option in cells group of the home button on the ribbon and choose “move or copy sheet “option from that.
- Or right click on the sheet tab – select “move or copy” option from the context menu.

Copying a worksheet

Format Worksheet Tabs:

To change worksheet tab color

- One way is - In Excel, to change worksheet tab color select the worksheet tab whose tab color you wish to change. Click the "Home" tab in the Ribbon then click the "Format" button in the "Cells" button group. Then roll your mouse pointer down to the "Tab Color" command. In the side menu that appears, then click the color you want to apply to the worksheet tab.
- The other way is – right click on sheet tab and choose "Tab color" option", select any color from color theme.

Copy of a worksheet

- We can create a copy of the worksheet by selecting copy option from shortcut menu of sheet tab.
- We can also move worksheet from its position (reposition). Right click on sheet tab and choose move option from shortcut menu.

INSERTION AND DELETION OF ROWS

Inserting rows on a worksheet

- Select the row, or a cell in the row below where you want the inserted row to appear. For example, if you wanted to insert a row between rows 7 and 8, select row 8.
- Click **Insert > Rows**

Inserting columns on a worksheet

- Select the column, or a cell in the column to the right of where you want the inserted column to appear. For example, if you wanted to insert a column between columns C and D, select column D.
- Click **Insert > Columns**

Inserting cells on a worksheet

- Select the cell, or the range of cells where you want to insert the new cells. Select the same number of cells as you would like to insert
- Click **Insert > Cells**
- In the dialogue box that appears select the direction in which to shift the surrounding cells

Deleting rows, columns, and cells

- Select the rows or columns to be deleted.
- Click **Edit > Delete**

- The rows or columns are deleted and all other rows and columns are shifted up and to the left

To delete data in a cell

- Select the cell or cells to be deleted.
- Click Edit > Delete
- In the dialogue box that appears select the direction in which to shift the surrounding cells

Note: Pressing the delete key only removes the contents from the cells and will not delete the rows, columns, or cells.

AUTO FILL

An amazing and often underutilized feature of Excel is the Auto fill. Auto fill is the use of the fill handle to copy data and sequences across a range of cells.

To fill a range of cells:

- Select the cell with the content you wish to copy
- Point at the black square that appears in the bottom right corner of the cell, until your mouse pointer becomes the fill handle
- Click and drag in the direction of the range you wish to fill.
- Excel will copy the contents of the cell across the range that you select. This will also work with dates.
- This feature becomes very powerful when used with cells containing formulas. A lot of time can be saved by copying formulas across a range of cells.

Printing a Workbook:

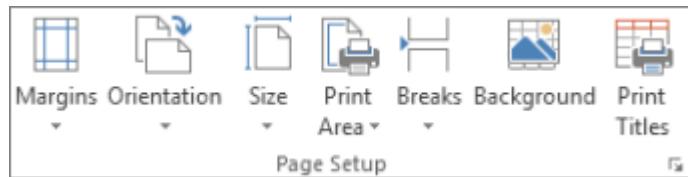
Select the worksheet or worksheets that you want to print. On the Page Layout tab, in the Page Setup group,

- Page

Orientation – is the data wide? Landscape might work better. Tall? Try portrait

Scaling – I always use the fit to option, if it will fit on one page, great. If not, play with the pages until it makes sense

Paper size – if 8.5×11" is too small, maybe the data will fit nicely on one legal size page



➤ To specify Margins

To use predefined margins, click Normal, Wide, or Narrow. To specify custom page margins, click Custom Margins and then—in the Top, Bottom, Left, and Right boxes—enter the margin sizes that you want.

- To set header or footer margins, click **Custom Margins**, and then enter a new margin size in the **Header or Footer** box. Setting either the header or footer margins changes the distance from the top edge of the paper to the header or from the bottom edge of the paper to the footer
- To center the page horizontally or vertically, click Custom Margins and then, under Center on page, select the horizontally or vertically check box.

➤ To use print titles:

Imagine how difficult it would be to read a worksheet if the column and row headings only appeared on the first page. The **Print Titles** command allows you to select specific rows and columns to appear on each page.

1. Click the **Page Layout** tab.
2. Select the **Print Titles** command.
3. The **Page Setup** dialog box appears. Click the icon at the end of the **Rows to repeat at top** field.
4. Your mouse becomes the small **selection arrow**. Click the rows you want to appear on each printed page. The **Rows to repeat at top** dialog box will record your selection.
5. Click the icon at the end of the **Rows to repeat at top** field.
6. Repeat for **Columns to repeat at left**, if necessary.
7. Click **OK**. You can go to **Print Preview** to see how each page will look when printed.

➤ To insert a break:

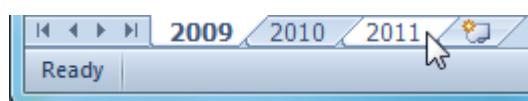
1. Click the **Page Layout** tab.

2. Determine the placement of the break by clicking the **row below, cell below, or column to the right** of where you want the break to appear. For example, select column C, and a break will appear after column B.
3. Select the **Insert Page Break** command from the **Breaks** drop-down menu.
4. The break is inserted. You can go to **Print Preview** to confirm that it appears in the correct place on the page.

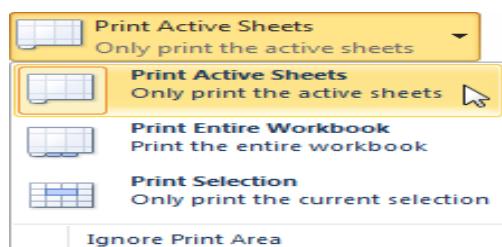
➤ **To print active sheets:**

If you have multiple worksheets in your workbook, you'll need to decide if you want to print the entire workbook or specific worksheets. Excel gives you the option to **Print Active Sheets**. A worksheet is considered active if it is **selected**.

1. Select the worksheets you want to print. To print multiple worksheets, click the first worksheet, hold down the **Ctrl key**, then click the other worksheets you want to select.



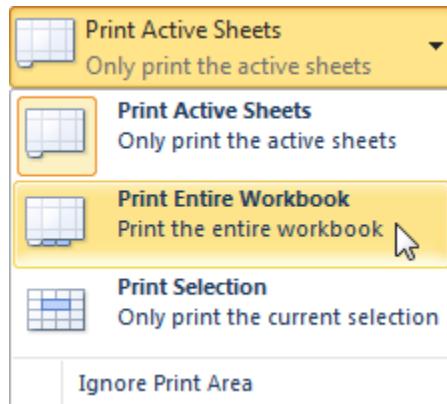
2. Click the **File** tab.
3. Select **Print** to access the **Print pane**.
4. Select **Print Active Sheets** from the **print range** drop-down menu.



5. Click the **Print** button.

(iii) To print the entire workbook:

1. Click the **File** tab.
2. Select **Print** to access the **Print pane**.
3. Select **Print Entire Workbook** from the **print range** drop-down menu.



4. Click the **Print** button.

(iv) To print a selection or set the print area:

Printing a **selection**—sometimes called setting the **print area**—lets you choose which cells to print, as opposed to the entire worksheet.

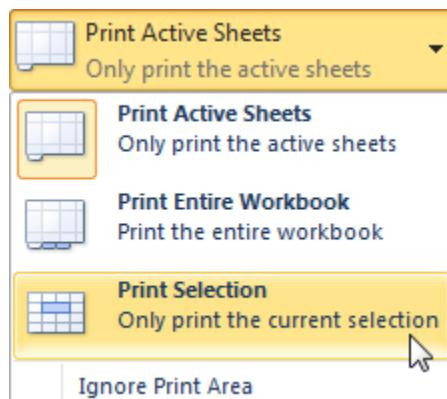
1. Select the cells you want to print.

	A	B	C
1	Employee Name	January	February
2	Allenson, Carol	\$ 5,897.00	\$ 2,356.00
3	Altman, Zoey	\$ 666.00	\$ 6,210.00
4	Aurelio, Fies	\$ 5,889.00	\$ 9,385.00
5	Aurelio, Vig	\$ 8,765.00	\$ 9,258.00
6	Bergman, Jeffery	\$ 1,928.00	\$ 6,595.00
7	Bittiman, William	\$ 4,108.00	\$ 7,172.00
8	Carlson, David	\$ 6,302.00	\$ 358.00
9	Carlton, Potter	\$ 3,647.00	\$ 2,858.00

2. Click the **File** tab.

3. Select **Print** to access the **Print pane**.

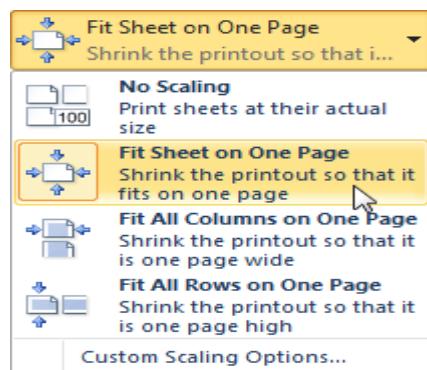
4. Select **Print Selection** from the **print range** drop-down menu.



5. You can see what your selection will look like on the page in **Print Preview**.
6. Click the **Print** button.

(v) To fit a worksheet on one page:

1. Click the **File** tab.
2. Select **Print** to access the **Print pane**.
3. Select **Fit Sheet on One Page** from the **scaling** drop-down menu.



4. Your worksheet is reduced in size until it fits on one page. Remember that if it is scaled too small, it might be difficult to read.

Formatting a Worksheet:

Cell: In Excel, the intersection of a column and a row is called as a cell. Each cell has a name or cell address. A cell is basic block of MS Excel. It holds data and formulas in tabular format. In a worksheet there has 65536 row and 256 columns.

How many sheets, rows, and columns can a spreadsheet have?

Version	Rows	Columns
Excel 2013	1,048,576	16,384 XFD
Excel 2007	1,048,576	16,384 XFD
Excel 2003 and earlier	65,536	256

The total cells in a worksheet are **256*65536 =16777216**

Cell Address: Each cell has a name or a cell address. The cell address consists of the column letter and row number. For example, the first cell is in first column and first row. First column

name is A and first row number is 1. Therefore, the first cell address is A1. Similarly, the address of last cell is IV65536 i.e. column IV and row number is 65536.

Cell pointer: The cell pointer in Excel is the active cell or the selected cell and is highlighted by a bolder rectangle. The location of the cell pointer is listed below the tool bar to the left of the formula bar. By using the arrow keys on the keyboard or pointing and clicking on the desired cell, you can move the pointer.

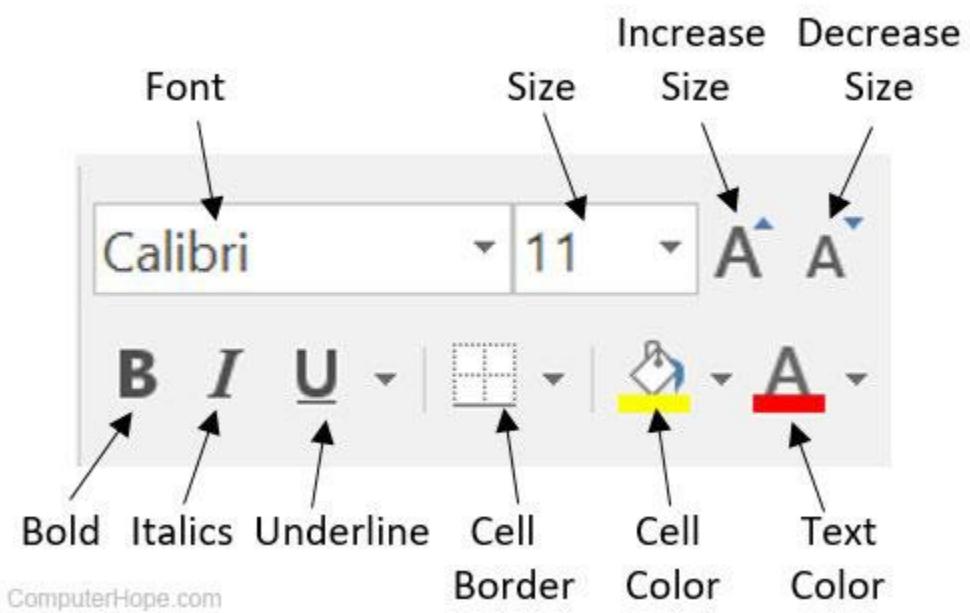
Cell range: A group of selected cells is called a **range**. The range is identified by its range reference, for example, A3:C5.

Adjacent range: In an **adjacent range**, all cells touch each other and form a rectangle. To select an adjacent range, click the cell in a corner of the range, drag the pointer to the cell in the opposite corner of the range, and release the mouse button.

Non-adjacent range: A **nonadjacent range** includes two or more adjacent ranges and selected cells. To select a nonadjacent range, select the first adjacent range or cell, press the Ctrl key as you select the other cells or ranges you want to include, and then release the Ctrl key and the mouse button

Change Font Styles and Sizes, Adding borders and Colors to Cells

In Microsoft Excel, a user can change the properties of text in any cell, including font type, size, color, as well as make it bold, italic, or underlined. A user can also change the color of a cell's background and the border around a cell. The following picture is a graphic illustration of the font and cell format bar in Excel, as well as a description of each of the tools contained within it.



➤ Changing font type

To change the text font within a Microsoft Excel spreadsheet, follow the steps below.

1. Select the cell containing the text you want to change.
2. Click the down arrow next to the font field on the format bar. (If you want to change the font to bold, italic, or underlined, click on the B, I, or U on the format bar.)
3. After clicking the down arrow for the font, you should be able to select from each of the installed fonts on your computer. Click the font you want to use, and the text in the selected cell will change.

Note: If the selected cell does not contain any text, the font type will change as soon as you type new text into the cell.

➤ Changing font size

To change the text size within a Microsoft Excel spreadsheet, follow the steps below.

1. Select the cell containing the text you want to change.
2. Click the down arrow next to the size box on the format bar. Typically, the default size is 11 or 12, as shown in the above example.
3. After clicking the down arrow for the size, you should have a selection of different sizes to choose. Some fonts may not scale properly, so they may have limited size options.

Note: If the selected cell does not contain any text, the font size will change as soon as you type new text into the cell.

➤ **Changing font color**

To change the text color within a Microsoft Excel spreadsheet, follow the steps below.

1. Select the cell containing the text you want to change.
2. Click the down arrow next to the text color icon. It is usually displayed as the letter "A" with a red underline, as shown in the example above.
3. After clicking the down arrow for the text color, select the color you want to make the text.

Note: If the selected cell does not contain any text, the font color will change as soon as you type new text into the cell.

➤ **Changing cell background color**

To change the cell background color within a Microsoft Excel spreadsheet, follow the steps below.

1. Select the cell for which you want to change the background color.
2. Click the down arrow next to the cell color icon. It is usually displayed as tipping paint can with a yellow underline, as shown in the example above.
3. After clicking the down arrow for the cell color, select the color you want to make the cell background.

➤ **Changing cell border**

By default, a cell does not have a border. Adding borders to a worksheet are a great way to help readers categorize data – use of borders allows you to help focus the headings for rows and columns and define what categories are and what data is. To change the cell border within a Microsoft Excel spreadsheet, follow the steps below.

The methods are:

- Add a border around all data: Select range of cells like C5 to G17 -> Right Click the selected range -> Select **Format Cells** -> Click on the **Border** Tab -> Click on the single thick line on the right of the **Style** box -> Click on the **Outline** in the **Presets** box -> Click **OK** (Do the same for ranges C5 to C17, D6 to D17 and D5 to G6)

- Add a colored border: Select range of cells like C5 to G5 -> Right Click the selected range -> Select **Format Cells** -> Click on the **Border** Tab -> Click on the single thick line on the right of the **Style** box -> Change the color to **Red, Accent 2** (hover over colors to see definition) -> In the Border section click the bottom area of the box (a red line should appear) -> Click **OK**

➤ **Merge Cells and Align Text:**

With the ability to spread headings over columns, wrap text, change the orientation of the text and align the text within cells you are able to provide as much information as possible by using simple text.

The methods are:

- Wrapping text within a single cell: Right Click on Selected Cell -> Select **Format Cells**-> Click on the **Alignment** Tab -> Click the check box next to *Wrap Text* -> Click **OK**
- Aligning and centering text over several columns: Select range of cells like D5 to G5 -> Right Click the selected range -> Select **Format Cells** -> Click on the **Alignment** Tab -> Click the check box next to **Merge Cells** -> Change the **Horizontal** alignment to **Center** -> Click **OK**

Changing Column Width and Row Height:

By default, when you create a new workbook in Excel, the row height and column width is always the same for all cells. However, you can easily change the height and width for one or more rows and columns. If you find yourself needing to expand or reduce Excel's row widths and column heights, there are several ways to adjust them. The table below shows the minimum, maximum and default sizes for each based on a point scale.

Type	Min	Max	Default
Column	0 (hidden)	255	8.43
Row	0 (hidden)	409	15.00

➤ **Set a column to a specific width:**

1. Select the column or columns that you want to change.
2. On the **Home** tab, in the **Cells** group, click **Format**.

3. Under **Cell Size**, click **Column Width**.
4. In the **Column width** box, type the value that you want.
5. Click **OK**.

➤ **Change the column width to automatically fit the contents (AutoFit)**

1. Select the column or columns that you want to change.
2. On the **Home** tab, in the **Cells** group, click **Format**.
3. Under **Cell Size**, click **AutoFit Column Width**.

➤ **Change the width of columns by using the mouse**

Do one of the following:

1. To change the width of one column, drag the boundary on the right side of the column heading until the column is the width that you want.
2. To change the width of multiple columns, select the columns that you want to change, and then drag a boundary to the right of a selected column heading.
3. To change the width of columns to fit the contents, select the column or columns that you want to change, and then double-click the boundary to the right of a selected column heading.
4. To change the width of all columns on the worksheet, click the **Select All** button, and then drag the boundary of any column heading.

➤ **Set a row to a specific height**

1. Select the row or rows that you want to change.
2. On the **Home** tab, in the **Cells** group, click **Format**.
3. Under **Cell Size**, click **Row Height**.
4. In the **Row height** box, type the value that you want, and then click **OK**.

➤ **Change the row height to fit the contents**

1. Select the row or rows that you want to change.
2. On the **Home** tab, in the **Cells** group, click **Format**.
3. Under **Cell Size**, click **AutoFit Row Height**.

➤ **Change the height of rows by using the mouse**

Do one of the following:

1. To change the row height of one row, drag the boundary below the row heading until the row is the height that you want.
2. To change the row height of multiple rows, select the rows that you want to change, and then drag the boundary below one of the selected row headings.
3. To change the row height for all rows on the worksheet, click the **Select All** button, and then drag the boundary below any row heading.

Unit – II

Adding Elements to a Workbook: Adding, Modifying, cropping an image, and rotating an Images, compressing a Picture, Adding WordArt, Inserting AutoShapes, Adding Clip Art, Adding a Hyperlink.

Protection: Protect worksheet, protect workbook, share workbook, and track Changes.

Charts: Chart elements: Titles, legend, data labels, creating a New Chart, Formatting the Chart, Types of charts, Using Chart Templates.

Adding Elements to a Workbook:

While Microsoft Excel is primarily used as a calculation program, in some situations you may want to store different elements like pictures, shapes, clipart etc., along with data. You can enter these elements into Excel simply to associate them with a particular piece of information.

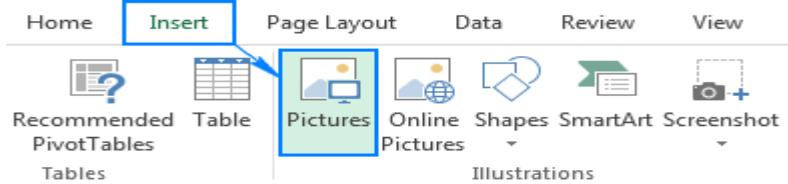
Adding Images/Inserting Pictures:

All versions of Microsoft Excel allow you to insert pictures stored anywhere on your computer or another computer you are connected to. In Excel 2016 and Excel 2013, you can also add an image from web pages and online storages such as OneDrive, Facebook and Flickr.

Insert an image from a computer

Inserting a picture stored on your computer into your Excel worksheet is easy by following these steps:

1. In your Excel spreadsheet, click where you want to put a picture.
2. Switch to the *Insert* tab > *Illustrations* group, and click **Pictures**.

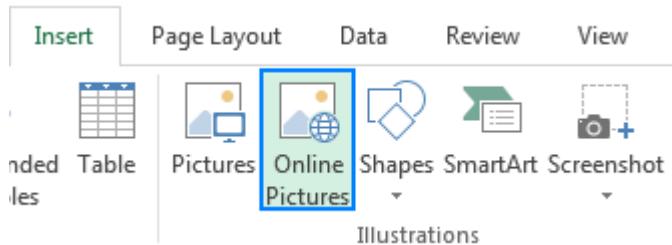


3. In the *Insert Picture* dialog that opens, browse to the picture of interest, select it, and click **Insert**. This will place the picture near the selected cell, more precisely, the top left corner of the picture will align with the top left corner of the cell.
- To insert **several images** at a time, press and hold the **Ctrl** key while selecting pictures, and then click **Insert**.

Add picture from the web, OneDrive or Facebook (Online pictures)

In the recent versions of Excel 2016 or Excel 2013, you can also add images from web-pages by using Bing Image Search. To have it done, perform these steps:

1. On the *Insert* tab, click the **Online Pictures** button:



2. A window will appear, you type what you're looking for into the search box, and hit Enter.
3. In search results, click on the picture you like best to select it, and then click **Insert**. You can also select a few images and have them inserted in your Excel sheet in one go.

Add/insert a picture in Excel cell

Normally, an image inserted in Excel lies on a separate layer and "floats" on the sheet independently from the cells. If you want to embed an image **into a cell**, change the picture's properties as shown below:

1. Resize the inserted picture so that it fits properly within a cell, make the cell bigger if needed, or merge a few cells.
2. Right-click the picture and select **Format Picture...**
3. On the *Format Picture* pane, switch to the *Size & Properties* tab, and select the **Move and size with cells** option.

Modifying Images

As we mentioned earlier, whenever you insert a picture into MS Excel, the **Picture toolbar** automatically opens. This gives you all the tools necessary to modify your image in one convenient place. You can apply changes to images in size, crop it, compress it, and adjust the color and contrast and more.

Note: All of the function available on the toolbar are also available in the Format Picture dialog box. To access it, double click on the picture.

Adjusting Color and Contrast

Select the Color button on picture toolbar, it gives you different ways to adjust the color of a picture:

To the right of the Color button on the Picture toolbar are the Contrast buttons, they adjust the contrast up or down, just as the Brightness buttons right beside them adjust the brightness up or down.

Cropping an image:

In MS Excel, you drag the Crop marks at the edges of the picture.

- Select a picture in MS Excel and click the Crop button in the Picture toolbar. You can see the black crop marks at each corner of the picture.
- To crop the picture, click one of the crop marks and drag it to the desired location. In this case, we will crop the picture to include only a selected part.
- To turn the crop function off, click the Crop button again.
- You can also use values to crop a picture by using the Format Picture dialog. To access the Format Picture dialog, double click on the picture. To crop a picture by entering values, select the Picture tab. Enter Values, then click **Ok**.

Rotating an image:

- To rotate an image, we'd click the Rotate left 90° button. This rotates the picture 90° to the left. You can also rotate an image by selecting it and placing your mouse over the handle at the top.
- When the mouse pointer turns into a circular arrow P, just click and drag the top of the picture either right or left to rotate it.
- You can also rotate the picture by selecting the size tab in the Format Picture dialog box and entering a value.
- Ex: If we enter 12, this will rotate the picture 12 degrees to the right. If we wanted to rotate to the left, we would enter a negative number, such as -12.

Changing the Borders of a Picture or an Image

- The next button on the Picture toolbar is the Line Style button. This refers to the border around the outer edge of a selected element.
- To change the border of an image, you can click this button in the toolbar, and then select the desired weight (thickness) of the line.
- You can also change the border style in the Colors and Lines tab of the Format picture dialog box. Using this method, you can also easily change the color and style of the line as well.

Compressing a Picture

- You can reduce the file size of a picture by using the Compress Picture command.
- This reduces the resolution of the picture for quicker downloading and removes unnecessary information. For instance, when you crop a picture, the cropped portions of a picture are still stored in the file, they have only been "hidden."

- Find the Compress Picture button on the toolbar, to the right of the Line Style button. When you press it, you will see the Compress Picture dialog box.
- Choose the options you want, and click **OK**. The Web/Screen option reduces picture resolution to 96 dpi, or dots per inch. This helps increase the loading speed of your document when you view it on the web or when you open it.
- With the Select Transparent Color button, you create a transparent area in a picture. To do this, click the button and select the color you want to make transparent by clicking on it in the picture.
- Use the Reset Picture button on the toolbar to reset the picture to its original size and format.

Adding WordArt:

WordArt is a program that allows you to treat text as a graphic. You can use the program to add special effects and flourishes to text, and then insert the text—as a graphic—in your worksheet. It is useful for creating special text elements such as logos, mastheads, or titles.

- You can insert WordArt into Excel much like in ms-word. Click **Insert > WordArt from Text tab**.
- Or select the WordArt icon in the Draw toolbar at the bottom of the worksheet window.
- You will then see the WordArt gallery. Select a style and click **OK**.
- Another dialog box will open where you will enter your own text.
- Select a font and a font size, and then click the text box and begin typing. Click **OK** when finished.
- When you insert WordArt into MS Excel, the WordArt toolbar will automatically open. Just like the Picture toolbar, this gives us easy access to all the functions associated with WordArt.

- When we click it, the Edit WordArt Text dialog box reopens. If we wanted to change our text, we'd simply select the Text box, make our changes, and click **OK**.
- We can use Format button to see the Format WordArt dialog box.
- As you can see it is almost identical to the Format Picture box. From here you can alter the WordArt's size, color, adjust properties, etc.
- Use the WordArt Shapes button to change the shape of your WordArt.
- Use the Same Letter Height button to make all of the characters in your text the same height. The Vertical Text button, reorients the text so it runs vertically.

Inserting AutoShapes:

- AutoShapes are basic shapes such as rectangles and circles and lines. They can also be arrows, connectors, flowchart symbols, and stars.
- Click **insert > shapes button** in illustrations. Or Click the AutoShapes button in the draw toolbar in the bottom left corner of Excel to see a list of AutoShape categories.
- We will then drag our shape to the desire size and release the mouse button.
- After you insert an AutoShape Excel, you can manipulate it like any other object. You can resize it, rotate it, and change the transparency and stroke size.
- To change any modifications you can select **Format button in drawing tools**. The Format AutoShape dialog is nearly identical to the Format Picture dialog.
- Click the **Size** tab to set sizing options. You can set a specific (absolute) measurement, or you can set the measurement as a percentage of the

document page or margin. On the **Size** tab, you can also set the shape's rotation and scale.

- If your AutoShape is an arrow, you can set the beginning style for the arrow and the ending style. Depending on the styles that you select, you can also change the size for the beginning and the end of the arrow.
- To fill your shape with a solid color, click the color that you want. To add a multiple-colored background, click **Fill Effects**.
- If you fill an AutoShape with a picture, you adjust that picture by making changes on the **Picture** tab of the **Format AutoShape** dialog box.

Adding Clip Art

In Office 2013 or Office 2016 there's no longer a clip art library, but Office still helps you insert clip art.

- From the Insert tab, in the Illustrations group, click Online Pictures.
- In the Insert Pictures dialog box that appears:
 - Type in your search word(s) and press enter.
 - View the results of your search.
- Select a picture. Click on Insert.
- Resize the image and/or cell to fit the image into your worksheet.
- Format menu in picture tools will open when you select the picture, then you can format the picture with layout, borders, size, color etc.

Creating a Hyperlink:

Hyperlinks are widely used on the Internet to navigate between web-sites. In your Excel worksheets, you can easily create such links too. An Excel hyperlink is a reference to a specific location, document or web-page that the user can

jump to by clicking the link. Microsoft Excel enables you to create hyperlinks for many different purposes including:

- Going to a certain location within the current workbook
- Opening another document or getting to a specific place in that document, e.g. a sheet in an Excel file or bookmark in a Word document.
- Navigating to a web-page on the Internet or Intranet
- Creating a new Excel file
- Sending an email to a specified address

Hyperlinks in Excel are easily recognizable - generally this text is highlighted in underlined blue.

The most common way to put a hyperlink directly into a cell is by using the **Insert Hyperlink** dialog, which can be accessed in 3 different ways. Just select the cell where you want to insert a link and do one of the following:

- On the *Insert* tab, in the *Links* group, click the **Hyperlink** button.
Right click the cell, and select Hyperlink... from the context menu.
- Press the **Ctrl + K** shortcut.

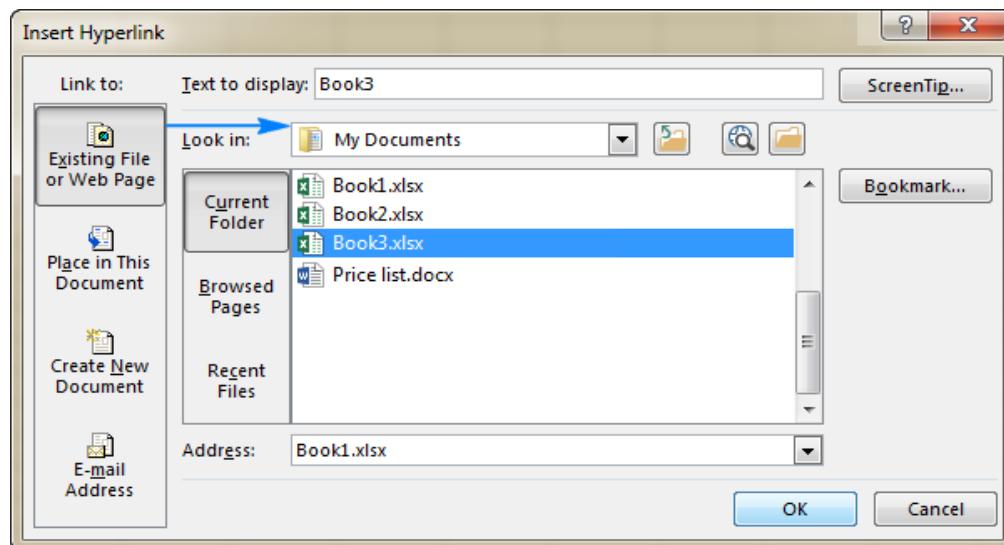
And now, depending on what sort of link you want to create, proceed with one of the following examples:

- [Hyperlink to another document](#)
- [Hyperlink to web-page \(URL\)](#)
- [Hyperlink to a new workbook](#)
- [Hyperlink to an email address](#)

Create hyperlink to another document

To insert a hyperlink to another document such as a different Excel file, Word document or PowerPoint presentation, open the *Insert Hyperlink* dialog, and perform the steps below:

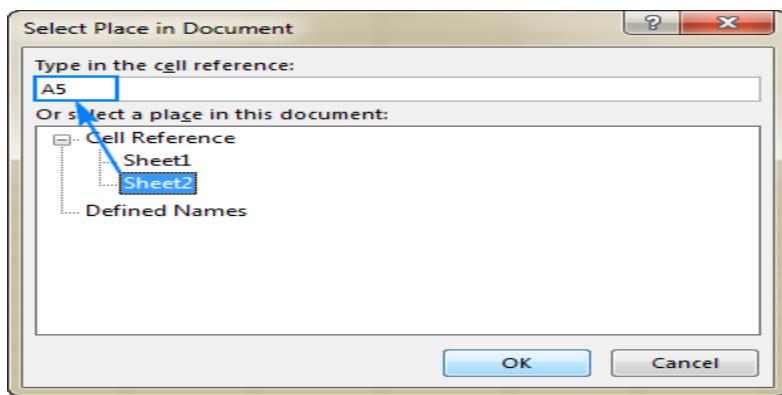
1. On the left-hand panel, under *Link to*, click the Existing File or Web Page
2. In the *Look in* list, browse to the location of the target file, and then select the file.
3. In the *Text to display* box, type the text you want to appear in the cell.
4. Optionally, click the *ScreenTip...* button in the upper-right corner, and enter the text to be displayed when the user hovers the mouse over the hyperlink. In this example, it's "Goto file3 in My Documents".
5. Click OK.



The hyperlink is inserted in the selected cell.

- To link to a specific sheet or cell, click the *Bookmark...* button in the right-hand part of the *Insert Hyperlink* dialog box, select the sheet and type the

target cell address in the *Type in the cell reference* box, and click *OK*.



Add a hyperlink to a web address (URL)

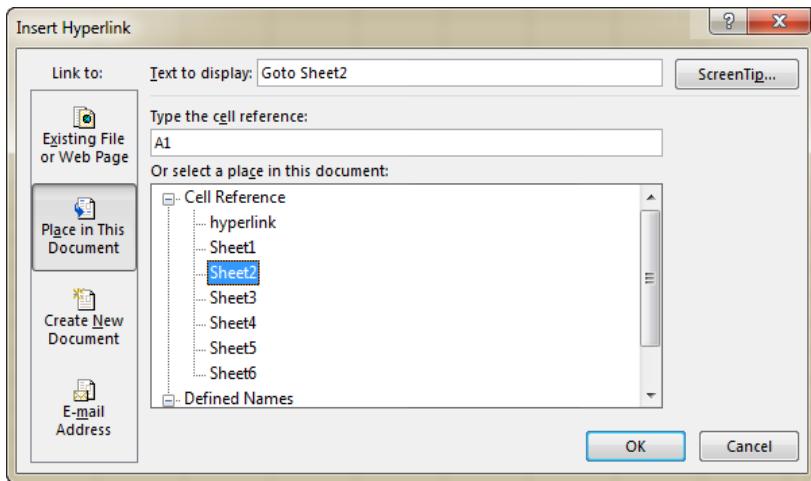
To create a link to a web page, open the *Insert Hyperlink* dialog, and proceed with the following steps:

1. Under *Link to*, select **Existing File or Web Page**.
2. Click the **Browse the Web** button, open the web page you want to link to, and switch back to Excel without closing your web browser.
3. Excel will insert the **web site Address** and **Text to display** for you automatically. You can change the text to display the way you want, enter a screen tip if needed, and click *OK* to add the hyperlink.
4. Alternatively, you can copy the web page URL before opening the *Insert Hyperlink* dialog, and then simply paste the URL in the **Address** box.

Hyperlink to a sheet or cell in the current workbook

To create a hyperlink to a specific sheet in the active workbook, click the **Place in this Document** icon. Under *Cell Reference*, select the target

worksheet, and click *OK*.



To create an Excel hyperlink to cell, type the cell reference in the *Type in the cell reference* box.

Insert a hyperlink to open a new Excel workbook

Besides linking to existing files, you can create a hyperlink to a new Excel file.

Here's how:

1. Under *Link to*, click the Create New Document icon.
2. In the *Text to display* box, type the link text to be displayed in the cell.
3. In the *Name of new document* box, enter the new workbook name.
4. Under *Full path*, check the location where the newly created file will be saved. If you want to change the default location, click the *Change* button.
5. Under *When to edit*, select the desired editing option.
6. Click *OK*.

How to remove hyperlink in Excel

Removing hyperlinks in Excel is a two-click process. You simply right-click a link, and select Remove Hyperlink from the context menu. This will remove a clickable hyperlink, but keep the link text in a cell. To delete the link text too, right-click the cell, and then click Clear Contents.

Protecting a Workbook:

Excel gives you the ability to protect your work, whether it's to prevent someone from opening a workbook without a password, granting Read-Only access to a workbook, or even just protecting a worksheet so you don't inadvertently delete any formulas.

Workbook-level: To control how users should work with worksheets inside your workbook's structure, use workbook-level protection. You can lock the structure of your workbook by specifying a password. Locking the workbook structure prevents other users from adding, moving, deleting, hiding, and renaming worksheets.

- To prevent other users from viewing hidden worksheets, adding, moving, deleting, or hiding worksheets, and renaming worksheets, you can protect the structure of your Excel workbook with a password.
- If you protect the workbook structure, users cannot insert, delete, rename, move, copy, hide or unhide worksheets anymore.
 1. Open a workbook.
 2. On the **Review tab**, in the **Changes group**, click **Protect Workbook**. Or click on file menu > info>protect workbook.
 3. Check Structure, enter a password and click OK.
 4. Reenter the password and click on OK.
 5. Users cannot insert, delete, rename, move, copy, hide or unhide worksheets anymore. If you forget or lose your password, you can't retrieve it.

Worksheet-level: To control how users should work within an individual worksheet, use worksheet-level protection. With sheet protection, you can

control how a user can work within worksheets. You can specify what exactly a user can do within a sheet, thereby making sure that none of the important data in your worksheet are affected. For example, you might want a user to only add rows and columns, or only sort and use AutoFilter. Once sheet protection is enabled, you can protect other elements such as cells, ranges, formulas, and ActiveX or Form controls.

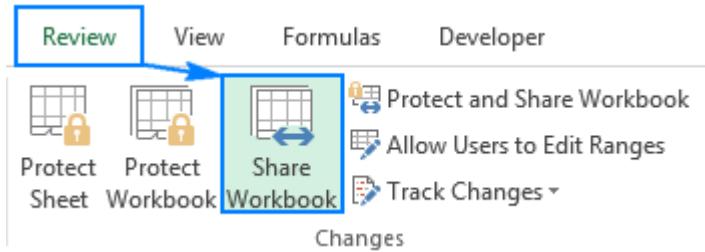
- To protect a sheet in Excel perform the following steps.
- To **password protect your Excel sheet**, type a password in the corresponding field. Be sure to remember the password or store it in a safe location because you will need it later to unprotect the sheet.
- ✓ Right click a worksheet tab at the bottom of your screen and select **Protect Sheet...** from the context menu. Or, click the **Protect Sheet** button on the *Review* tab, in the *Changes* group.
- ✓ In the *Protect Sheet* dialog window, do the following:
 - ✓ Select the actions you allow the users to perform.
 - By default, the following 2 options are selected: *Select locked cells* and *Select unlocked cells*. If you leave only these two options selected, the users of your sheet, including yourself, will be able only to select cells (both locked and unlocked).
 - To allow some other actions such as sorting, filtering, formatting cells, deleting or inserting rows and columns, check the corresponding boxes.
 - If you don't check any action, users will only be able to view the contents of your Excel sheet.
 - ✓ Click the OK button.
 - ✓ To unprotect a worksheet, Right-click the sheet tab, and select **Unprotect Sheet...** from the context menu.

Sharing a workbook:

These days more and more people are using Microsoft Excel for team work. We can also **export** and **share** workbooks with others directly from Excel. The recent versions of Excel 2010, 2013 and 2016 make it easy to share and collaborate on workbooks. By sharing an Excel file, you are giving other users access to the same document and allow them to make edits simultaneously. Here we will learn how to share an Excel workbook for multiple users by saving it to a local network location where other people can access it and make edits. You can keep track of those changes and accept or reject them.

With the workbook open, perform the following steps to share it:

1. On the *Review* tab, in the *Changes* group, click the **Share Workbook** button.



2. The *Share Workbook* dialog box will appear, and you select the Allow changes by more than one user at the same time. This also allows workbook merging check box on the *Editing* tab.
3. Optionally, switch to the *Advanced* tab, select the desired settings for tracking changes, and click *OK*.
For example, you may want to have changes updated automatically every n number of minutes (all the other settings on the screenshot below are the default ones).
4. Save your Excel file to a network location where other people can access it (the fastest way is by using the **Ctrl + S** shortcut).

5. If done correctly, the word [Shared] will appear to the right of the workbook's name
6. When the teamwork has been completed, you can stop sharing the workbook in this way:

Open the *Share Workbook* dialog box (*Review* tab > *Changes* group). On the *Editing* tab, clear the Allow changes by more than one user at the same time... check box, and click *OK*.

Track Changes in workbook:

When collaborating on an Excel workbook, you may want to keep track of the changes that have been made to it. This could be especially useful when the document is almost finished and your team is making the final revisions. In an Excel file, you can review, accept or reject changes electronically by using the Track Changes feature specially designed for it. By using the built-in Track Changes in Excel, you can easily review your edits directly in the edited worksheet or on a separate sheet, and then accept or reject each change individually or all changes at a time. To use the Excel tracking feature most effectively, there are a few points for you to remember.

1. *Track Changes is only available in shared workbooks*
2. *Track Changes cannot be used in workbooks that contain tables*
3. *It's not possible to undo changes in Excel*
4. *Not all changes are tracked in Excel*
5. *Change history is kept for 30 days by default*

Turn on Excel Track Changes feature

To view the changes made to a given workbook by you or other users, perform these steps:

1. Be certain that you want to use this method before continuing. Shared Workbooks have limitations, and therefore we highly recommend co-authoring, which is the replacement for Shared Workbooks.
2. Click **Review > Share Workbook**.
Note that in newer versions of Excel, the Share Workbook button has been hidden. Here's how to unhide it.
3. In the **Share Workbook** dialog box, on the **Editing** tab, select the **Allow changes by more than one user at the same time** check box.
4. Click the **Advanced** tab.
5. Under **Track changes**, click **Keep change history for** and, in the **days** box, type the number of days of change history that you want to keep. By default, Excel keeps the change history for 30 days and permanently erases any change history that is older than this number of days. To keep change history for a longer than 30 days, enter a number that is larger than 30.
6. Click **OK** and, if you are prompted to save the workbook, click **OK** to save the workbook.

Charts in Excel:

A chart is a tool you can use in Excel to communicate data graphically. Charts allow your audience to see the meaning behind the numbers, and they make showing comparisons and trends much easier. A chart is a visual representation of data, in which the data is represented by symbols such as bars in a bar chart or lines in a line chart.

To create charts for the data by below mentioned steps.

- Select the data for which you want to create the chart.

- Choose Insert Tab » Select the chart or click on the Chart group to see various chart types.
- Select the chart of your choice and click OK to generate the chart.

Chart Elements

The different parts that make up a chart are referred to as chart elements. Chart elements give more descriptions to your charts, thus making your data more meaningful and visually appealing.

Follow the steps given below to insert the chart elements in your graph.

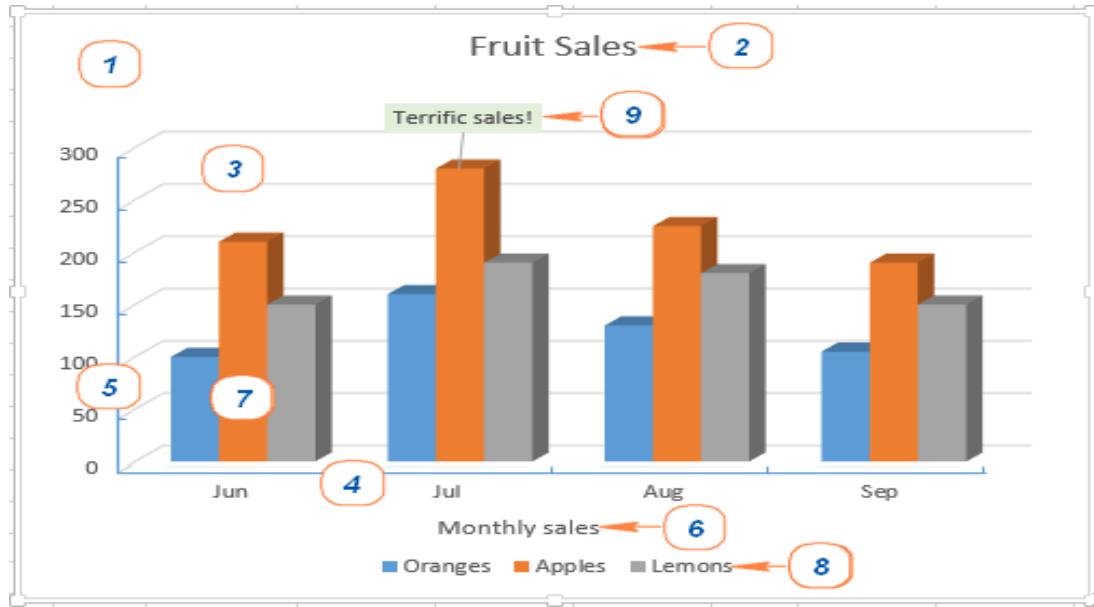
Step 1 – Click the chart. Three buttons appear at the upper-right corner of the chart.

Step 2 – Click the  Chart Elements icon. A list of available elements will be displayed.

The following chart elements are available –

Excel charts have a handful of elements. Some of these elements are displayed by default, others can be added and modified manually as needed.

- | | |
|-------------------------------|-----------------------------------|
| 1. Chart area | 6. Axis title |
| 2. Chart title | 7. Data points of the data series |
| 3. Plot area | 8. Chart legend |
| 4. Horizontal (category) axis | 9. Data label |
| 5. Vertical (value) axis | |



- | | |
|-------------------------------|-----------------------------------|
| 1. Chart area | 6. Axis title |
| 2. Chart title | 7. Data points of the data series |
| 3. Plot area | 8. Chart legend |
| 4. Horizontal (category) axis | 9. Data label |
| 5. Vertical (value) axis | |

- **Chart Area:** The chart area is everything within the outside border. This is the area that makes up the chart. All charts have a chart area. This includes the plot area and the space outside it. You need to select the chart area when you want to make changes to the whole chart.
- **Chart titles:** When you create a chart, a Chart Title box appears above the chart.
- **Plot Area:** The plot area is the area which is enclosed by the two axis. This area can have its own border as well as a background color. The plot area is everything enclosed by the axes. This does not include titles, legend, etc. This is the area enclosed by the two axes. All charts have a plot area.
- **Axes:** Charts typically have two axes that are used to measure and categorize the data. A **vertical axis** (also known as value axis or y axis), and

A **horizontal axis** (also known as category axis or x axis) 3-D Column charts have a third axis, the depth axis.

- **Axis titles:** Axis titles give the understanding of the data of what the chart is all about. You can add axis titles to any horizontal, vertical, or the depth axes in the chart. You cannot add axis titles to charts that do not have axes (Pie or Doughnut charts).
- **Data Series:** A data series is a collection of data points (or markers) and normally corresponds to the data within a single row or column. This could be a series of columns, bars or a series of squares or crosses joined together by a line.
- **Data labels:** Data labels make a chart easier to understand because they show the details about a data series or its individual data points. You can change the location of the data labels within the chart, to make them more readable.
- **Legend:** When you create a chart, the Legend appears by default. You can hide a Legend by deselecting it from the Chart Elements list.

Creating Charts with Insert Chart

To create a chart in Excel, you start by entering the numeric data on a worksheet, and then continue with the following steps.

1. Prepare the data to plot in a chart

- You can organize the data in rows or columns, and Microsoft Excel will automatically determine the best way to plot the data in your graph
- The data in the first column (or columns headings) is used as labels along the X axis of your chart.
- The numerical data in other columns are used to create the labels for the Y axis.

- Either the column headings or data in the first column are used in the chart legend. Excel automatically chooses the data for the legend based on your data layout.

2. Select data to include in the chart

- Select all the data you want to include in your Excel graph. Be sure to select the column headings if you want them to appear either in the chart legend or axis labels.

3. Insert the chart in Excel worksheet

- To add the graph on the current sheet, go to the *Insert* tab > *Charts* group, and click on a chart type you would like to create.

To use the option Recommended Charts, follow the steps given below –

Step 1 – Select the data.

Step 2 – Click the **Insert** tab on the Ribbon.

Step 3 – Click **Recommended Charts**.

Formatting Charts in Excel

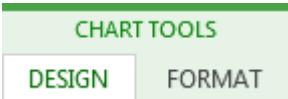
Once you create a chart it's easy to format and enhance your chart using Excel's menus and commands. **To change chart style in Excel, simply right click or double click on the chart item you want to format** to view the formatting options for that item.

Just a few of the chart items you can format are:

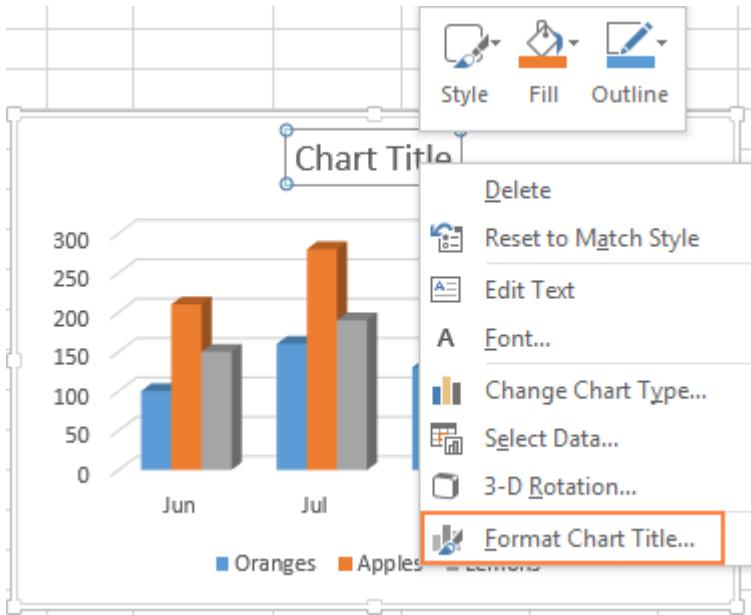
- Chart Titles, Axis Titles, and Data Labels
- Chart Lines
- Axis Labels
- Plot Area / Chart Area

Overall, there are 3 ways to customize charts in Excel 2016 and Excel 2013.

1. Select the chart and look for the needed options on the Chart Tools tabs on the Excel ribbon.



2. Right-click an element on the chart and select the corresponding context menu item. For example, here's the right-click menu for customizing the chart title:



3. Use on-object chart customization buttons. These buttons appear in the top right corner of your chart as soon as you click on it.



Chart Elements button. It launches the checklist of all the elements you can modify or add to your graph, and it only shows those elements that are applicable to the selected chart type. The Chart Elements button supports Live Preview, so if you are not sure what a certain element is, hover the mouse on it and you will see what your graph would look like if you select that option.

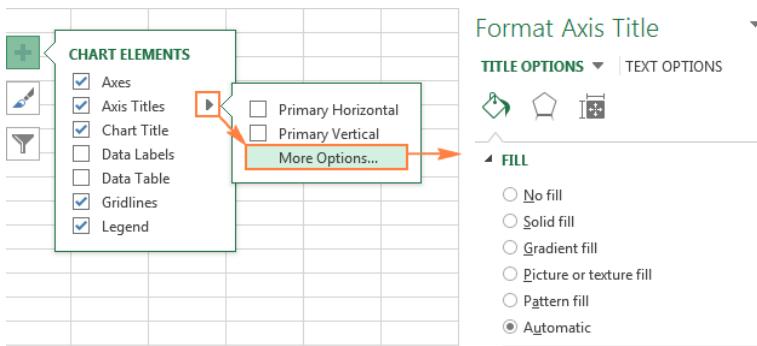


Chart Styles button. It lets you quickly change the chart styles and colors.



Chart Filters button. It allows you to show or hide data displayed in your chart.

For more options, click the **Chart Elements** button, find the element you want to add or customize in the checklist, and click the arrow next to it. The Format Chart pane will appear on the right of your worksheet, where you can select the options you want:



Format your chart using the Ribbon

1. In your chart, click to select the chart element that you want to format.
2. On the **Format** tab under **Chart Tools**, do one of the following:
 - ✓ Click **Shape Fill** to apply a different fill color, or a gradient, picture, or texture to the chart element.



- ✓ Click **Shape Outline** to change the color, weight, or style of the chart element.



- ✓ Click **Shape Effects** to apply special visual effects to the chart element, such as shadows, bevels, or 3-D rotation



3. To apply a predefined shape style, on the **Format** tab, in the **Shape Styles** group, click the style that you want. To see all available shape styles, click the **More** button

4. To change the format of chart text, select the text, and then choose an option on the mini toolbar that appears. Or, on the **Home** tab, in the **Font** group, select the formatting that you want to use.

Types of Charts:

Excel provides you different types of charts that suit your purpose. Based on the type of data, you can create a chart. You can also change the chart type later.

Excel offers the following major chart types –

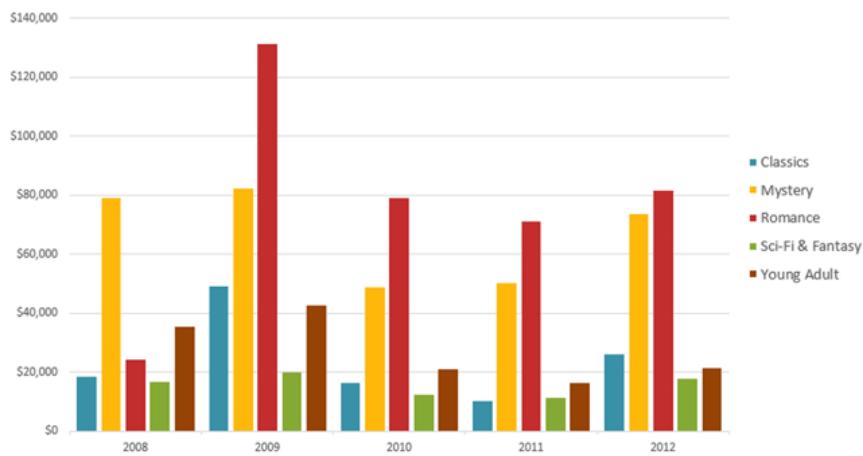
- Column Chart
- Bar Chart
- Pie Chart
- Doughnut Chart
- Line Chart
- Area Chart
- XY (Scatter) Chart
- Bubble Chart
- Stock Chart
- Surface Chart
- Radar Chart

Column Chart

A Column Chart typically displays the categories along the horizontal (category) axis and values along the vertical (value) axis. To create a column chart, arrange the data in columns or rows on the worksheet.

A column chart looks as follows –

Column



Line Chart

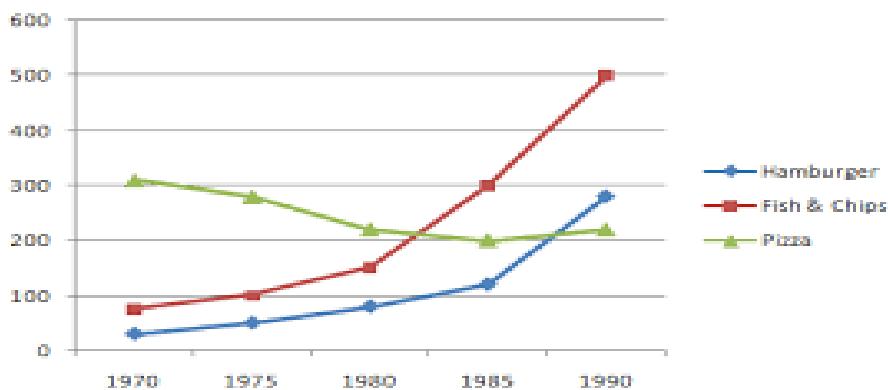
Line charts can show continuous data over time on an evenly scaled Axis. Therefore, they are ideal for showing trends in data at equal intervals, such as months, quarters or years.

In a Line chart –

- Category data is distributed evenly along the horizontal axis.
- Value data is distributed evenly along the vertical axis.

To create a Line chart, arrange the data in columns or rows on the worksheet.

A line chart looks as follows:

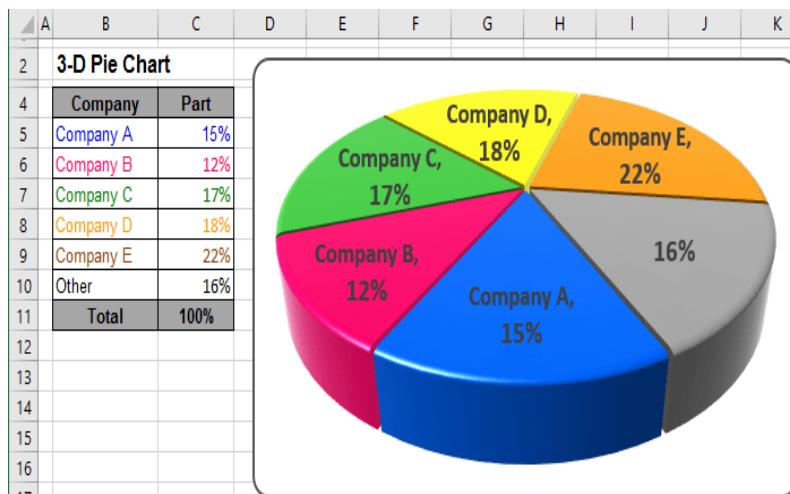


Pie Chart

Pie charts show the size of items in one data series, proportional to the sum of the items. The data points in a pie chart are shown as a percentage of the whole pie. To create a Pie Chart, arrange the data in one column or row on the worksheet.

A Pie Chart has the following sub-types –

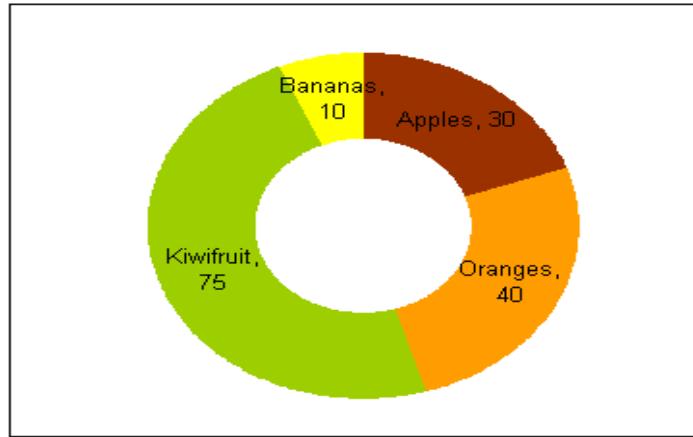
- Pie
- 3-D Pie
- Pie of Pie
- Bar of Pie



Doughnut Chart

A Doughnut chart shows the relationship of parts to a whole. It is similar to a Pie Chart with the only difference that a Doughnut Chart can contain more than one data series, whereas, a Pie Chart can contain only one data series.

A Doughnut Chart contains rings and each ring representing one data series. To create a Doughnut Chart, arrange the data in columns or rows on a worksheet.



Bar Chart

Bar Charts illustrate comparisons among individual items. In a Bar Chart, the categories are organized along the vertical axis and the values are organized along the horizontal axis. To create a Bar Chart, arrange the data in columns or rows on the Worksheet.

A Bar Chart has the following sub-types –

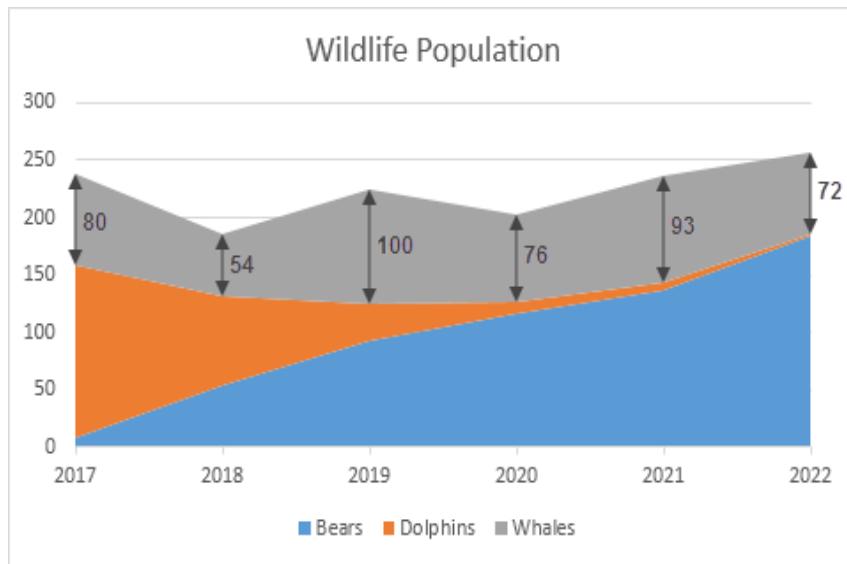
- Clustered Bar, Stacked Bar, 100% Stacked Bar, 3-D Clustered Bar, 3-D Stacked Bar, 3-D 100% Stacked Bar etc.



Area Chart

Area Charts can be used to plot the **change over time** and draw attention to the total value across a trend. By showing the sum of the plotted values, an

area chart also shows the relationship of parts to a whole. To create an Area Chart, arrange the data in columns or rows on the worksheet.



XY (Scatter) Chart

XY (Scatter) charts are typically used for showing and comparing numeric values, like scientific, statistical, and engineering data.

A Scatter chart has two Value Axes –

- Horizontal (x) Value Axis
- Vertical (y) Value Axis

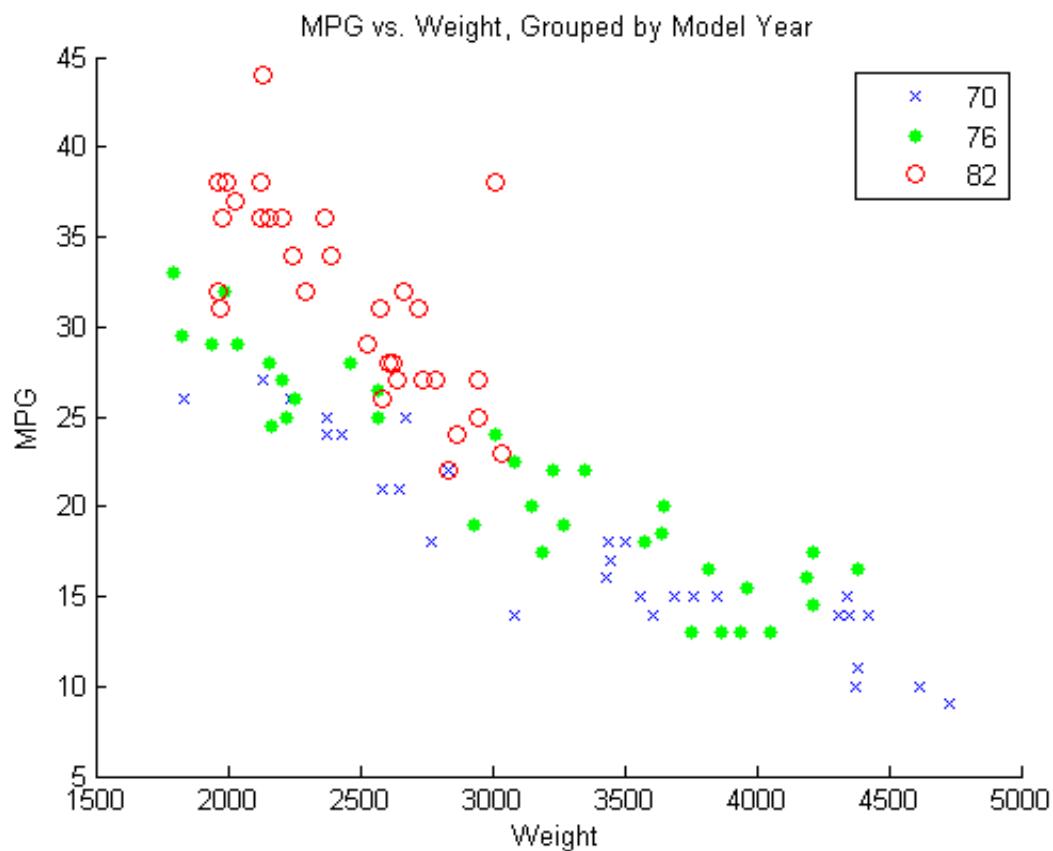
It combines x and y values into single data points and displays them in irregular intervals, or clusters. To create a Scatter chart, arrange the data in columns and rows on the worksheet.

Place the x values in one row or column, and then enter the corresponding y values in the adjacent rows or columns.

Consider using a Scatter chart when –

- You want to change the scale of the horizontal axis.
- You want to make that axis a logarithmic scale.
- Values for horizontal axis are not evenly spaced.

- There are many data points on the horizontal axis.
- You want to adjust the independent axis scales of a scatter chart to reveal more information about data that includes pairs or grouped sets of values.
- You want to show similarities between large sets of data instead of differences between data points.
- You want to compare many data points regardless of the time.
 - The more data that you include in a scatter chart, the better the comparisons you can make.

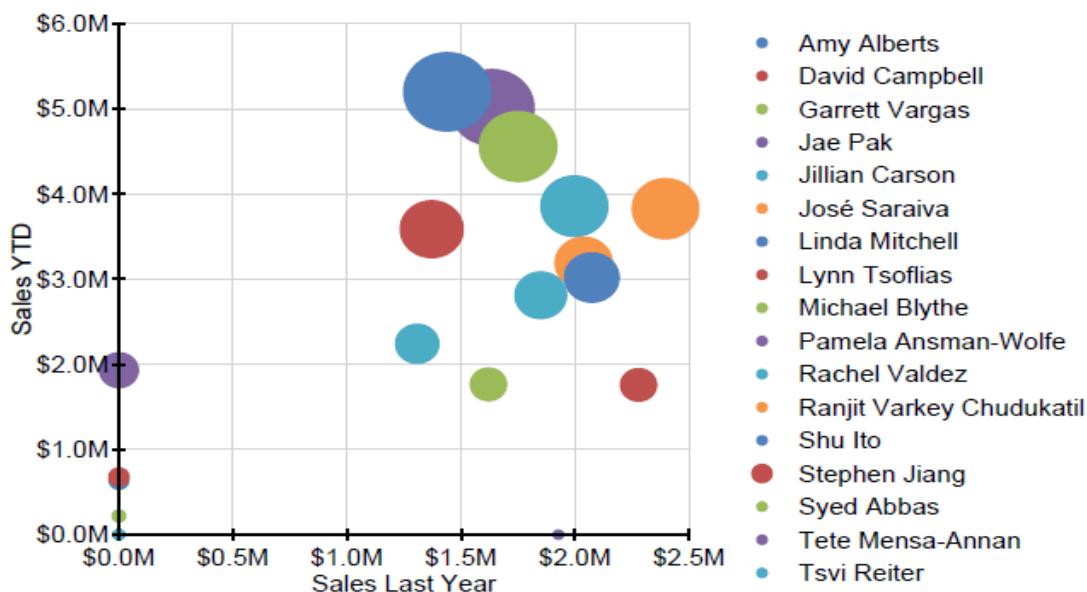


Bubble Chart

A Bubble chart is like a Scatter chart with an additional third column to specify the size of the bubbles it shows to represent the data points in the data series.

A Bubble chart has the following sub-types –

- Bubble
- Bubble with 3-D effect



Surface Chart

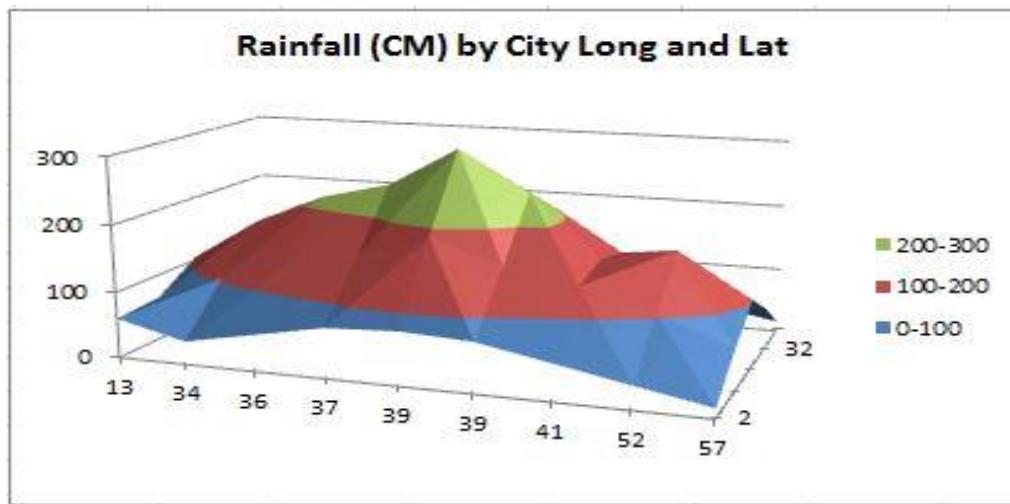
A Surface chart is useful when you want to find the optimum combinations between two sets of data. As in a topographic map, colors and patterns indicate areas that are in the same range of values.

To create a Surface chart –

- Ensure that both the categories and the data series are numeric values.
- Arrange the data in columns or rows on the worksheet.

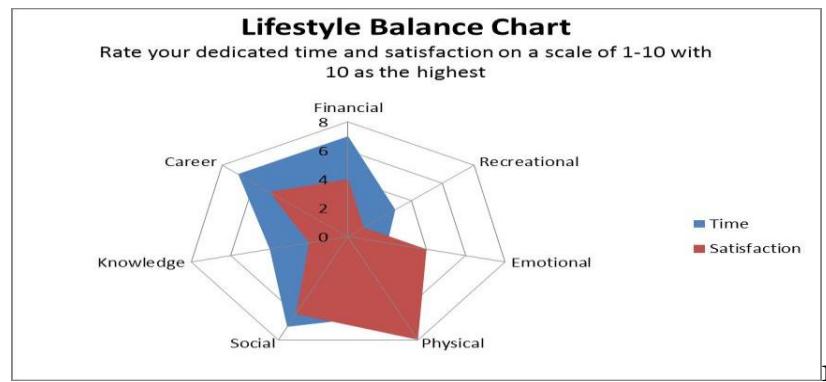
A Surface chart has the following sub-types –

- 3-D Surface
- Wireframe 3-D Surface
- Contour
- Wireframe Contour



Radar Chart

Radar charts compare the aggregate values of several data series. To create a Radar chart, arrange the data in columns or rows on the worksheet.



Combo Chart

Combo charts combine two or more chart types to make the data easy to understand, especially when the data is widely varied. It is shown with a

secondary axis and is even easier to read. To create a Combo chart, arrange the data in columns and rows on the worksheet.



Using Templates in Excel:

A **template** is a predesigned spreadsheet you can use to create new spreadsheets with the same formatting and predefined formulas. With **templates**, you don't need to know how to do the math, or even how to write formulas—these are already integrated into the spreadsheet.

How to create a chart template

- In Excel 2013 and 2016, to save a graph as a chart template, right-click the chart and pick *Save as Template* in the pop-up menu:
- Clicking the *Save As Template* option brings up the *Save Chart Template* dialog, where you type the template name and click the *Save* button.
- By default, the newly created chart template is saved to the special **Charts** folder. All chart templates stored to this folder are automatically added to the **Templates** folder that appears in the *Insert Chart* and *Change Chart Type* dialogs when you create a new or modify an existing graph in Excel.

How to apply the chart template

- To create a chart in Excel based on a specific chart template, open the *Insert Chart* dialog by clicking the *Dialog Box Launcher* in the *Charts* group on the ribbon. On the *All Charts* tab, switch to the *Templates* folder, and click on the template you want to apply.
- To apply the chart template to an existing graph, right click on the graph and choose *Change Chart Type* from the context menu. Or, go to the *Design* tab and click *Change Chart Type* in the *Type* group.
- Either way, the *Change Chart Type* dialog will open, you find the desired template in the *Templates* folder and click on it.

How to delete a chart template in Excel

- To delete a graph template, open the *Insert Chart* dialog, go to the *Templates* folder and click the *Manage Templates* button in the bottom left corner.

Unit – III

Data Sorting: Sorting by One Column, Sorting by Colors or Icons, Sorting by Multiple Columns, Sorting by a Custom List.

Filtering Data: Creating a Custom AutoFilter, Using an Advanced Filter.

Data Outline: Group, Ungroup and Subtotals.

Tables: Creating a Table, Entering Data into a Table, Sorting Data into a Table, Using Filters to Sort Tables,

Data Tools: Data Validation, Consolidation

Data Sorting:

Sorting data is an integral part of Data Analysis. You can arrange a list of names in alphabetical order, compile a list of sales figures from highest to lowest, or order rows by color or icons. Sorting data helps you quickly visualize and understand your data better, organize and find the data that you want, and ultimately make more effective decisions.

You can sort by columns or by rows. Most of the sorts that you use will be column sorts.

You can sort data in one or more columns by

- text (A to Z or Z to A)
- numbers (smallest to largest or largest to smallest)
- dates and times (oldest to newest and newest to oldest)
- a custom list (E.g. Large, Medium, and Small)
- format, including cell color, font color, or icon set

Sort by one Column

- To sort on one column, execute the following steps.
- Select the Column by which you want to sort data.
- To sort in ascending order, on the Data tab, in the Sort & Filter group, click AZ.
- To sort in descending order, on the Data tab, in the Sort & Filter group, click ZA.
- We can sort numerical data either ascending or descending order, we can also sort alphabetical data in A to Z or Z to A.

Note: If you want to sort data based on a selected column, Choose **Continue with the selection** or if you want sorting based on other columns, choose **Expand Selection**.

The following table has information about employees in an organization.

A	B	C	D	E	F	G	H
EmployeeID	ManagerID	Title		BirthDate	MaritalStatus	Gender	HireDate
1	0	Chief Executive Officer		1/29/1969	S	M	1/14/2009
2	1	Vice President of Engineering		8/1/1971	S	F	1/31/2008
3	2	Engineering Manager		11/12/1974	M	M	11/11/2007
4	3	Senior Tool Designer		12/23/1974	S	M	12/5/2007
5	3	Design Engineer		9/27/1952	M	F	1/6/2008
6	3	Design Engineer		3/11/1959	M	M	1/24/2008
7	3	Research and Development Manager		2/24/1987	M	M	2/8/2009
8	4	Research and Development Engineer		6/5/1986	S	F	12/29/2008
9	4	Research and Development Engineer		1/21/1979	M	F	1/16/2009
10	4	Research and Development Manager		11/30/1984	M	M	5/3/2009
11	3	Senior Tool Designer		1/17/1978	S	M	12/5/2010
12	4	Tool Designer		7/29/1959	M	M	12/11/2007
13	4	Tool Designer		5/28/1989	M	F	12/23/2010
14	3	Senior Design Engineer		6/16/1979	S	M	12/30/2010
15	3	Design Engineer		5/2/1961	M	F	1/18/2011
16	1	Marketing Manager		3/19/1975	S	M	12/20/2007
17	2	Marketing Assistant		5/3/1987	S	M	1/26/2007
18	2	Marketing Specialist		3/6/1978	S	M	2/7/2011
19	2	Marketing Assistant		1/29/1978	S	F	2/14/2011
20	2	Marketing Assistant		3/17/1975	M	F	1/7/2011
21	2	Marketing Specialist		2/4/1986	M	M	3/2/2009

Sort by more than one Column or Row

You can sort a table by more than one column or row.

- Click the Table.
- Click Sort.
- In the Sort dialog box, specify the column by which you want to sort first.

In the screen shot given below, Sort By Title, Sort On Values, Order A – Z are chosen.

A	B	C	D	E	F	G	H
EmployeeID	ManagerID	Title		BirthDate	MaritalStatus	Gender	HireDate
28	4	Production Technician - WC60		3/13/1988	M	M	6/30/2006
17	2	Marketing Assistant		5/3/1987	S	M	1/26/2007
3	2	Engineering Manager		11/12/1974	M	M	11/11/2007
4	3	Senior Tool Designer		12/23/1974	S	M	12/5/2007
12	4	Tool D	Sort				
16	1	Market					
40	3	Produ					
5	3	Desig					
48	4	Produ					
49	4	Produ					
6	3	Design					
2	1	Vice P					
50	4	Produ					
55	3	Produ					
51	4	Produ					
27	3	Produ					
52	4	Produ					
62	3	Production Supervisor - WC60		8/7/1956	M	M	3/17/2008
53	4	Production Technician - WC10		3/29/1956	M	F	3/28/2008
26	2	Production Control Manager		11/3/1982	M	M	12/1/2008
72	4	Production Technician - WC30		5/14/1977	M	M	12/1/2008

- Click Add Level in the Sort dialog box. The Then By dialog appears.

- Specify the column by which you want to sort next.
- In the screen shot given below, Then By HireDate, Sort On Values, Order Oldest to Newest are chosen.
- Click OK.

The screenshot shows a Microsoft Excel spreadsheet with employee data. A 'Sort' dialog box is open over the data. The 'Sort On' dropdown is set to 'Title' with 'Values' selected and 'A to Z' as the order. The 'Then by' dropdown is set to 'HireDate' with 'Values' selected and 'Oldest to Newest' as the order. The 'OK' button is highlighted.

EmployeeID	ManagerID	Title	BirthDate	MaritalStatus	Gender	HireDate
28	4	Production Technician - WC60	3/13/1988	M	M	6/30/2006
17	2	Marketing Assistant	5/3/1987	S	M	1/26/2007
3	2	Engineering Manager	11/12/1974	M	M	11/11/2007
4	3	Senior Tool Designer	12/23/1974	S	M	12/5/2007
12	4	Tool Designer	Sort			
16	1	Market Researcher				
40	3	Product Manager				
5	3	Design Engineer				
48	4	Production Supervisor				
49	4	Production Technician				
6	3	Design Engineer				
2	1	Vice President				
50	4	Production Manager				
55	3	Production Control Manager				
51	4	Production Control Manager				
27	3	Production Control Manager				
52	4	Production Control Manager				
62	3	Production Supervisor - WC60	8/7/1956	M	M	3/17/2008
53	4	Production Technician - WC10	3/29/1956	M	F	3/28/2008
26	2	Production Control Manager	11/3/1982	M	M	12/1/2008
72	4	Production Technician - WC30	5/14/1977	M	M	12/1/2008

The data will be sorted for Title in the ascending alphanumeric order and then by HireDate. You will see the employee data sorted by title, and in each title category, in the seniority order.

A	B	C	D	E	F	G	H
1	EmployeeID	ManagerID	Title	BirthDate	MaritalStatus	Gender	HireDate
2	245	3	Accountant	1/4/1976	M	F	2/18/2009
3	248	3	Accountant	7/1/1979	S	M	3/8/2009
4	241	2	Accounts Manager	7/8/1983	M	M	1/30/2009
5	246	3	Accounts Payable Specialist	2/14/1977	M	M	2/11/2009
6	247	3	Accounts Payable Specialist	3/9/1979	M	F	3/1/2009
7	242	3	Accounts Receivable Specialist	3/6/1976	M	F	12/18/2008
8	243	3	Accounts Receivable Specialist	2/23/1976	S	F	1/6/2009
9	244	3	Accounts Receivable Specialist	9/20/1984	S	M	1/24/2009
10	272	2	Application Specialist	1/30/1985	M	F	12/23/2008
11	269	2	Application Specialist	5/26/1987	M	M	1/11/2009
12	268	2	Application Specialist	3/13/1988	S	M	2/3/2009
13	267	2	Application Specialist	5/19/1978	S	F	2/16/2009
14	262	2	Assistant to the Chief Financial Officer	6/21/1964	S	M	1/12/2009
15	239	3	Benefits Specialist	11/20/1984	M	F	12/25/2008
16	251	4	Buyer	8/17/1984	S	M	2/10/2009
17	252	4	Buyer	8/21/1974	M	M	2/28/2009
18	253	4	Buyer	11/30/1970	M	F	12/17/2009
19	254	4	Buyer	11/24/1970	M	M	1/4/2010
20	255	4	Buyer	11/29/1966	M	M	1/11/2010
21	256	4	Buyer	5/12/1952	M	M	1/23/2010
22	257	4	Buyer	9/17/1972	S	M	1/27/2010
23	***	-	-	-	-	-	-

Sort by Cell Color

To sort the table by the column total marks that contains cells with colors (Conditionally Formatted)

- Click the Header of the column. Ex: Total Marks.

- Click **Data** tab.
- In the **Sort & Filter** group, click **Sort**. The Sort dialog box appears.
- Choose **Sort By** as Total Marks, **Sort on** as Cell Color and specify the color green in **Order**. Click Add Level.
- Choose **Sort By** as Total Marks, **Sort on** as Cell Color and specify the color Yellow in **Order**. Click Add Level.
- Choose **Sort By** as Total Marks, **Sort on** as Cell Color and specify the color Red in **Order**.

The screenshot shows a Microsoft Excel spreadsheet with a table of student marks. The columns are labeled 'Student Code' and 'Total Marks'. The data rows are color-coded: rows 3, 5, 7, 9, 11, 13, and 15 are yellow; rows 4, 6, 8, 10, 12, 14, and 16 are red; and rows 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 17 are green. A 'Sort' dialog box is open over the spreadsheet. The 'Sort by' dropdown is set to 'Total Marks'. The 'Sort on' dropdown is set to 'Cell Color'. The 'Order' dropdown shows three levels: 'On Top' (green), 'On Top' (yellow), and 'On Top' (red). An 'Add Level' button is highlighted with an arrow. The 'OK' button is visible at the bottom right of the dialog box.

The column – Total Marks will be sorted by the cell color as specified in the Order.

A	B	C
2	Student Code	Total Marks
3	2015-16-Batch1-7	964
4	2015-16-Batch1-11	889
5	2015-16-Batch1-13	867
6	2015-16-Batch1-1	814
7	2015-16-Batch1-2	657
8	2015-16-Batch1-3	540
9	2015-16-Batch1-4	806
10	2015-16-Batch1-6	637
11	2015-16-Batch1-8	605
12	2015-16-Batch1-9	493
13	2015-16-Batch1-11	889
14	2015-16-Batch1-12	794
15	2015-16-Batch1-13	867
16	2015-16-Batch1-14	585
17	2015-16-Batch1-5	433
	2015-16-Batch1-10	414
	2015-16-Batch1-15	448

Sort by Font Color

To sort the column Total Marks in the table, that contains cells with font colors (conditionally formatted) –

- Click the header of the column – Total Marks.
- Click **Data** tab.
- In the **Sort & Filter** group, click **Sort**. The Sort dialog box appears.
- Choose **Sort By** as Total Marks, **Sort On** as Font Color and specify the color green in **Order**. Click Add Level.

- Choose Sort By as Total Marks, Sort On as Font Color and specify the color yellow in Order. Click Add Level.
- Choose Sort By as Total Marks, Sort On as Font Color and specify the color red in Order.

The screenshot shows the 'Add Level' dialog box overlaid on a Microsoft Excel spreadsheet. The dialog box has tabs for 'Sort by', 'Sort on', and 'Order'. Under 'Sort by', 'Total Marks' is selected. Under 'Sort on', 'Font Color' is selected. Under 'Order', there are three color-coded dropdown menus: green (On Top), brown (On Top), and red (On Top). The underlying Excel table contains student data with columns for Student Code and Total Marks. The Total Marks column is sorted by font color, with higher values in green and lower values in red.

A	B	C
1		
2	Student Code	Total Marks
3	2015-16-Batch1-1	814
4	2015-16-Batch1-2	657
5	2015-16-Batch1-3	540
6	2015-16-Batch1-4	806
7	2015-16-Batch1-5	433
8	2015-16-Batch1-6	637
9	2015-16-Batch1-7	964
10	2015-16-Batch1-8	605
11	2015-16-Batch1-9	493
12	2015-16-Batch1-10	414
13	2015-16-Batch1-11	889
14	2015-16-Batch1-12	794
15	2015-16-Batch1-13	867
16	2015-16-Batch1-14	585
17	2015-16-Batch1-15	448

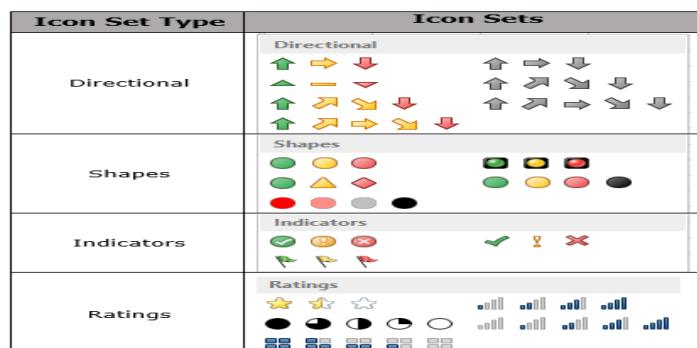
The column – Total Marks is sorted by the font color as specified in the Order.

The screenshot shows the same Excel table as above, but now the rows are sorted by Total Marks. The highest value, 964, is at the top, followed by 889, 867, 814, 806, 794, 764, 657, 637, 585, 540, 493, 433, 414, and 448 at the bottom. The font colors correspond to the sorting order specified in the 'Add Level' dialog.

A	B	C
1		
2	Student Code	Total Marks
3	2015-16-Batch1-7	964
4	2015-16-Batch1-11	889
5	2015-16-Batch1-13	867
6	2015-16-Batch1-1	814
7	2015-16-Batch1-2	657
8	2015-16-Batch1-3	540
9	2015-16-Batch1-4	806
10	2015-16-Batch1-6	637
11	2015-16-Batch1-8	605
12	2015-16-Batch1-9	493
13	2015-16-Batch1-12	794
14	2015-16-Batch1-14	585
15	2015-16-Batch1-5	433
16	2015-16-Batch1-10	414
17	2015-16-Batch1-15	448

How to Apply Icons to cells (Conditional Formatting)

You can use the icon sets to visualize numerical differences. The following icon sets are available



As you observe, an icon set consists of three to five symbols. You can define criteria to associate an icon with each value in a cell range. For example, a red down arrow for small numbers, a green up arrow for large numbers, and a yellow horizontal arrow for intermediate values.

- Select the range to be conditionally formatted.
- Click **Conditional Formatting** in the **Styles** group under **Home** tab.
- Click **Icon Sets** from the drop-down menu. The **Icon Sets** options appear.
- Click the colored three arrows.

Colored Arrows appear next to the Data based on the Values in the selected range.

Student Marks		
Student Code	Three Arrows (Colored)	5 Ratings
2015-16-Batch1-1	814	814
2015-16-Batch1-2	657	657
2015-16-Batch1-3	540	540
2015-16-Batch1-4	806	806
2015-16-Batch1-5	433	433
2015-16-Batch1-6	637	637
2015-16-Batch1-7	964	964
2015-16-Batch1-8	605	605
2015-16-Batch1-9	493	493
2015-16-Batch1-10	414	414
2015-16-Batch1-11	889	889
2015-16-Batch1-12	794	794
2015-16-Batch1-13	867	867
2015-16-Batch1-14	585	585
2015-16-Batch1-15	448	448

- Repeat the first three steps. The **Icon Sets** options appear.
- Select **5 Ratings**. The Rating Icons appear next to the data based on the values in the selected range.

Sort by Cell Icon

To sort the table by the column Total Marks that contains cells with Cell Icons (Conditionally Formatted), follow the steps given below –

- Click the Header of the column – Total Marks.
- Click **Data** tab.
- In the **Sort & Filter** group, click **Sort**. The Sort dialog box appears.
- Choose **Sort By** as Total Marks, **Sort On** as **Cell Icon** and specify in **Order**. Click Add Level.

- Choose Sort By as Total Marks, Sort On as Cell Icon and specify in Order. Click Add Level.
- Choose Sort By as Total Marks, Sort On as Cell Icon and specify in Order.

The screenshot shows a Microsoft Excel spreadsheet with data in columns A, B, and C. Column A contains student codes, and column C contains total marks. The 'Sort' dialog box is open, showing three levels of sorting:

- Sort by:** Total Marks (Column B)
- Sort on:** Cell Icon
- Order:** On Top (Orange arrow icon)

The second level of sorting is also set to 'Total Marks' and 'Cell Icon' with 'On Top' order. The third level is also set to 'Total Marks' and 'Cell Icon' with 'On Top' order. The 'Add Level' button is highlighted.

	B	C
1		
2	Student Code	Total Marks
3	2015-16-Batch1-7	964
4	2015-16-Batch1-11	889
5	2015-16-Batch1-13	867
6	2015-16-Batch1-1	814
7	2015-16-Batch1-2	657
8	2015-16-Batch1-3	540
9	2015-16-Batch1-4	806
10	2015-16-Batch1-6	637
11	2015-16-Batch1-8	605
12	2015-16-Batch1-9	493
13	2015-16-Batch1-12	794
14	2015-16-Batch1-14	585
15	2015-16-Batch1-5	433
16	2015-16-Batch1-10	414
17	2015-16-Batch1-15	448

The column – Total Marks will be sorted by Cell Icon as specified in the Order.

The screenshot shows the same Excel spreadsheet after sorting. The 'Total Marks' column (Column C) is now sorted by cell icon, with higher values (like 964) having green up arrows and lower values (like 448) having red down arrows. The student codes in Column A are also sorted by their position in the 'Total Marks' column.

	B	C
1		
2	Student Code	Total Marks
3	2015-16-Batch1-7	964
4	2015-16-Batch1-11	889
5	2015-16-Batch1-13	867
6	2015-16-Batch1-1	814
7	2015-16-Batch1-4	806
8	2015-16-Batch1-12	794
9	2015-16-Batch1-2	657
10	2015-16-Batch1-6	637
11	2015-16-Batch1-8	605
12	2015-16-Batch1-3	540
13	2015-16-Batch1-9	493
14	2015-16-Batch1-14	585
15	2015-16-Batch1-5	433
16	2015-16-Batch1-10	414
17	2015-16-Batch1-15	448

Sort by a Custom List

You can create a custom list and sort the table by the custom list.

In the table given below, you find an indicator column with title – Position. It has the values high, medium and low based on the position of total marks with respect to the entire range

A	B	C	D
1	Student Code	Total Marks	Position
3	2015-16-Batch1-1	814	High
4	2015-16-Batch1-2	657	Medium
5	2015-16-Batch1-3	540	Medium
6	2015-16-Batch1-4	806	High
7	2015-16-Batch1-5	433	Low
8	2015-16-Batch1-6	637	Medium
9	2015-16-Batch1-7	964	High
10	2015-16-Batch1-8	605	Medium
11	2015-16-Batch1-9	493	Low
12	2015-16-Batch1-10	414	Low
13	2015-16-Batch1-11	889	High
14	2015-16-Batch1-12	794	Medium
15	2015-16-Batch1-13	867	High
16	2015-16-Batch1-14	585	Medium
17	2015-16-Batch1-15	448	Low

Now, suppose you want to sort the column - Position, with all High values on top, all low values at bottom, and all medium values in between. That means the order you want is low, medium and high. With **Sort A to Z**, you get the order high, low and medium. On the other hand, with **Sort Z to A**, you get the order medium, low and high.

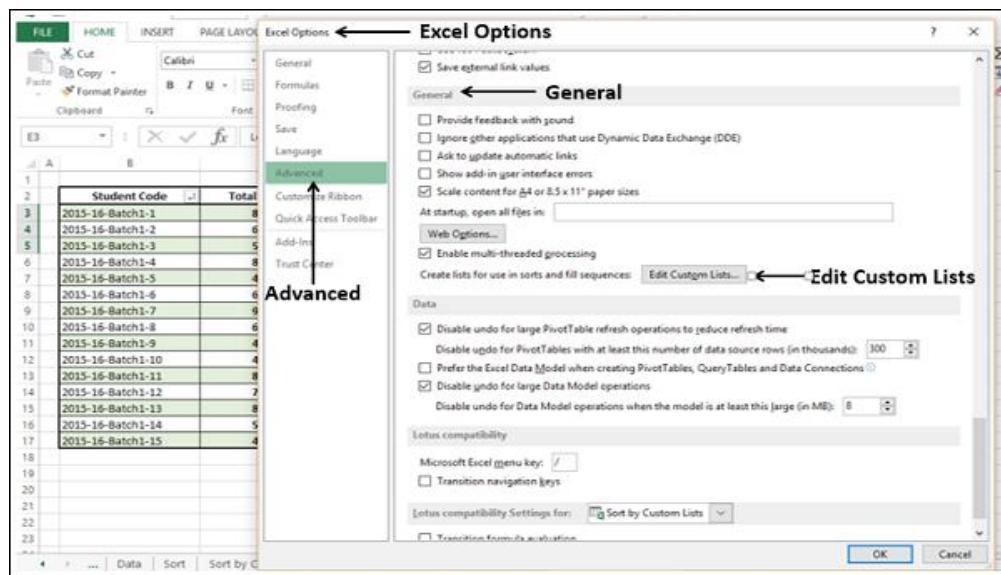
You can resolve this is to create a custom list.

- Define the order for the custom list as high, medium and low in a range of cells as shown below.
- Select that Range.

A	B	C	D	E
1	Student Code	Total Marks	Position	Custom List
3	2015-16-Batch1-1	814	High	High
4	2015-16-Batch1-2	657	Medium	Medium
5	2015-16-Batch1-3	540	Medium	Low
6	2015-16-Batch1-4	806	High	
7	2015-16-Batch1-5	433	Low	
8	2015-16-Batch1-6	637	Medium	
9	2015-16-Batch1-7	964	High	
10	2015-16-Batch1-8	605	Medium	
11	2015-16-Batch1-9	493	Low	
12	2015-16-Batch1-10	414	Low	
13	2015-16-Batch1-11	889	High	
14	2015-16-Batch1-12	794	Medium	
15	2015-16-Batch1-13	867	High	
16	2015-16-Batch1-14	585	Medium	
17	2015-16-Batch1-15	448	Low	

- Click the **File** tab.
- Click **Options**. In the **Excel Options** dialog box, Click **Advanced**.

- Scroll to the General.
- Click Edit Custom Lists.

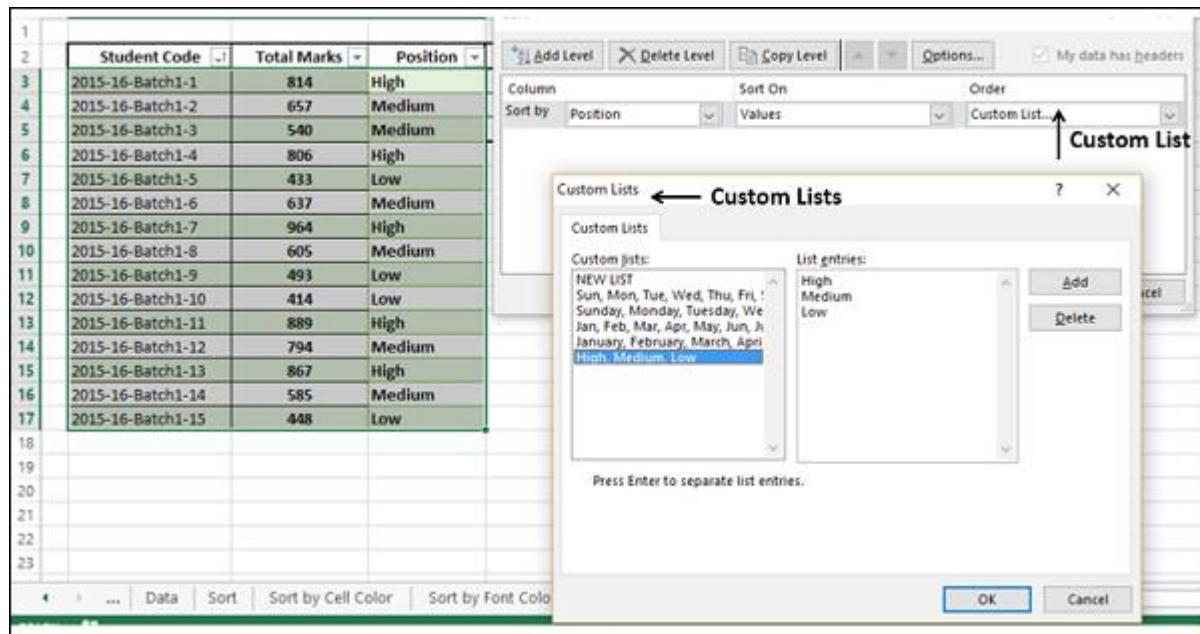


The **Edit Custom Lists** dialog box appears. The select range in worksheet appears in the **Import list from cells** Box. Click **Import**.

Your custom list is added to the **Custom Lists**. Click **OK**.

The next step is to sort the table with this Custom List.

- Click the Column – Position. Click on Sort. In the Sort dialog box, ensure Sort By is Position, Sort On is Values.
- Click on Order. Select Custom List. Custom Lists dialog box appears.
- Click on the High, Medium, Low Custom List. Click on OK.



In the Sort dialog box, in the Order Box, High, Medium, Low appears. Click on OK.

Student Code	Total Marks	Position
2015-16-Batch1-1	814	High
2015-16-Batch1-2	657	Medium
2015-16-Batch1-3	540	Medium
2015-16-Batch1-4	806	High
2015-16-Batch1-5	433	Low
2015-16-Batch1-6	637	Medium
2015-16-Batch1-7	964	High
2015-16-Batch1-8	605	Medium
2015-16-Batch1-9	493	Low
2015-16-Batch1-10	414	Low
2015-16-Batch1-11	889	High
2015-16-Batch1-12	794	Medium
2015-16-Batch1-13	867	High
2015-16-Batch1-14	585	Medium
2015-16-Batch1-15	448	Low

The table will be sorted in the defined order – high, medium, low.

	Student Code	Total Marks	Position	Custom List
2	2015-16-Batch1-1	814	High	High
3	2015-16-Batch1-4	806	High	Medium
4	2015-16-Batch1-7	964	High	Low
5	2015-16-Batch1-11	889	High	
6	2015-16-Batch1-13	867	High	
7	2015-16-Batch1-2	657	Medium	
8	2015-16-Batch1-3	540	Medium	
9	2015-16-Batch1-6	637	Medium	
10	2015-16-Batch1-8	605	Medium	
11	2015-16-Batch1-12	794	Medium	
12	2015-16-Batch1-14	585	Medium	
13	2015-16-Batch1-5	433	Low	
14	2015-16-Batch1-9	493	Low	
15	2015-16-Batch1-10	414	Low	
16	2015-16-Batch1-15	448	Low	
17				

You can create Custom Lists based on the following values –

- Text
- Number
- Date
- Time

You cannot create custom lists based on format, i.e. by cell / font color, or cell icon.

Filtering the data:

Data filtering helps to display the rows that satisfy the criteria subject to specification of a column. It is the easy way of finding the required data in a list.

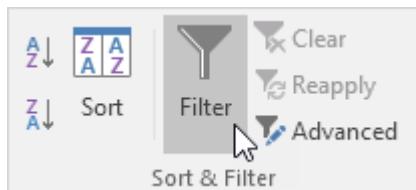
For Ex: To show the data out the marks who got between 60% and 70%, then data filtering helps to show the required data.

There are two commands for filtering data in M.S.Excel, Viz.

1. **Auto Filters:** It is used for filtering for simple criteria like the sorting of above 60% to 70% marks of students. It quickly filters a data set based on selection, specified text, number or other such criteria.
2. **Advanced Filter:** Excel's Advanced Filter is really helpful when it comes to finding data that meets two or more complex criteria such as extracting matches and differences between two columns, filtering rows that match items in another list, finding exact matches including uppercase and lowercase characters, and more. For example, if the user wants to filter according to age, qualification, place and highest marks of students, then the user need to apply advanced filters.

Custom Auto Filter: Excel Auto Filter supports filtering of data in number filter and text filter. The flowing are the steps to create a custom auto filter.

1. Click any single cell inside a data set.
2. On the Data tab, in the Sort & Filter group, click Filter.

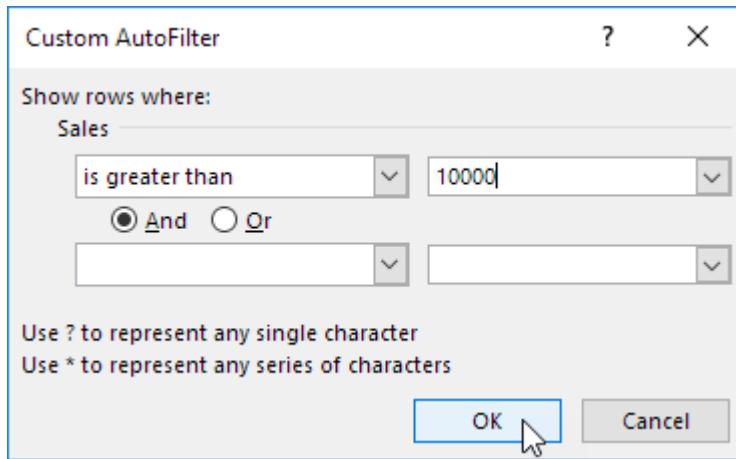


Arrows in the column headers appear.

Number Filter

To apply a **number filter**, execute the following steps.

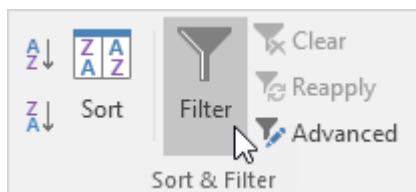
3. Click the **arrow** next to selected column.
4. Click Number Filters (this option is available because the Sales column contains numeric data) and select **custom filter** option from the list.



5. Enter filter criteria in terms of mathematical operations greater than, less than etc and values from shows rows where block of custom auto filter dialog box and then click OK.

Text Filter:

1. Click any single cell inside a data set.
2. On the Data tab, in the Sort & Filter group, click Filter.

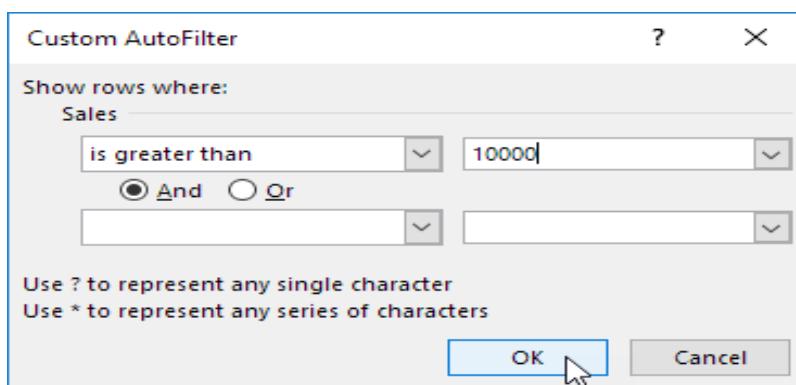


Arrows in the column headers appear.

Text Filter

To apply a number filter, execute the following steps.

3. Click the arrow next to selected column.
4. Click Text Filters (this option is available because the Last Name column contains text data) and select Equals from the list.



- Enter filter criteria in terms equal, does not-equal, begins with, contains etc and values for that criteria from “shows rows where” block of custom auto filter dialog box and then click OK.

We can also display records that begin with a specific character, end with a specific character, contain or do not contain a specific character, etc. We can use make use of meta characters like:

? to represent single character in criteria

* to represent a series of zero or more characters in criteria.

Ex: "?a*"

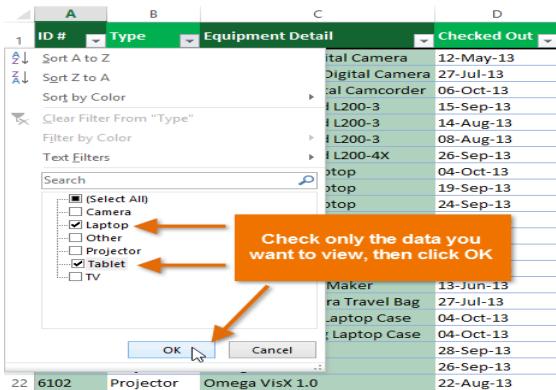
To apply regular filter (Basic Filter) on data follow the given steps:

STEPS:

- The data should include header row
- Data Menu – Sort & Filter Ribbon – Filter
- A drop-down arrow  will appear in the header cell for each column.
- Click the drop-down arrow for the column the user wants to filter. In our example, we will filter column B to view only certain types of data.

A	B	C	D	E	F	
1	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
2	3000	Camera	Saris Lumina Digital Camera	12-May-13	15-May-13	Shannon Nguyen
3	3005	Camera	Saris Z-60 Digital Camera	27-Jul-13	06-Aug-13	Sela Shepard
4	3070	Camera	Omega PixL Digital Camcorder	06-Oct-13		Min Seung
5	1021	Laptop	15" EDI SmartPad L200-3	15-Sep-13	01-Oct-13	Sofie Ragnar
6	1022	Laptop	15" EDI SmartPad L200-3	14-Aug-13	16-Aug-13	Hank Sorenson
7	1023	Laptop	15" EDI SmartPad L200-3	08-Aug-13	15-Aug-13	Jennifer Weiss
8	1025	Laptop	15" EDI SmartPad L200-4X	26-Sep-13	04-Oct-13	Min Seung
9	1031	Laptop	17" Saris X-10 Laptop	04-Oct-13		Nick Ortiz
10	1032	Laptop	17" Saris X-10 Laptop	19-Sep-13		Stanley Geyer
11	1033	Laptop	17" Saris X-10 Laptop	24-Sep-13	26-Sep-13	George D'Agosta

- The Filter menu will appear.
- Uncheck the box next to Select All to quickly deselect all data.
- Check the boxes next to the data to filter, then click OK. In this example, it get displayed Laptop and Tablet to view only those types of equipment.



8. The data will be **filtered**, temporarily hiding any content that doesn't match the criteria.
9. Filtering options can also be accessed from the **Sort & Filter** command on the **Home** tab.

To clear a filter:

After applying a filter, to remove—or **clear**—it from the worksheet:

1. Click the **drop-down arrow** for the filter to clear.
2. The **Filter menu** will appear.
3. Choose **Clear Filter from [COLUMN NAME]** from the Filter menu.
4. The filter will be cleared from the column. The previously hidden data will be displayed.
5. To remove all filters from your worksheet, click the **Filter** command on the **Data** tab.

Advanced filtering:

If the user need to filter for something specific, basic filtering may not give enough options. Excel includes many **advanced filtering tools**, including **search**, **text**, **date**, and **number filtering**, which can narrow the results to help find exactly. Advanced text filters can be used to display more specific information, such as cells that contain a certain number of characters, or data that excludes a specific word or number.

Extracting a Unique list: You can use Excel Advanced Filter to quickly extract unique records from a data set (or in other words remove duplicates). Let's see how to use advanced filter to get a unique list. Suppose you have a dataset as shown below:

	A	B	C
1	Date	Sales Rep	Sales
2	03-12-2017	Jenny	6238
3	11-11-2017	Rachel	4412
4	14-10-2017	Martha	4682
5	13-09-2017	Joe	5881
6	13-09-2017	Joe	5881
7	31-08-2017	Tom	4748
8	20-08-2017	Bob	3158
9	08-08-2017	Greg	2588
10	31-07-2017	Joe	4366
11	19-07-2017	Tom	7081
12	19-07-2017	Tom	7081
13	08-06-2017	Mike	3807
14	24-05-2017	Mike	8373
15	23-05-2017	Jenny	5086
16	05-05-2017	Joe	5106
17	19-04-2017	Jenny	3904
18	19-04-2017	Jenny	3904
19	28-02-2017	Martha	8365
20	26-02-2017	Bob	9650

As you can see, there are duplicate records in this data set (highlighted in orange). These could be due to an error in data entry or result of data compilation. In such a case, you can use Excel Advanced Filter tool to quickly get a list of all the unique records in a different location (so that your original data remains intact). Here are the steps to get all the unique records:

- Select the entire data set (including the headers).
- Go Data tab → Sort & Filter → Advanced. This will open the Advanced Filter dialog box.

In the Advanced Filter dialog box, use the following details:

- Action: Select the 'Copy to another location' option. This will allow you to specify the location where you can get the list of unique records.
- List Range: Make sure it refers to the dataset from which you want to find unique records. Also, make sure headers in the data set are included.
- Criteria Range: Leave this empty.
- Copy To: Specify the cell address where you want to get the list of unique records.
- Copy Unique Records Only: Check this option.
- Click OK.

This will instantly give you a list of all the unique records.

Using Criteria in Excel Advanced Filter

Getting unique records is one of the many things you can do with Excel advanced filter. Its primary utility lies in its ability to allow using complex criteria for filtering data. Here is what I mean by complex criteria. Suppose you have a dataset as shown below and you want to quickly get all the records where the sales are greater than 5000 and the region is the US.

	A	B	C	D
1	Date	Sales Rep	Region	Sales
2	03-12-2017	Jenny	US	6238
3	11-11-2017	Rachel	US	4412
4	14-10-2017	Martha	Europe	4682
5	13-09-2017	Joe	Asia	5881
6	31-08-2017	Tom	Asia	4748
7	20-08-2017	Bob	US	3158
8	08-08-2017	Greg	Europe	2588
9	31-07-2017	Joe	Europe	4366
10	19-07-2017	Tom	Asia	7081
11	08-06-2017	Mike	US	3807
12	24-05-2017	Mike	Asia	8373
13	23-05-2017	Jenny	Europe	5086
14	05-05-2017	Joe	Asia	5106
15	19-04-2017	Jenny	US	3904
16	28-02-2017	Martha	Europe	8365
17	26-02-2017	Bob	US	9650

Here is how you can use Excel Advanced Filter to filter the records based on the specified criteria:

- The first step when using Excel Advanced Filter with complex criteria is to specify the criteria. To do this, copy the headers and paste it somewhere in the worksheet.
- Specify the criteria for which you want to filter the data. In this example, since we want to get all the records for the US with sales more than 5000, enter 'US' in the cell below Region and >5000 in the cell below Sales. This would now be used as an input in Advanced Filter to get the filtered data (as shown in the next steps).

A	B	C	D	E	F	G	H	I
1	Date	Sales Rep	Region	Sales				
2	03-12-2017	Jenny	US	6238				
3	11-11-2017	Rachel	US	4412				
4	14-10-2017	Martha	Europe	4682				
5	13-09-2017	Joe	Asia	5881				
6	31-08-2017	Tom	Asia	4748				
7	20-08-2017	Bob	US	3158				
8	08-08-2017	Greg	Europe	2588				
9	31-07-2017	Joe	Europe	4366				
10	19-07-2017	Tom	Asia	7081				
11	08-06-2017	Mike	US	3807				
12	24-05-2017	Mike	Asia	8373				
13	23-05-2017	Jenny	Europe	5086				
14	05-05-2017	Joe	Asia	5106				
15	19-04-2017	Jenny	US	3904				
16	28-02-2017	Martha	Europe	8365				
17	26-02-2017	Bob	US	9650				

Date	Sales Rep	Region	Sales
US	>5000		

- Select the entire data set (including the headers).
- Go Data tab → Sort & Filter → Advanced. This will open the Advanced Filter dialog box.
In the Advanced Filter dialog box, use the following details:
- Action: Select the 'Copy to another location' option. This will allow you to specify the location where you can get the list of unique records.
- List Range: Make sure it refers to the dataset from which you want to find unique records. Also, make sure headers in the data set are included.
- Criteria Range: Specify the criteria we constructed in the steps above. In this example, it would be F1:I3.
- Copy To: Specify the cell address where you want to get the list of unique records.
- Copy Unique Records Only: Check this option.
- Click OK.

This would instantly give you all the records where the region is the US and the sales are more than 5000.

Data Outline:

Outlining Data

Outlining data makes your data easier to view. Outline includes grouping, ungrouping & subtotal. With the help of outline data options the user can hide and unhide rows and columns for temporary purpose and also to calculate automatic mathematical options with the help of subtotal.

Grouping the data:

With the help of grouping the data, the user can group the selected columns and rows.

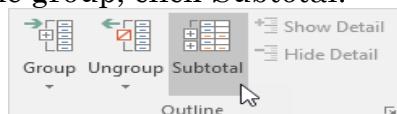
STEPS:

SUBTOTAL

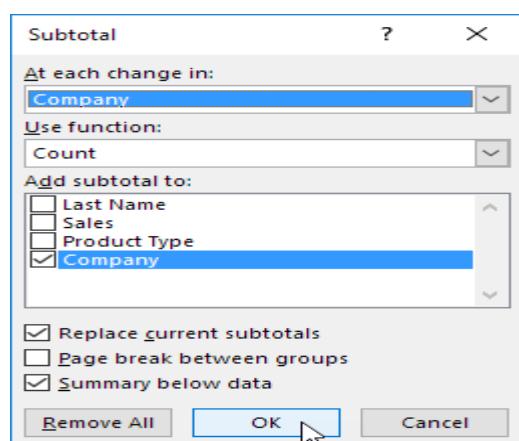
1. First, sort the data on the Company column.

	A	B	C	D	E
1	Last Name	Sales	Product Type	Company	
2	Jones	\$1,390.00	DF-3	Kung Food	
3	Williams	\$1,243.00	FD-2	Kung Food	
4	Johnson	\$9,339.00	DC-1	Kung Food	
5	Jones	\$7,433.00	DF-7	Kung Food	
6	Brown	\$3,255.00	FD-2	Pancakes on the Rocks	
7	Williams	\$1,930.00	A-34	Pancakes on the Rocks	
8	Williams	\$1,064.00	EE-2	Peace A Pizza	
9	Brown	\$4,865.00	EEE-45	Peace A Pizza	
10	Smith	\$9,698.00	F-3334	Peace A Pizza	
11	Smith	\$1,675.00	EEE-312	Wok N Roll	
12	Johnson	\$1,480.00	DC-1	Wok N Roll	
13	Smith	\$1,891.00	EEE-312	Wok N Roll	
14	Jones	\$9,213.00	FG-5	Wok N Roll	
15	Williams	\$1,486.00	A-34	Wok N Roll	
16					

2.. On the Data tab, in the Outline group, click Subtotal.



3. Select the Company column, the column we use to outline our worksheet.
4. Use the Count function.
5. Check the Company check box.
6. Click OK.



Result:

1	2	3	A	B	C	D
		1	Last Name	Sales	Product Type	
		2	Jones	\$1,390.00	DF-3	Kung Food
		3	Williams	\$1,243.00	FD-2	Kung Food
		4	Johnson	\$9,339.00	DC-1	Kung Food
		5	Jones	\$7,433.00	DF-7	Kung Food
		6			Kung Food Count	
		7	Brown	\$3,255.00	FD-2	Pancakes on the Rocks
		8	Williams	\$1,930.00	A-34	Pancakes on the Rocks
		9			Pancakes on the Rocks Count	
		10	Williams	\$1,064.00	EE-2	Peace A Pizza
		11	Brown	\$4,865.00	EEE-45	Peace A Pizza
		12	Smith	\$9,698.00	F-3334	Peace A Pizza
		13			Peace A Pizza Count	
		14	Smith	\$1,675.00	EEE-312	Wok N Roll
		15	Johnson	\$1,480.00	DC-1	Wok N Roll
		16	Smith	\$1,891.00	EEE-312	Wok N Roll
		17	Jones	\$9,213.00	FG-5	Wok N Roll
		18	Williams	\$1,486.00	A-34	Wok N Roll
		19			Wok N Roll Count	
		20			Grand Count	
		21				14

7. To collapse a group of cells, click a minus sign. You can use the numbers to collapse or expand groups by level. For example, click the 2 to only show the subtotals.

1	2	3	A	B	C	D
		1	Last Name	Sales	Product Type	Company
		6			Kung Food Count	4
		9			Pancakes on the Rocks Count	2
		13			Peace A Pizza Count	3
		19			Wok N Roll Count	5
		20			Grand Count	14
		21				

Note: click the 1 to only show the Grand Count, click the 3 to show everything.

To collapse a group of columns, execute the following steps.

8. For example, select column A and B.

9. On the Data tab, in the Outline group, click Group.

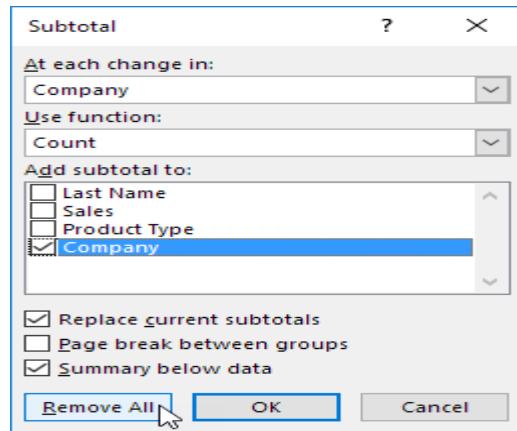


10. Click the minus sign above column C (it will change to a plus sign).

Result:

1	2	3	C	D	E	F
		1	Product Type	Company		
		2	DF-3	Kung Food		
		3	FD-2	Kung Food		
		4	DC-1	Kung Food		
		5	DF-7	Kung Food		
		6	Kung Food Count		4	
		7	FD-2	Pancakes on the Rocks		
		8	A-34	Pancakes on the Rocks		
		9	Pancakes on the Rocks Count		2	
		10	EE-2	Peace A Pizza		
		11	EEE-45	Peace A Pizza		
		12	F-3334	Peace A Pizza		
		13	Peace A Pizza Count		3	
		14	EEE-312	Wok N Roll		
		15	DC-1	Wok N Roll		
		16	EEE-312	Wok N Roll		
		17	FG-5	Wok N Roll		
		18	A-34	Wok N Roll		
		19	Wok N Roll Count		5	
		20	Grand Count		14	
		21				

11. To remove the outline, click any cell inside the data set and on the Data tab, in the Outline group, click Subtotal, Remove all.



Outline (group) data in a worksheet:

If you have a list of data that you want to group and summarize, you can create an outline of up to eight levels, one for each group. Each inner level, represented by a higher number in the outline symbols, displays detail data for the preceding outer level, represented by a lower number in the outline symbols. Use an outline to quickly display summary rows or columns, or to reveal the detail data for each group. You can create an outline of rows (as shown in the example below), an outline of columns, or an outline of both rows and columns.

	A	B	C
1	Region	Month	Sales
2	East	AprTotal	11,034
3	East	MarTotal	11,075
4	West	AprTotal	9,643
5	West	Mar	3,036
6	West	Mar	7,113
7	West	Mar	8,751
8	West	MarTotal	18,900
9		All Sales	50,652

An outlined row of sales data grouped by geographical regions and months with several summary and detail rows displayed.

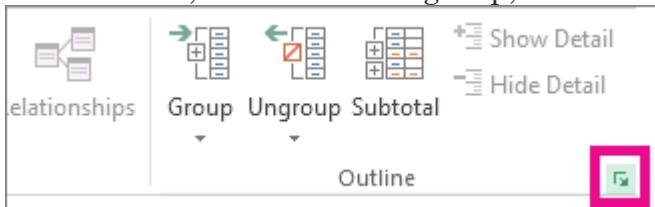
1. To display rows for a level, click the appropriate **1 2 3** outline symbols.
2. Level 1 contains the total sales for all detail rows.
3. Level 2 contains total sales for each month in each region.
4. Level 3 contains detail rows — in this case, rows 11 through 13.
5. To expand or collapse data in your outline, click the **[+]** and **[−]** outline symbols.

Create an outline of rows

1. Make sure that each column of the data that you want to outline has a label in the first row, contains similar facts in each column, and that the range has no blank rows or columns.
2. Make sure your detail rows also have a summary row—a subtotal. Do one of the following:

Insert summary rows by using the **Subtotal** command

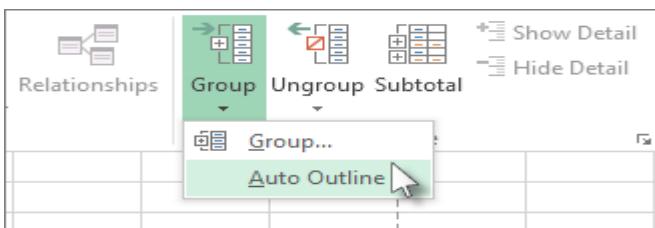
- Use the **Subtotal** command, which inserts the SUBTOTAL function immediately below or above each group of detail rows and automatically creates the outline for you
- **Insert your own summary rows**
- Insert your own summary rows, with formulas, immediately below or above each group of detail rows. For example, under (or above) the rows of sales data for March and April, use the [SUM function](#) to subtotal the sales for those months. The table later in this topic shows you an example of this.
- 3. Specify whether the summary rows are located below or above the detail rows. On the **Data** tab, in the **Outline** group, click the **Outline** dialog box launcher.



4. If your summary rows are above your detail rows, clear the **Summary rows below detail** checkbox. Otherwise, leave the checkbox alone.
5. Outline your data. Do one of the following:

Outline the data automatically

- If necessary, select a cell in the range of cells you want to outline.
- On the **Data** tab, in the **Outline** group, click the arrow under **Group**, and then click **Auto Outline**.
- Outline the outer group.



Outline the data manually

Important: When you manually group outline levels, it's best to [have all data displayed](#) to avoid grouping the rows incorrectly.

Ungroup:

- If you want to ungroup rows/columns, select the rows/columns, and then on the **Data** tab, in the **Outline** group, click **Ungroup**.
- You can also ungroup sections of the outline without removing the entire outline. Hold down SHIFT while you click the **+** or **-** for the group, and then on the **Data** tab, in the **Outline** group, click **Ungroup**.

- **Important:** If you ungroup an outline while the detail data is hidden, the detail rows may remain hidden. To display the data, drag across the visible row numbers adjacent to the hidden rows. On the **Home** tab, in the **Cells** group, click **Format**, point to **Hide & UnHide**, and then click **Unhide Rows**.

Create an outline of columns

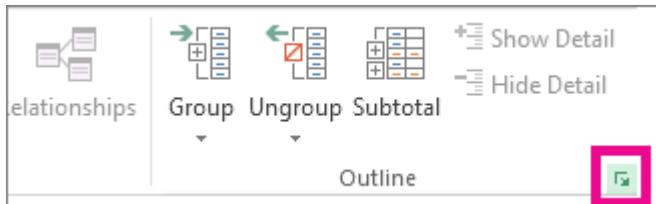
1. Make sure that each row of the data that you want to outline has a label in the first column, contains similar facts in each row, and the range has no blank rows or columns.
2. Insert your own summary columns with formulas immediately to the right or left of each group of detail columns. The table listed in step 4 below shows you an example.

Note: To outline data by columns, you must have summary columns that contain formulas that reference cells in each of the detail columns for that group.

3. Specify whether the location of the summary column is to the right or left of the detail columns. On the **Data** tab, in the **Outline** group, click the **Outline** dialog box launcher.

How to specify the summary column location

- a. On the **Data** tab, in the **Outline** group, click the **Outline** dialog box launcher.



- b. To specify a summary column to the left of the details column, clear the **Summary columns to right of detail** check box. To specify a summary column to the right of the details column, select the **Summary columns to right of detail** check box.
- c. Click **OK**.
4. To outline the data, do one of the following:

Outline the data automatically

- a. If necessary, select a cell in the range.
- b. On the **Data** tab, in the **Outline** group, click the arrow below **Group** and click **Auto Outline**.

Outline the data manually

Important: When you manually group outline levels, it's best to [have all data displayed](#) to avoid grouping columns incorrectly.

- c. Outline the outer group.

Show or hide outlined data

1. If you don't see the outline symbols  ,  , and  , click the Microsoft Office Button  and then click **Excel Options** (Excel 2007), OR, click the **File** tab (other versions), and then click **Options**, click the **Advanced** category, and then under the **Display options for this worksheet** section, select the **worksheet**, and then select the **Show outline symbols if an outline is applied** check box.
2. Click **OK**.
3. Do one or more of the following:

Show or hide the detail data for a group

- o To display the detail data within a group, click the  for the group.
- o To hide the detail data for a group, click the  for the group.

Expand or collapse the entire outline to a particular level

- o In the  outline symbols, click the number of the level that you want. Detail data at lower levels is then hidden.

For example, if an outline has four levels, you can hide the fourth level while displaying the rest of the levels by clicking .

Show or hide all of the outlined detail data

- o To show all detail data, click the lowest level in the  outline symbols. For example, if there are three levels, click .
- o To hide all detail data, click .

Remove an outline

1. Click the worksheet.
2. On the **Data** tab, in the **Outline** group, click **Ungroup** and click **Clear Outline**.

Important: If you remove an outline while the detail data is hidden, the detail rows or columns may remain hidden. To display the data, drag across the visible row numbers or column letters adjacent to the hidden rows and columns. On the **Home** tab, in the **Cells** group, click **Format**, point to **Hide & Unhide**, and then click **Unhide Rows** or **Unhide Columns**.

Tables in Excel:

In Excel 2007, and later versions, you can use the **Table** command to convert a list of data into a formatted Excel Table. Tables have many features, such as sorting and filtering that will help you organize and view your data. Tables allow you to analyze your

data in Excel quickly and easily. An Excel Table makes an excellent source for a pivot table, so you should use this feature if you plan to create a Pivot Table from the data.

	A	B	C	D	E	F	G	H
1	Product Sales							
3	Date	Region	Product	Qty	Cost	Amt	Tax	Total
4	1-Apr	East	Paper	73	12.95	945.35	66.17	1,011.52
5	2-Apr	West	Pens	40	2.19	87.60	6.13	93.73
6	1-Apr	West	Paper	33	12.95	427.35	29.91	457.26
7	3-Apr	East	Paper	21	12.95	271.95	19.04	290.99
8	2-Apr	East	Pens	14	2.19	30.66	2.15	32.81
9	3-Apr	West	Paper	10	12.95	129.50	9.07	138.57

Preparing Your Data

Before you create the formatted Excel Table, follow these guidelines for organizing your data.

- The data should be **organized in rows and columns**, with each row containing information about one record, such as a sales order, or inventory transaction.
- In the first row of the list, each column should contain a short, descriptive and **unique heading**.
- Each column in the list should contain **one type of data**, such as dates, currency, or text.
- Each row in the list should contain the **details for one record**, such as a sales order. If possible, include a unique identifier for each row, such as an order number.
- The list should have **no blank rows** within it, and no completely blank columns.
- The list should be **separated from any other data** on the worksheet, with at least one blank row and one blank column between the list and the other data.

Creating an Excel Table

After your data is organized, as described above, you're ready to create the formatted Table.

- Select a cell in the list of data that you prepared.
- On the Ribbon, click the Insert tab.



3. In the Tables group, click the Table command.
4. In the Create Table dialog box, the range for your data should automatically appear, and the *My table has headers* option is checked. If necessary, you can adjust the range, and check box.
5. Click OK to accept these settings.

Entering new data into an Excel Table

By default an Excel table will expand automatically, and fill formulas down to the last row. For example:

- Add new data in the row immediately below a table, or in the column to its immediate right, and the table expands automatically, to include that new data.
- Enter a formula in the first row of a blank column, that formula fills down to all the remaining rows, as soon as you press Enter

Rename an Excel Table

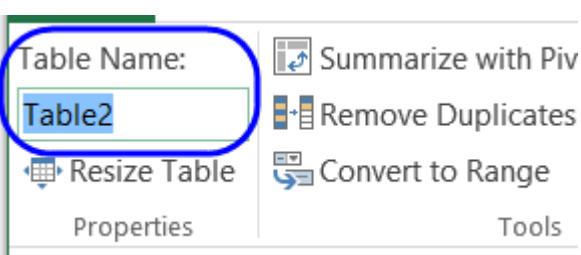
When it is created, an Excel table is given a default name, such as Table 3. You should change the name to something meaningful, so it will be easier to work with the table later.

To change the table name:

1. Select any cell in the table
2. On the Ribbon, under the Table Tools tab, click the Design tab.



3. At the far left of the Ribbon, click in the Table name box, to select the existing name



- Then, type a new name, such as Orders, and press the Enter key

Sort and Filter the Data

Your list is now an Excel Table, and is automatically formatted with a default Table Style, which you can change.

The heading cells have drop down arrows that you can use to sort or filter the data.

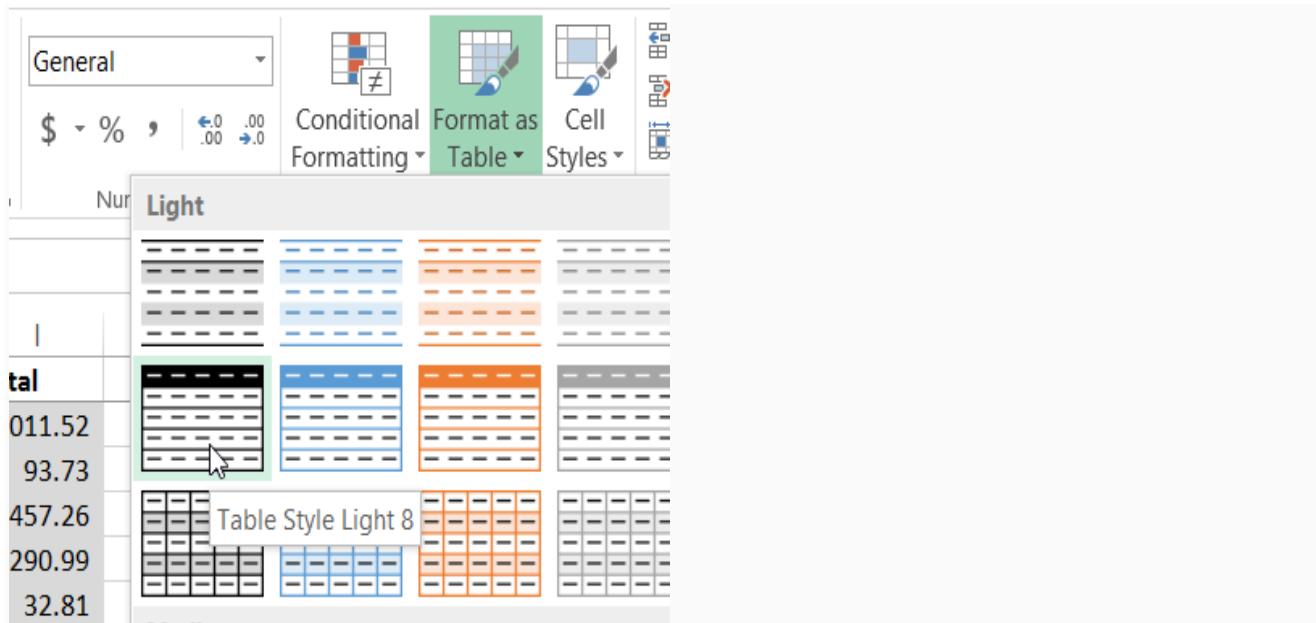
Create an Excel Table with Specific Style

When you create a table with the Table command on the Ribbon's Insert tab, the table retains any formatting that it currently has, and the default Table Style is applied.

If you want to apply a specific table style when creating an Excel Table:

- Select a cell in the list of data that you prepared.
- On the Ribbon, click the Home tab.
- In the Styles group, click Format as Table
- Click on the Style that you want to use
- OR, to apply a Style and remove any existing formatting, right-click on a Style, and click Apply and Clear Formatting.
- In the Create Table dialog box, the range for your data should automatically appear, and the *My table has headers* option is checked. If necessary, you can adjust the range, and check box.
- Click OK to accept these settings.

A formatted Excel Table is created, with the selected Table Style.



Show Totals in a Table

After you create an Excel table, it's easy to show the total for a column, or for multiple columns, using a built-in Table feature.

To show a total:

1. Select any cell in the table
2. On the Ribbon, under the Table Tools tab, click the Design tab
3. In the Table Style Options group, add a check mark for Total Row

Change and Add Totals

In addition to the automatically created totals, you can select totals for other columns.

1. Click in the Total cell for one of the columns.
2. From the drop down list, select the function that you want to use in the current column.

Data Validation:

What is data validation in Excel?

Data Validation is a very useful and easy to use tool in Excel with which you can set data validations on the data that is entered that is entered into your Worksheet. Excel Data Validation is a feature that restricts (validates) user input to a worksheet. Technically, you create a validation rule that controls what kind of data can be entered

into a certain cell. In Excel, the data validation feature helps you control what can be entered in your worksheet. For example, you can:

- Allow only numeric or text values in a cell.
- Allow only numbers within a specified range.
- Allow data entries of a specific
- Restrict dates and times outside a given time frame.
- Restrict entries to a selection from a drop-down list.
- Validate an entry based on another cell.
- Show an input message when the user selects a cell.
- Show a warning message when incorrect data has been entered

A	B		C	D
1	Order ID	Item	Order date	Qty.
2	1001	Oranges	07/20/2017	30
3	1002	Bananas	07/20/2017	20
4	1003	Lemons	07/22/2017	10
5	1004	Cherries	07/22/2017	15
6	1005	Apples	07/24/2017	25
7	106			
8				
9				

How to do data validation in Excel

To add data validation in Excel, perform the following steps.

1. Open the Data Validation dialog box

Select one or more cells to validate, go to the *Data* tab > *Data Tools* group, and click the *Data Validation* button.

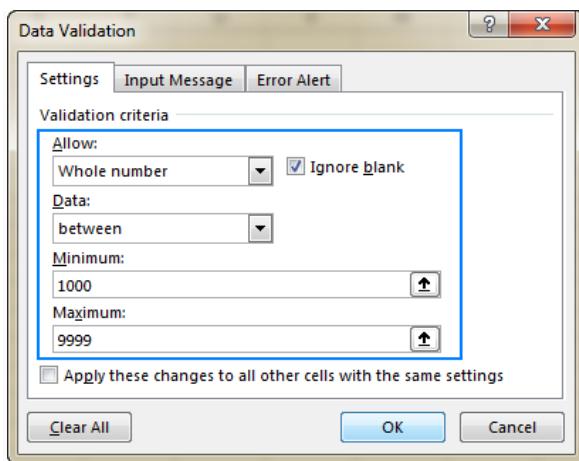
You can also open the Data Validation dialog box by pressing **Alt > D > L**, with each key pressed separately.

2. Create an Excel validation rule

On the *Settings* tab, define the validation criteria according to your needs. In the criteria, you can supply any of the following:

- *Values* - type numbers in the criteria boxes like shown in the screenshot below.
- *Cell references* - make a rule based on a value or formula in another cell.
- *Formulas* - allow to express more complex conditions like in this example.

As an example, let's make a rule that restricts users to entering a whole number between 1000 and 9999:



With the validation rule configured, either click *OK* to close the *Data Validation* window or switch to another tab to add an input message or/and error alert.

3. Add an input message (optional)

If you want to display a message that explains to the user what data is allowed in a given cell, open the *Input Message* tab and do the following:

- Make sure the *Show input message when cell is selected* box is checked.
- Enter the title and text of your message into the corresponding fields.
- Click *OK* to close the dialog window.

As soon as the user selects the validated cell, the following message will show up:

A	B	C	D	
1	Order ID	Item	Order date	Qty.
2	1001	Oranges	07/20/2017	30
3	1002	Bananas	07/20/2017	20
4	1003	Lemons	07/22/2017	10
5	1004	Cherries	07/22/2017	15
6	1005	Apples	07/24/2017	25
7				
8	Order ID Please enter a 4-digit number from 1000 to 9999.			
9				
10				
11				
12				

4. Display an error alert (optional)

In addition to the input message, you can show one of the following error alerts when invalid data is entered in a cell.

- Alert in stop box

- Alert Warning box
- Alert in Information box

To configure a custom error message, go to the *Error Alert* tab and define the following parameters:

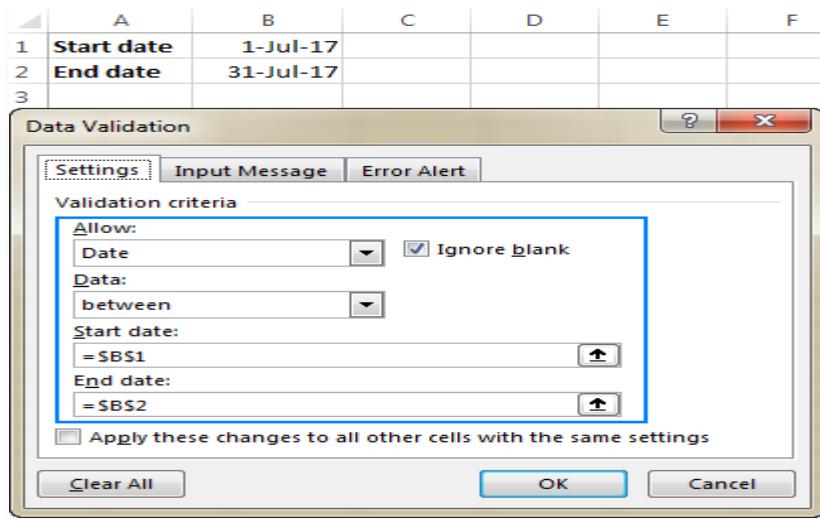
- Check the *Show error alert after invalid data is entered* box (usually selected by default).
- In the *Style* box, select the desired alert type.
- Enter the title and text of the error message into the corresponding boxes.
- Click *OK*.

Date and time validation in Excel

To validate dates, select **Date** in the *Allow* box, and then pick an appropriate criteria in the *Data* box. There are quite a lot of predefined options to choose from: allow only dates between two dates, equal to, greater than or less than a specific date, and more.

Similarly, to validate times, select **Time** in the *Allow* box, and then define the required criteria.

For example, to allow only dates between *Start date* in B1 and *End date* in B2, apply this Excel date validation rule:



To validate entries based on today's date and current time, make your own data validation like:

Validate dates based on today's date: In many situations, you may want to use today's date as the start date of the allowed date range. To get the current date, use

The TODAY function, and then add the desired number of days to it to compute the end date.

For example, to limit the data entry to 6 days from now (7 days including today), we are going to use the built-in Date rule with the formula-based criteria:

- Select **Date** in the *Allow*
- Select **between** in the *Data*
- In the *Start date* box, enter =TODAY()
- In the *End date* box, enter =TODAY() + 6

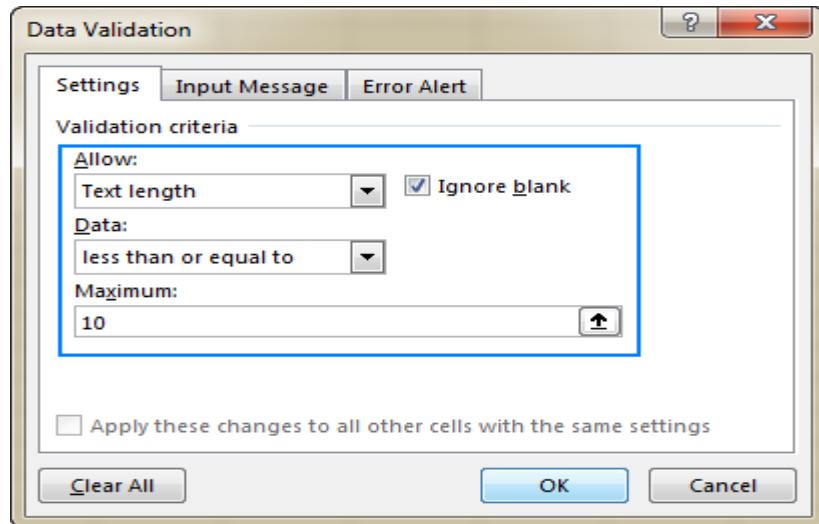
Validate times based on current time: To validate data based on the current time, use the predefined Time rule with your own data validation formula:

- In the *Allow* box, select **Time**.
- In the *Data* box, pick either **less than** to allow only times before the current time, or **greater than** to allow times after the current time.
- In the *End time* or *Start time* box (depending on which criteria you selected on the previous step), enter one of the following formulas:
 - To validate **dates and times** based on the current date and time:
=NOW()
 - To validate **times** based on the current time:
=TIME(HOUR(NOW()), MINUTE(NOW()), SECOND(NOW()))

Text length

To allow data entry of a specific length, select **Text length** in the *Allow* box, and choose the validation criteria in accordance with your business logic.

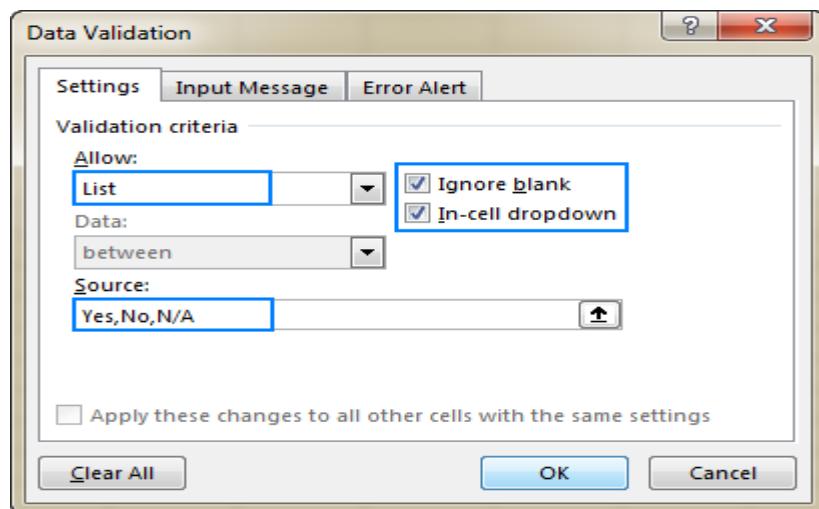
For example, to limit the input to 10 characters, create this rule:



Excel data validation list (drop-down)

To add a drop-down list of items to a cell or a group of cells, select the target cells and do the following:

1. Open the *Data Validation* dialog box (*Data* tab > *Data Validation*).
2. On the *Settings* tab, select *List* in the *Allow*
3. In the *Source* box, type the items of your Excel validation list, separated by commas. For example, to limit the user input to three choices, type *Yes, No, N/A*.
4. Make sure the *In-cell dropdown* box is selected in order for the drop-down arrow to appear next to the cell.
5. Click *OK*.



Note. Please be careful with the *Ignore blank* option, which is selected by default. If you are creating a drop-down list based on a named range that has at least one blank cell, selecting this check box allows entering any value in the validated cell. In many

situations, it is also true for validation formulas: if a cell referenced in the formula is blank, any value will be allowed in the validated cell.

Custom data validation rules

In addition to built-in Excel data validation rules, you can create custom rules with your own data validation formulas. Here are just a few examples:

- Allow numbers only
- Allow text only
- Allow text beginning with specific characters
- Allow only unique entries and disallow duplicates

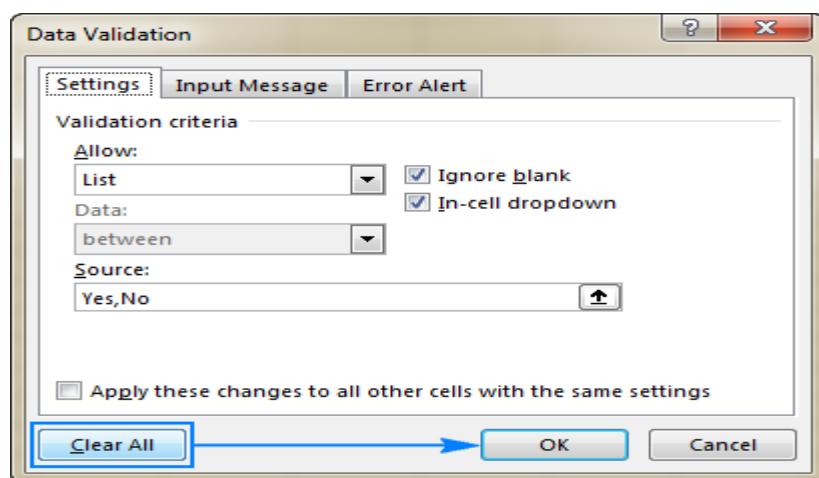
How to remove data validation in Excel

The standard approach designed by Microsoft and the mouse-free technique devised by Excel geeks who would never take their hands off the keyboard unless absolutely necessary (e.g. to take a cup of coffee :)

Method : Regular way to remove data validation

Normally, to remove data validation in Excel worksheets, you proceed with these steps:

1. Select the cell(s) with data validation.
2. On the *Data* tab, click the *Data Validation* button.
3. On the *Settings* tab, click the *Clear All* button, and then click *OK*.



Tips:

1. To remove data validation from all cells on the current sheet, use the [Find & Select feature](#) to select all of the validated cells.
2. To remove a certain data validation rule, select any cell with that rule, open the *Data Validation* dialog window, check the *Apply these changes to all other cells with the same settings* box, and then click the *Clear All* button.

As you see, the standard method is pretty fast but does require a few mouse clicks, no big deal as far as I'm concerned. But if you prefer working with the keyboard over a mouse, you may find the following approach appealing.

Data Consolidation:

Excel 2016 allows you to consolidate data from different worksheets into a single worksheet. Using the program's Consolidate command button on the Data tab of the Ribbon, you can easily combine data from multiple spreadsheets. The beauty of the Consolidate feature is that it can easily sum, count, average, etc. The ranges you consolidate do not have to be of the same size in each worksheet, the number of rows or columns might be different from sheet to sheet. And yet, you can still consolidate the data into a summary sheet.

For example, you can use the Consolidate command to total all budget spreadsheets prepared by each department in the company or to create summary totals for income statements for a period of several years. When you consolidate data in one worksheet, you can easily update and combine it. However, even when the data entries are laid out differently in each spreadsheet, Excel can still consolidate them provided that you've used the same labels to describe the data entries in their respective worksheets.

Consolidate data in multiple worksheets within the same workbook

In our example, we have data for 3 years expenditure on tea, coffee and milk. The data is broken down into quarters and stored in one year per worksheet in one workbook. We can create a 'Consolidated Summary' sheet which will show expenditure by year and quarter. It does not matter if the data has the same arrangement of columns and rows or not. Excel will sort that out for you.

Year 1 worksheet

A	B	C	D	E
1	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Coffee	£ 2,128	£ 3,526	£ 5,372	£ 9,378
Tea	£ 1,633		£ 5,392	£ 1,730
Milk	£ 4,837		£ 3,082	£ 5,272

Year 1 Year 2 Year 3 Consolidated Summary +

Year 2 worksheet

8		Quarter 1	Quarter 2	Quarter 3	Quarter 4
9	Coffee	£ 2,944	£ 3,528	£ 7,822	£ 8,464
10	Milk	£ 8,227		£ 9,462	£ 2,748
11					

Year 1 Year 2 Year 3 Consolidated Summary +

Year 3 worksheet

7		Quarter 4	Quarter 3	Quarter 1	
8	Coffee	£ 9,664	£ 7,123	£ 2,643	
9	Tea	£ 7,356	£ 2,865	£ 6,092	
10	Milk	£ 6,787	£ 1,595	£ 8,356	
11					

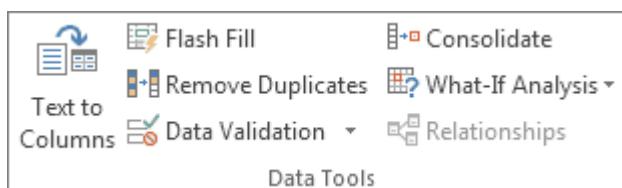
Year 1 Year 2 Year 3 Consolidated Summary +

The following are the steps to Consolidate:

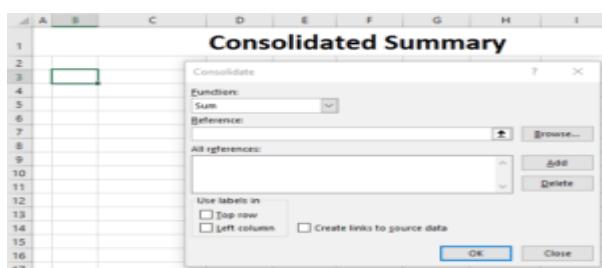
Step1: To start using the Data Consolidation tool, you need to select an empty sheet in the workbook as your master worksheet or add a new one if necessary. In this example the worksheet is renamed ‘Consolidated Summary’.

Step2: Select the upper-left cell of the area where you want the consolidated data to appear.

Step3: On the Ribbon, Choose **Data > Consolidate** to view the Consolidate dialog:

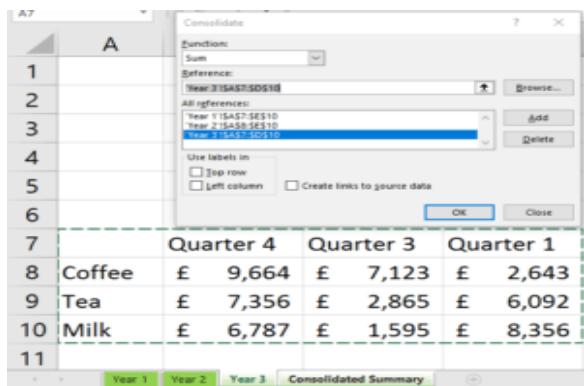


Step4: In the Function box, click the summary function that you want Excel to use to consolidate the data. As you will see from the drop-down, there are 11 functions to choose from. For our data we want to add up the values so we'll set the Function to Sum.



Step5: Click in the Reference area and select the first data range to consolidate – to do this you will need to click the Sheet tab i.e. “Year 1” and then drag over the data (including row and column headings) and then click the Add button to add this first set of data to the consolidation dialog.

Step6: Continue in the same way by clicking on the next sheet, highlighting the data, and clicking on the Add button until all your data and worksheets appear in the References section of the dialog e.g. “Year 2” and “Year 3”.



Note: You can name your ranges before you start the Consolidation process. If you name each range then, when you create the consolidation, place your cursor in the Reference field, press F3 and then choose the range from the list in the Paste Name dialog.

Step7: To indicate where the labels are located in the source ranges, select the check boxes under **Use labels in**: either the **Top row**, the **Left column**, or both. In this example, **Top row** is the name of the quarters, i.e. Quarter 1, Quarter 2, etc. and the **Left Column** are the list of items, i.e. Coffee, Tea and Milk.

Automatic vs. Manual updates: If you want Excel to update your consolidation table automatically when the source data changes, select the **Create links to source data** check box. If unchecked, you can still update the consolidation manually.

Step8: When you click OK, Excel summarizes all the data into your new sheet as your master worksheet (Consolidated Summary).

	A	B	C	D	E	F	G	H
1								
2								
3								
7	Coffee	£ 9,664	£ 7,123	£ 2,643				
9	Tea	£ 7,356	£ 2,865	£ 6,092				
10	Milk	£ 6,787	£ 1,595	£ 8,356				
11								
	Year 1	Year 2	Year 3	Consolidated Summary				

Consolidate data from multiple workbooks to one new workbook

Step1: Make sure all the individual workbooks you wish to consolidate are currently open.

Step2: Open a new, blank workbook as your master worksheet or add a new one if necessary. The worksheet is renamed as “Consolidate Summary” and save this workbook with a name e.g. Summary.xlsx.

Step3: Select the upper-left cell of the area where you want the consolidated data to appear.

Step4: On the Ribbon, Choose Data > Consolidate to view the Consolidate dialog

Step5: selecting data ranges from different workbooks instead of different worksheets.

Step6: When you click OK, Excel summarizes all the data into your new master worksheet (Consolidated Summary).

Unit - IV

Formulas and functions: creating a formula, formula auditing, meaning and advantages of functions, insert function.

Mathematical functions: sum, autosum, sumif, subtotal product, power, sqrt, round.

Statistical functions: average, averageif and averageifs, count, counta, countif, countifs, max min, median, mode.

Date & time functions: date, now, day, year, month, time, today, weekday, date-value.

Look up & reference: vlookup & hlookup

Financial functions: rate, type, pv, fv, nper, pmt, ipmt, cumipmt, npv, irr.

Names in excel: defining names, using and managing defined names.

Function:

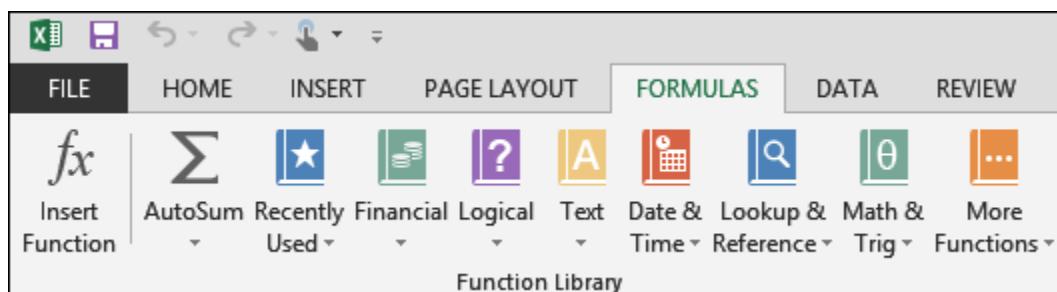
Functions are nothing but in-built formulae. They are the simplified formulas already inserted in the computer. In other words, the simplified form of formula is function.

A function is a calculation or operation that returns a result. The inputs in a function are called “**arguments**.”

All functions begin with an equals sign [=]. That way Excel knows not to treat the arguments as text. For example, =AVERAGE(2,4) is a function but AVERAGE(2,4) is just a string of text. Without an equals sign, Excel will not calculate a result. The arguments in this function are 2 and 4.

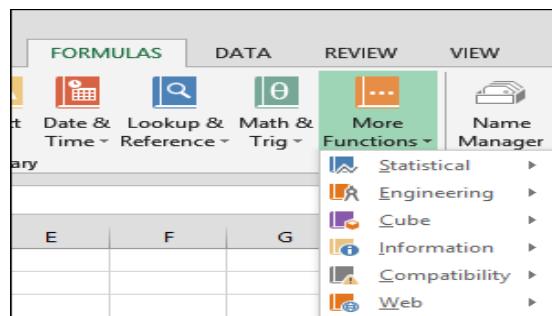
Note, Excel uses upper-case letters to list functions, but you can use lower or upper-case letters when you write them.

In Excel, the “Function Library” can be found on the “Formulas” tab.



There are 13 categories of functions, some of which are:

- Mathematical: AVERAGE() – calculates the average of a series of numbers.
- Date and time: DATEVALUE() – converts a string of text like “30 November 2013” to a number so that you can use this number in other date and time functions. You cannot do math with dates unless you convert them to numbers first. We explain this in detail in Lesson 4.
- Text: LEN() – returns the length of a string. Ex: =LEN(“Excel”) is 5.
- Logical: IF() – the IF() function is written like =IF(<test>, then A, else B). So, if “test” is true, then the result is A; if “test” is not true, then B.
- Lookup and Reference: These are needed to lookup values elsewhere in the spreadsheet. Ex: VLOOKUP looks in a table of values to find one cell.



What is a Formula?

A formula is combination of “operators”, “operands”, and “functions.”

For example, the function =SUM adds a list of numbers (it is so commonly used, that is listed on the first menu in Excel, abbreviated by the Greek letter Sigma (Σ), which is the notation that mathematicians use to sum a series).

You use a formula like doing a calculation by hand. For example, you could put your family budget into a formula like this:

$$\text{Remaining cash} = (4 * \text{weekly salary}) - \text{mortgage} - \text{food} - \text{utilities}$$

The operators are multiply [*] and subtract [-]. The operands are the values “weekly salary”, “mortgage”, “food”, and “utilities.” The result is “remaining cash.”

Creating Formulas:

Excel formula begins with the equal sign (=). So, whatever formula you are going to write, begin by typing = either in the destination cell or in the Excel formula bar.

- Creating formulas in Excel by using constants and operators
 - Writing formulas in Excel using cell references
 - Creating Excel formula by using defined names
 - Making a formula in Excel by using functions
- **Formula by using constants and operators:**

In Microsoft Excel formulas, **constants** are numbers, dates or text values that you enter directly in a formula. To create a simple Excel formula using constants, just do the following:

Select a cell where you want to output the result.

Type the equal symbol (=), and then type the equation you want to calculate.

Press the Enter key to complete your formula.

Here is an example of a simple **subtraction formula** in Excel: =100-50

- **Formulas in Excel using cell references:**

Instead of entering values directly in your Excel formula, you can **refer to the cells**, containing those values. Ex: if you want to subtract a value in cell B2 from the value in cell A2, you write the following subtraction formula: =A2-B2

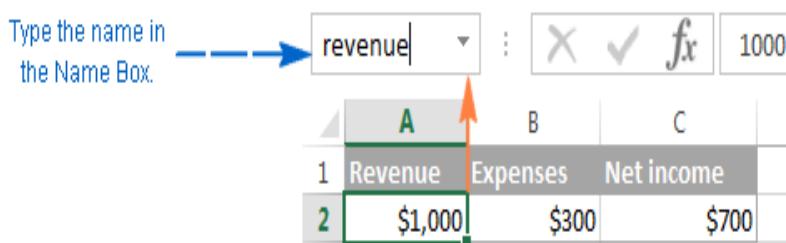
	A	B	C
1	Revenue	Expenses	Net income
2	\$1,000	\$300	\$700

Note: By default, Excel adds relative cell references. To switch to another reference type, press the F4 key.

- A big advantage of using cell references in Excel formulas is that whenever you change a value in the referred cell, the **formula recalculates automatically** without you having to manually update all the calculations and formulas on your spreadsheet.

➤ **Formula by using defined names:**

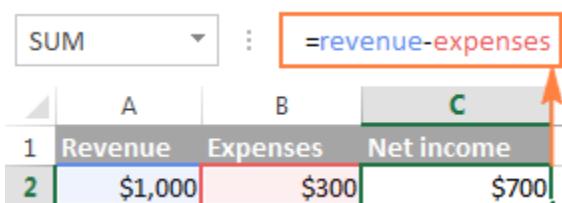
- To take a step further, you can create a name for a certain cell or a range of cells, and then refer to that cell(s) in your Excel formulas by simply typing the name.
- The fastest way to create a name in Excel, is to select a cell(s) and type the name directly in the *Name Box*. For example, this is how you create a name for cell A2:



- A professional-like way to define a name is via the *Formulas* tab > *Defined names* group or Ctrl+F3 shortcut.

For Ex: revenue for cell A2, *expenses* for cell B2

- And now, to calculate the net income, you can type the following formula in any cell on any sheet within the workbook in which those names were created:=revenue-expenses



➤ **Formulas by using functions:**

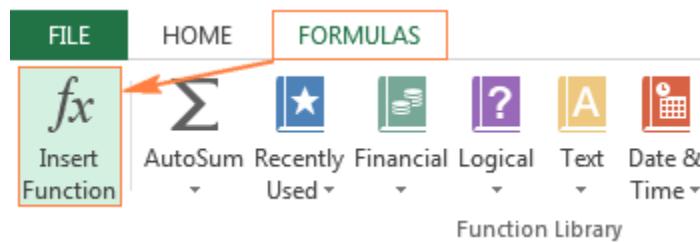
- Excel functions are nothing else than predefined formulas that perform the required calculations behind the scene.

- Each formula begins with an equal sign (=), followed by the function name and the function arguments entered within the parentheses. Each function has specific arguments and syntax (particular order of arguments).
- In your Excel spreadsheets, you can create a function-based formula in 2 ways:
 1. By using the function wizard
 2. By writing a formula in a cell or formula bar

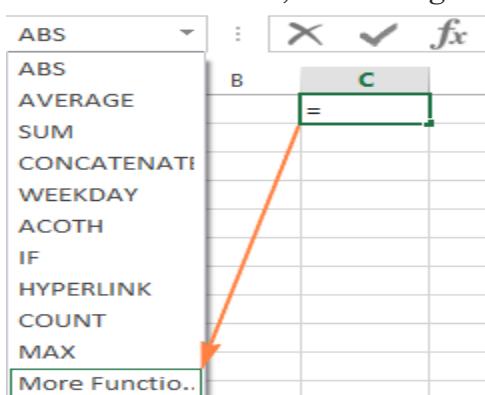
1. Create a formula in Excel by using the Function Wizard

a) Run the function wizard.

To run the wizard, click the **Insert Function** button on the *Formulas* tab > *Function Library* group, or pick a function from one of the categories:



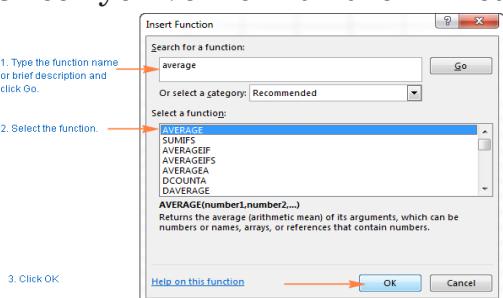
- Alternatively, you can click the **Insert Function** button to the left of the formula bar.
- Or, type the equal sign (=) in a cell and pick a function from the drop-down menu to the left of the formula bar. By default, the drop-down menu displays 10 most recently used functions, to get to the full list, click **More Functions...**



b) Find the function you want to use.

- When the *Insert Function* wizard appears, you do the following:
- If you know the function name, type it in the **Search for a function** field and click **Go**.

- If you are not sure exactly what function you need to use, type a very brief description of the task you want to solve in the **Search for a function** field, and click **Go**. For example, you can type something like this: "sum cells", or "count empty cells".
- If you know what category the function belongs to, click the small black arrow next to **Select a category** and choose one of the 13 categories listed there. The functions belonging to the selected category will appear in the **Select a function**
- You can read a short description of the selected function right under the *Select a function* box. If you need further details regarding that function, click the *Help on this function* link near the bottom of the dialog box.
- Once you've found the function you wish to use, select it and click **OK**.



c) Specify the function arguments.

In the second step of the Excel function wizard, you are to specify the function's arguments. Good news is that no knowledge of the function's syntax is required. You just enter the cell or range references in the arguments' boxes and the wizard will take care of the rest.

To **enter an argument**, you can either type a cell reference or range directly into the box. Alternatively, click the range selection icon next to the argument (or simply put the cursor into the argument's box), and then select a cell or a range of cells in the worksheet using the mouse. While doing this, the function wizard will shrink to a narrow range selection window. When you release the mouse button, the dialog box will be restored to its full size.

A short explanation for the currently selected argument is displayed right under

The screenshot shows two Excel spreadsheets side-by-side. The left spreadsheet has columns A and B, with rows 1 through 5. Row 1 is a header with 'Item' and 'Sales'. Rows 2 through 5 list items: Apples (\$750), Bananas (\$470), Grapes (\$590), and Lemons (\$550). The bottom row has '2014' in column A and '2015' in column B. The right spreadsheet also has columns A and B, with rows 1 through 5. It lists the same items with slightly different sales values: Apples (\$870), Bananas (\$520), Grapes (\$610), and Lemons (\$590). The bottom row has '2014' in column A and '2015' in column B. Below the spreadsheets is the 'Function Arguments' dialog box for the AVERAGE function. It shows three arguments: Number1 (2014!B2:B5), Number2 (2015!B2:B5), and Number3 (empty). The formula result is shown as 618.75. The dialog box includes a description of the AVERAGE function, which calculates the arithmetic mean of its arguments, and a note about the number of arguments (1 to 255). There are 'OK' and 'Cancel' buttons at the bottom.

the function's description.

Excel functions allow you to perform calculations with cell residing on the same worksheet, different sheets and even different workbooks. In this example, we are calculating the average of sales for 2014 and 2015 years located in two different spreadsheets, which is why the range references in the above screenshot include the sheet names. Find more about how to reference another sheet or workbook in Excel.

As soon as you've specified an argument, the value or array of values in the selected cell(s) will be displayed right to the argument's box.

d) Complete the formula.

When you have specified all the arguments, click the OK button (or just press the Enter key), and the completed formula is entered into the cell.

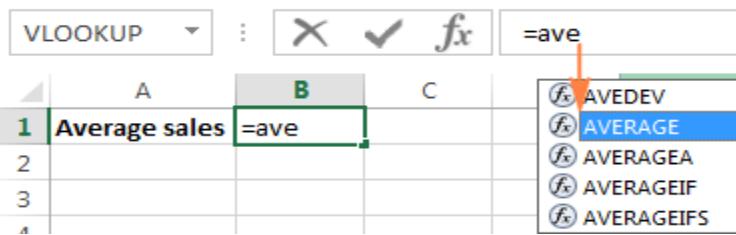
The screenshot shows an Excel spreadsheet with a single cell B1 selected. The formula bar at the top shows the formula =AVERAGE('2014'!B2:B5,'2015'!B2:B5). The cell B1 contains the value 618.75. The rest of the spreadsheet is empty with columns A, C, D, and E visible.

2. Write a formula directly in a cell or formula bar

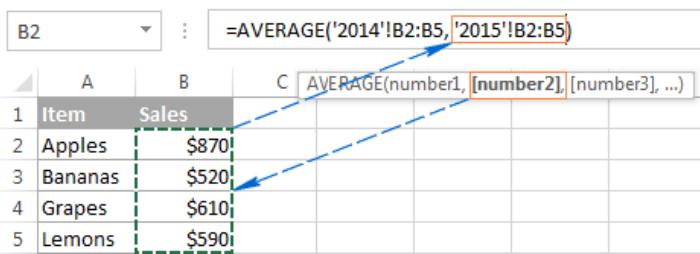
As you've just seen, creating a formula in Excel by using the function wizard is easy, though it's quite a long multi-step process. When you have some experience with Excel formulas, you might like a faster way - typing a function directly into a cell or formula bar.

- As usual, you start by typing the equal sign (=) followed by the function name. As you do this, Excel will perform some kind of incremental search and display a list of

functions that match the part of the function's name you've already typed:



- So, you can either finish typing the function name on your own or select from the displayed list. Either way, as soon as you type an opening parenthesis, Excel will show the **function screen tip** highlighting the argument you need to enter next. You can type the argument in the formula manually, or click a cell (select a range) in the sheet and have a corresponding cell or range reference added to the argument.



- After you've input the last argument, type the closing parenthesis and hit Enter to complete the formula.

II. FORMULA AUDITING:

- Formula auditing in excel is a fundamental part of spreadsheets, and anyone who works on spreadsheets regularly should make use of this tool.
- It helps to visualize what cells are being used. Formula auditing in Excel allows you to display the relationship between formulas and cells.
- Excel Formula Auditing commands provide you an easy way to find
 - Which cells are contributing in the calculation of a formula in the active cell.
 - Which formulas are referring to the active cell.
- These findings are shown graphically by arrow lines that makes the visualization easy. You can display all the formulas in the active worksheet with a single command. If your formulas refer to cells in a different workbook, open that workbook also. Excel cannot go to a cell in a workbook that is not open.

- This group has the collection of various such tools. Because these are necessary for the checking purposes. The example below helps you master Formula Auditing quickly and easily. If you click on Formulas – formula auditing ribbon you will find the following options:

Formula Auditing options:

- Trace Precedents
- Trace Dependents
- Remove Arrows
 - Remove-Precedent Arrows
 - Remove-Dependent Arrows
- Show Formulas
- Error Checking
 - Trace Error
 - Circular References
- Evaluate Formula
- Watch Window

Trace Precedents - which cells using this formula?

Precedent cells are those cells that are referred to by a formula in the active cell. The Trace Precedents tool shows the arrows indicating which cells affect the value of the selected cell.

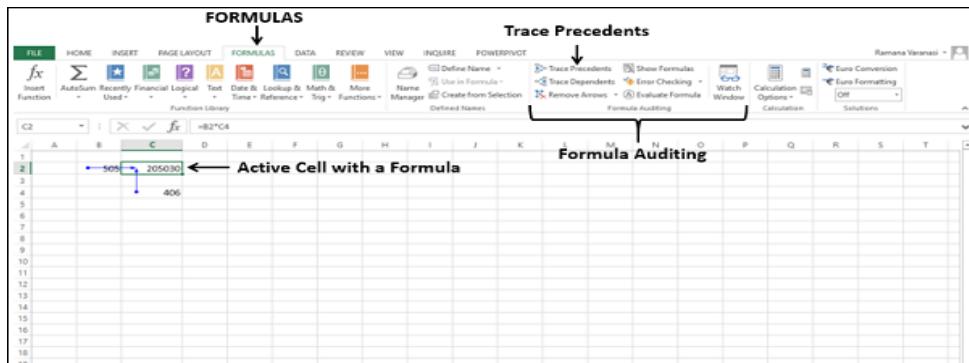
Ex: In the following example, the active cell is C2. In C2, you have the formula =B2*C4.

B2 and C4 are precedent cells for C2.

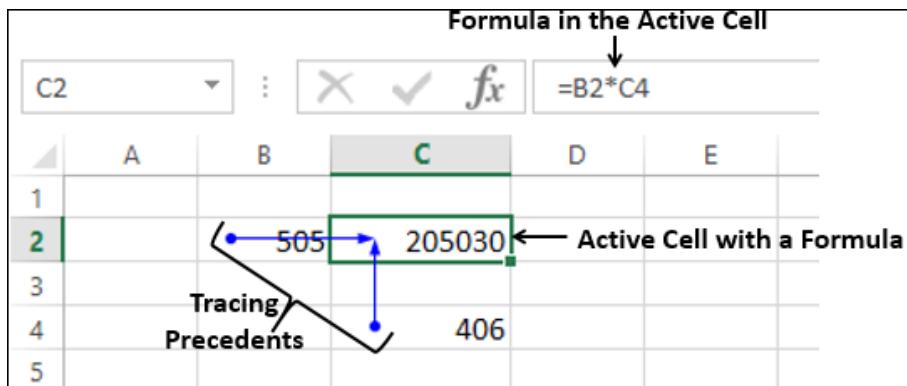
Formula in Active Cell					
C2	:	X ✓ fx	=B2*C4		
	A	B	C	D	E
1					
2		505	205030	← Active Cell	
3					
4			406		
5					

To trace the precedents of the cell C2,

- Click in the cell C2.
- Click the Formulas tab.
- Click Trace Precedents in the Formula Auditing group.



Two arrows, one from B2 to C2 and another from C4 to C2 will be displayed, tracing the precedents.



Note that for tracing precedents of a cell, the cell should have a formula with valid references. Otherwise, you will get an error message.

Removing Arrows

To remove the arrows, execute the following steps. The already drawn arrows by the Trace Precedents; and the Trace Dependents buttons is removed by the Remove Arrows button. Also, this button has the Remove Precedent Arrows and the Remove Dependent Arrows buttons.

- On the Formulas tab, in the Formula Auditing group, click Remove Arrows.
Result: All the arrows in the worksheet will disappear.

Tracing Dependents - which formulas use this cell?

Dependent cells contain formulas that refer to other cells. That means, if the active cell contributes to a formula in another cell, the other cell is a dependent cell on the active cell. The *Trace Dependents button shows the arrows, indicating which cells have been affected by the value of selected cell.*

In the example below, C2 has the formula =B2*C4. Therefore, C2 is a dependent cell on the cells B2 and C4

					Formula in C2
C2	A	B	C	D	E
1	505		205030		
2				406	
3					
4					
5					

**Cell dependent
on B2 and C4**

To trace the dependents of the cell B2,

- Click in the cell B2.
- Click the Formulas tab.
- Click Trace Dependents in the Formula Auditing group.

An arrow appears from B2 to C2, showing C2 is dependent on B2.

To trace the dependents of the cell C4 –

- Click in the cell C4.
- Click the Formula tab > Trace Dependents in the Formula Auditing group.

Another arrow appears from C4 to C2, showing C2 is dependent on C4 also.

Click Remove Arrows in the Formula Auditing group. All the arrows in the worksheet will disappear.

Note – For tracing dependents of a cell, the cell should be referenced by a formula in another cell. Otherwise, you will get an error message.

Show Formulas:

By default, Excel shows the results of formulas. To show the formulas instead of their results, execute the following steps. This button will show formulas in cells instead of results of formulas. In this example it will look like this:

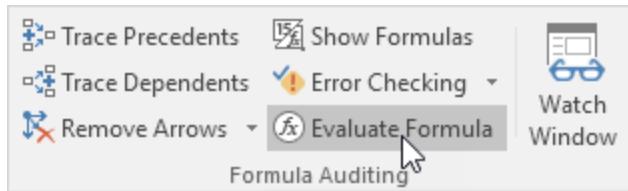
A	B	C	D	
1	Day out - Boat trip			
2	Description	Amount		
3				
4	Boat rent	400		
5	Boat fuel	33		
6	Life vests	20		
7	Picnic	68		
8	Dinner	240		
9	Total cost	=SUM(C5:C9)		
10	Group size	8		
11	Cost per person	=ROUNDUP(C10/C12,0)		
12				
13				
14				

Evaluating a Formula:

To find how a complex formula in a cell works step by step, you can use Evaluate Formula command.

To debug a formula by evaluating each part of the formula individually, execute the following steps.

1. Select cell C13.
2. On the Formulas tab, in the Formula Auditing group, click Evaluate Formula.



3. Click Evaluate four times.

In the Evaluate Formula dialog box, the formula is displayed in the box under Evaluation. By clicking the Evaluate button several times, the formula gets evaluated step-wise.

Error Checking

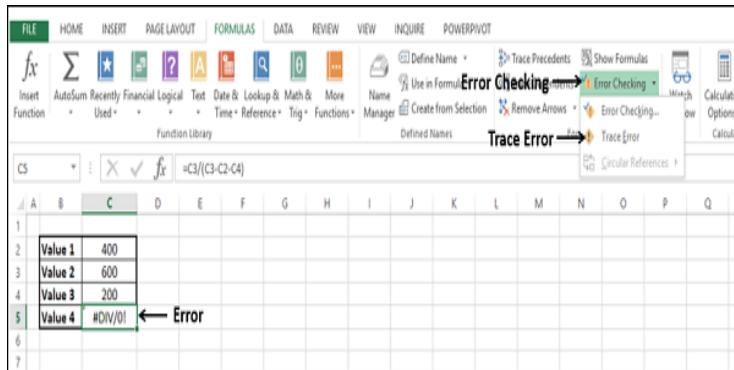
It is a good practice to do an error check once your worksheet and/or workbook is ready with calculations.

Consider the following simple calculations.

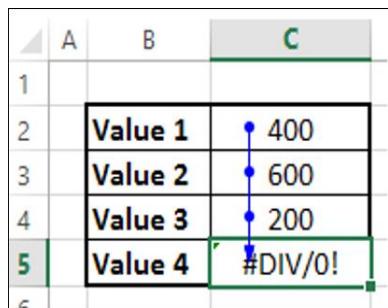
C5	:	X	✓	fx	=C3/(C3-C2-C4)	
A	B	C	D	E	F	G
1						
2	Value 1	400				
3	Value 2	600				
4	Value 3	200				
5	Value	#DIV/0!				
6						

The calculation in the cell has resulted in the error #DIV/0!.

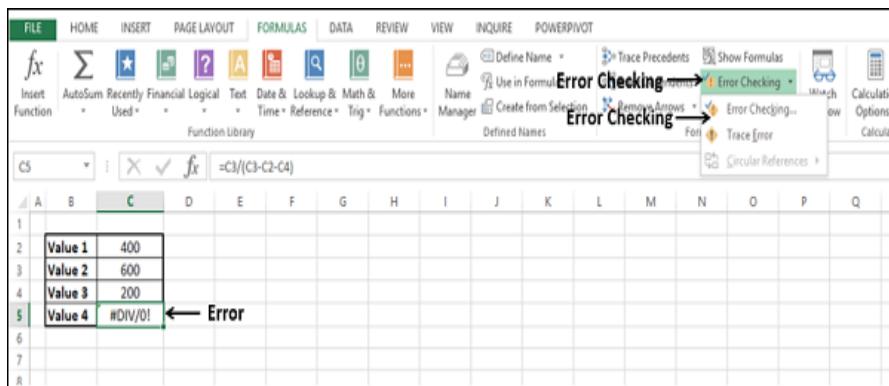
- Click in the cell C5.
- Click the FORMULAS tab on the Ribbon.
- Click the arrow next to Error Checking in the Formula Auditing group. In the drop-down list, you will find that Circular References is deactivated, indicating that your worksheet has no circular references.
- Select Trace Error from the drop-down list.



The cells needed to compute the active cell are indicated by blue arrows.



- Click Remove Arrows.
- Click the arrow next to Error Checking.
- Select Error Checking from the drop-down list.



The Error Checking dialog box appears.

Observe the following –

- If you click Help on this error, Excel help on the error will be displayed.
- If you click Show Calculation Steps, Evaluate Formula dialog box appears.
- If you click Ignore Error, the Error Checking dialog box closes and if you click Error Checking command again, it ignores this error.

- If you click Edit in Formula Bar, you will be taken to the formula in the formula bar, so that you can edit the formula in the cell.

III. FUNCTIONS: MEANING AND ADVANTAGES OF FUNCTIONS

Functions

A function is a built in formula. There are over 400 built in functions in Excel that can be accessed through the Insert Function button on the Formula Bar. The power of Excel, however, is to do more complicated calculations, including calculations for the cell itself, no matter what the content and more complex formulas (such as averages, sums, etc., beyond basic math).

Understanding How Functions Work

Excel uses straightforward formulas to perform simple calculations, such as adding or subtracting, on a number or series of numbers. For example, the formula =SUM(B4:B8) inserts the sum of the numbers contained in the range B4 to B8 into the cell containing the formula. These simple formulas are the foundation of many functions. Other functions combine several formulas or procedures to achieve a desired result.

Functions should be entered in the following basic order:

1. Start a function with an equal sign (=).
2. Enter the function name.
3. Include information about a cell or range of cells to be analyzed.
4. Enter arguments about what to do with the selected range of cells.

Function Syntax and Arguments

A function's syntax refers to the layout of the function and includes the function's name, parenthesis, comma separators, and arguments.

Like all formulas, functions begin with the equal sign (=) followed by the function's name and its arguments:

- The function name tells Excel what calculations to perform;
- The arguments are contained inside parentheses or round brackets and tell the function what data to use in those calculations.

For example, one of the most used functions in Excel and Google Sheets is the [SUM function](#):

= SUM (D1 : D6)

In this example,

- the name tells Excel to add together the [data](#) in selected cells;
- the argument (D1:D6) function adds the contents of cell range D1 to D6.

Advantages of Functions:

- Functions are tools you can use to analyze data and get information. In other words, functions help answer your questions so that you can evaluate and examine your business and make projections.
- Excel uses straightforward formulas to perform simple calculations.
- One of the key benefits of using Excel functions is that they help simplify your formulas.
- Another key benefit of using functions is that they help you accomplish tasks that would be impossible with standard formulas. For instance, imagine that you wanted a couple of formulas that would automatically return the largest and smallest numbers in a range of cells. Sure, if your range was small enough, you could eyeball the largest and smallest numbers. But that's hardly automated.
- Functions can also help save time by helping you automate tasks that would take you hours to accomplish manually. For example, say that you needed to extract the first 10 characters of a customer number.

MATHEMATICAL FUNCTIONS:

Sum(): This function helps to calculate the sum of the given numbers or cell references.

Syntax: =sum(number1,number2...)

For Ex: =sum(A1:A23) will return the sum of the values in cells A1 to A23

Auto sum: Simplest way of adding, subtracting numbers is known auto sum. It will be displayed on the home menu. Just click on the auto sum option and automatically it get select, click on ok.

- Home – editing ribbon - autosum



Sumif(): It will add the numbers for specified criteria The Excel SumIf function finds the values in a supplied array, that satisfy a given criteria, and returns the sum of the corresponding values in a second supplied array.

Syntax: =sumif(range, criteria,[sum range])

For Ex:

A	B	C	D	
1	Date	State	Name	Amount
2	1/5/2009	MI	John	2
3	1/6/2009	NY	Peter	6
4	1/7/2009	PA	John	8
5	1/5/2009	NH	Peter	3
6	1/6/2009	MI	John	4
7	1/7/2009	FL	Peter	6

=SUMIF(C2:C7,"John" ,D2:D7)

or

=SUMIF(C2:C7,C2 ,D2:D7) It will display as 14

=SUMIF(D2:D7,>5",D2:D7) It will display as 20

Subtotal(): Microsoft defines Excel SUBTOTAL as the function that returns a subtotal in a list or database. In this context, "subtotal" is not just totaling numbers in a defined range of cells. Unlike other Excel functions that are designed to do only one specific thing, SUBTOTAL is amazingly versatile - it can perform different arithmetic and logical operations such as counting cells, calculating average, finding the minimum or maximum value, and more. The Excel SUBTOTAL function returns an aggregate result for supplied values. SUBTOTAL can return a SUM, AVERAGE, COUNT, MAX, and others (see table below), and SUBTOTAL function can either include or exclude values in hidden rows.

Syntax: =SUBTOTAL (function number, ref1, [ref2], ...)

Where:

- **Function number** - a number that specifies which function to use for the subtotal.
- **Ref1, Ref2, ...** - one or more cells or ranges to subtotal. The first ref argument is required, others (up to 254) are optional.

The function number argument can belong to one of the following sets:

- 1 - 11 ignore filtered-out cells, but include manually hidden rows.
- 101 - 111 ignore all hidden cells - filtered out and hidden manually.

Function number		Function	Description
1	101	AVERAGE	Returns the average of numbers.
2	102	COUNT	Counts cells that contain numeric values.
3	103	COUNTA	Counts non-empty cells.
4	104	MAX	Returns the largest value.
5	105	MIN	Returns the smallest value.
6	106	PRODUCT	Calculates the product of cells.

Function number		Function	Description
7	107	STDEV	Returns the standard deviation of a population based on a sample of numbers.
8	108	STDEVP	Returns the standard deviation based on an entire population of numbers.
9	109	SUM	Adds up the numbers.
10	110	VAR	Estimates the variance of a population based on a sample of numbers.
11	111	VARP	Estimates the variance of a population based on an entire population of numbers.

For example, this is how you can make a Subtotal 9 formula to sum up the values in cells C2 to C8:

The screenshot shows a Microsoft Excel spreadsheet with a table of data in columns A, B, and C. The table has rows numbered 1 to 9, with row 9 being the total. The formula bar at the top shows the partial formula `=SUBTOTAL(9`. A dropdown menu is open next to the formula bar, listing various functions with their corresponding function numbers: 2 - COUNT, 3 - COUNTA, 4 - MAX, 5 - MIN, 6 - PRODUCT, 7 - STDEV.S, 8 - STDEV.P, 9 - SUM (which is highlighted with a blue background), 10 - VAR.S, 11 - VAR.P, and 101 - AVERAGE. A blue arrow points from the formula bar towards the '9 - SUM' option in the dropdown menu.

A	B	C
Region	Item	Sales
East	Apples	\$285
East	Grapes	\$340
East	Apples	\$280
East	Oranges	\$335
North	Apples	\$260
North	Grapes	\$250
North	Lemons	\$255
9	Total	\$1,070

To add a function number to the formula, double-click on it, then type a comma, specify a range, type the closing parenthesis, and press Enter. The completed formula will look like this:

`=SUBTOTAL(9,C2:C8)`

In a similar manner, you can write a Subtotal 1 formula to get an average, Subtotal 2 to count cells with numbers, Subtotal 3 to count non-blanks, and so on. The following screenshot shows a few other formulas in action:

	A	B	C	D	E
1	Region	Item	Sales		
2	East	Apples	\$285		
3	East	Grapes	\$340		
4	East	Apples	\$280		
5	East	Oranges	\$335		
6	North	Apples	\$260		
7	North	Grapes	\$250		
8	North	Lemons	\$255		
9	Total		\$2,005	=SUBTOTAL(9, C2:C8)	
10	Average		\$286	=SUBTOTAL(1, C2:C8)	
11	Min		\$250	=SUBTOTAL(5, C2:C8)	
12	Max		\$340	=SUBTOTAL(4, C2:C8)	

Note. When you use a Subtotal formula with a summary function like SUM or AVERAGE, it calculates only cells with numbers ignoring blanks and cells containing non-numeric values.

Product(): PRODUCT function returns the product (multiplication) of a supplied set of numerical values.

Syntax: =PRODUCT(number1, [number2], ...)

For ex: =PRODUCT(A1, A2)

Power(): Power function calculates a given number, raised to a supplied power.

Syntax: =POWER(number, power)

where the number and power arguments are numeric values. Note that the Excel Power function is the same as using the power operator ^.

For Ex: =POWER(4, 2) is the same as 4^2 . i.e 16

Sqrt(): The Excel Sqrt function calculates the positive square root of a supplied number.

Syntax: =sqrt(number)

where the number argument is the numeric value that you want to find the square root of.

For Ex: $=\text{sqrt}(4)$ i.e 2

Round(): The Microsoft Excel ROUND function returns a number rounded to a specified number of digits.

The ROUND function is a built-in function in Excel that is categorized as Math/Trig Function. It can be used as a worksheet function (WS) in Excel. As a worksheet function, the ROUND function can be entered as part of a formula in a cell of a worksheet.

Syntax: $=\text{ROUND}(\text{number}, \text{digits})$

For Ex: $=\text{ROUND}(-23.67, 1)$ Result: -23.7

Statistical functions

Statistical functions: average, averageif and averageifs, count, counta, countif, countifs, max, min, median, mode.

AVERAGE:

The AVERAGE function will average cells that contain numbers.

Its syntax is: $=\text{AVERAGE}(\text{value1}, \text{value2}, \dots, \text{value30})$.

The arguments (e.g. value1) can be cell references, or values typed into the AVERAGE formula.

The following AVERAGE function example uses only one argument - a reference to cells A1:A5.

1. Enter the sample data on your worksheet
2. In cell A7, enter an AVERAGE formula, to average the numbers in column A: $=\text{AVERAGE}(A1:A5)$
3. Press the Enter key, to complete the formula.
4. The result will be 21.83, the average of the cells that contain numbers.
Cell A1 isn't included in the average, because it contains text, and the empty cell C3, is ignored.

A7	=AVERAGE(A1:A5)	B	C	D
A	Qty			
1	50			
2	5.5			
3	10			
7	21.83			

AVERAGEA:

The AVERAGEA function will average the cells that are not empty.

Its syntax is: =AVERAGEA(value1, value2,...value30).

The arguments (e.g. value1) can be cell references, or values typed into the formula. The following example uses one argument -- a reference to cells A1:A5.

1. Enter the sample data on your worksheet
2. In cell A7, enter a AVERAGEA formula, to average the numbers in column A: =AVERAGEA(A1:A5)
3. Press the Enter key, to complete the formula.
4. The result will be 16.38, the average of the cells that contain data. Cell A1 contains text, which is treated as a zero, and cell A3 is not included in the average, because it is blank.

Note: AVERAGEA will include cells with formulas — including those that look empty, because they evaluate to "", e.g. =IF(B2="", "", B2).

AVERAGEIF: Match criterion exactly

In Excel, average cells that meet a specific criterion. In this example only the quantities for the Pen orders will be averaged.

B12	=AVERAGEIF(A1:A10,"Pen",B1:B10)	C	D	E
A	Item	Qty		
2	Pen	5		
3	Pencil	9		
4	Binder	9		
5	Pen	6		
6	Pen	15		
7	Binder	12		
8	Pencil	10		
9	Binder	6		
10	Pen	11		
11				
12		9.25		

1. Select the cell in which you want to see the average (cell A12 in this example)
2. The completed formula is: **=AVERAGEIF(A1:A10,"Pen",B1:B10)**
3. Press the Enter key to complete the entry
4. The result will be 9.25, the average quantity for rows that contain "Pen"

AVERAGEIFS: Match multiple criteria

In Excel 2007 and later versions, you can use the AVERAGEIFS function to average rows that meet two or more criteria. In this example only the rows where the item is "Pen" and the quantity is greater than or equal to ten will be averaged.

The criteria have been entered in cell D3 and E3. We'll refer to those cells in the formula, instead of typing the values in the formula.

The completed formula is:

=AVERAGEIFS(B2:B10,A2:A10,D3,B2:B10,>=" & E3)

		=AVERAGEIFS(B2:B10,A2:A10,D3,B2:B10,>=""&E3)						
		A	B	C	D	E	F	G
1		Item	Qty					
2	Pen	5		Item		Min		
3	Pencil	9		Pen		10		
4	Binder	9						
5	Pen	6						
6	Pen	15						
7	Binder	12						
8	Pencil	10						
9	Binder	6						
10	Pen	11						
11								
12			13					
13								

Note: Instead of referring to cells for the criteria, you can type them into the formula. Here is the same formula, with typed criteria:

=AVERAGEIFS(B2:B10,A2:A10,"Pen",B2:B10,">=10")

COUNT:

The COUNT function will count cells that contain numbers.

Its syntax is:

=COUNT(value1, value2,...value30).

The arguments (e.g. value1) can be cell references, or values typed into the COUNT formula.

The following COUNT function example uses one argument -- a reference to cells A1:A5.

- Enter the sample data on your worksheet

- In cell A7, enter an COUNT formula, to count the numbers in column A: **=COUNT(A1:A5)**
- Press the Enter key, to complete the formula.
- The result will be 3, the number of cells that contain numbers.
Cell A1 isn't counted, because it contains text.

	A	B	C	D
1	Qty			
2	50			
3				
4	5.5			
5	10			
6				
7	=COUNT(A1:A5)			
8	COUNT(value1, [value2], ...)			

COUNTA:

The COUNTA function will count cells that are not empty. (See [note on blank cells below](#))

Its syntax is:

=COUNTA(value1, value2,...value30).

The arguments (e.g. value1) can be cell references, or values typed into the formula.

The following example uses one argument -- a reference to cells A1:A5.

1. Enter the sample data on your worksheet
2. In cell A7, enter a COUNTA formula, to count the numbers in column A: **=COUNTA(A1:A5)**
3. Press the Enter key, to complete the formula.
4. The result will be 4, the number of cells that contain data.

COUNTBLANK:

The COUNTBLANK function will count cells that are empty.

Its syntax is: **=COUNTBLANK(range).**

The following example uses a reference to cells A1:A5.

1. Enter the sample data on your worksheet
2. In cell A7, enter a COUNTBLANK formula, to count the numbers in column A: **=COUNTBLANK(A1:A5)**
3. Press the Enter key, to complete the formula.
4. The result will be 1, the number of empty cells.

COUNTIF:

In Excel, count cells that meet a specific criterion. In this example only the Pen orders will be counted.

1. Select the cell in which you want to see the count (cell A12 in this example)

2. Select the cells that contain the values to check for the criterion. In this example, cells A1:A10 will be checked. Type a comma, to separate the arguments
 3. Type the criterion. In this example, you're checking for text, so type the word in double quotes: "Pen"
- Note: upper and lower case are treated equally*
4. The completed formula is: =COUNTIF(A1:A10,"Pen")
 5. Press the Enter key to complete the entry
 6. The result will be 4, the number of cells that contain "Pen"

	A	B	C	D
1	Item	Qty		
2	Pen	5		
3	Pencil	9		
4	Binder	9		
5	Pen	6		
6	Pen	15		
7	Binder	12		
8	Pencil	10		
9	Binder	6		
10	Pen	11		
11				
12	=COUNTIF(A1:A10,"Pen")			
13	COUNTIF(range, criteria)			

Match criterion in a string

In Excel, count cells that contain a criterion as part of the cell's contents. In this example all Pen, Gel Pen, and Pencil orders will be counted, because they contain the string "pen"

The completed formula is: =COUNTIF(A1:A10,"*Pen*")

The result will be 6, the number of cells that contain the string, "Pen"

COUNTIFS - Count Cells that Match multiple criteria

In Excel you can use the COUNTIFS function to count rows that meet two or more criteria. In this example only the rows where the item is "Pen" and the quantity is greater than or equal to ten will be counted.

1. Select the cell in which you want to see the total
2. Select the cells that contain the values to check for the first criterion. In this example, cells A2:A10 will be checked. Use the following formula:

A	B	C	D	E	F	G	H
1	Item	Qty					
2	Pen	5					
3	Pencil	9					
4	Binder	9					
5	Pen	6					
6	Pen	15					
7	Binder	12					
8	Pencil	10					
9	Binder	6					
10	Pen	11					
11							
12	=COUNTIFS(A2:A10,D3,B2:B10,">=" & E3)						
13	COUNTIFS(criteria_range1, criteria1, [criteria_range2, criteria2], [criteria_range3, ...])						
14							

=COUNTIFS(A2:A10,D3,B2:B10,">=" & E3)

Or

Use typed criteria:

=COUNTIFS(A2:A10,"Pen",B2:B10,">=10")

MEDIAN: The Microsoft Excel MEDIAN function returns the median of the numbers provided. Median is a function which is used to find the middle number in a given range of numbers. When you are finding median manually, you need to sort the data in an ascending order but in Excel, you can simply use the Median function and select the range and you will find the median.

Syntax: MEDIAN(number1, [number2, ... number_n])

Book1 (version 1) [Autosaved] - Microsoft ...							
File Home Insert Page Layout Formulas Data Review View ▾ ?							
fx		Σ AutoSum	Logical	Insert Function	Recently Used	Date & Time	Defined Names
Function Library							
C2		fx	=MEDIAN(A2, A3)				
	A	B	C	D	E	F	G
1	Value						
2	10.5		8.85				
3	7.2						
4	200						
5	5.4						
6	8.1						
7							
	Sheet1	Sheet2	Sheet3				
Ready							

=MEDIAN(A2, A3)

Result: 8.85

=MEDIAN(A2:A6)

Result: 8.1

=MEDIAN(1, 3, 13, 14, 15)

Result: 13

MODE: The Microsoft Excel MODE function returns the most frequently occurring number found in a set of numbers.

Syntax

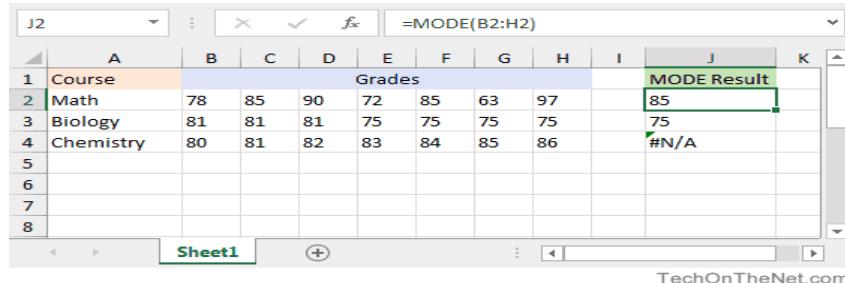
The syntax for the MODE function in Microsoft Excel is:

`MODE(number1, [number2, ... number_n])`

Parameters or Arguments: number1, number2, ... number_n

Each number can be a range, a cell or a numeric value. There can be up to 255 numbers.

Returns: The MODE function returns a numeric value.



A	B	C	D	E	F	G	H	J
1 Course				Grades				MODE Result
2 Math	78	85	90	72	85	63	97	85
3 Biology	81	81	81	75	75	75	75	75
4 Chemistry	80	81	82	83	84	85	86	#N/A
5								
6								
7								
8								

=MODE(B2:H2)

Result: 85

=MODE(B2,C2,D2,E2,F2,G2,H2)

Result: 85

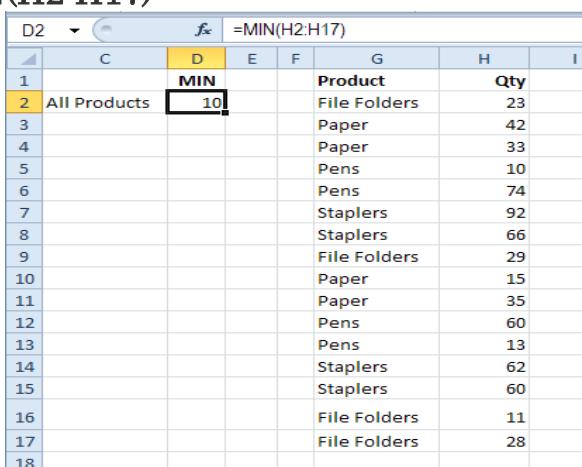
=MODE(B4:H4)

Result: #N/A 'No repeating number is found

MIN: To find the minimum value, use the MIN function.

To find the lowest value in a range of cells, use the MIN function. For example, this formula will find the lowest value in cells H2:H17

=MIN(H2:H17)



C	D	E	F	G	H	I
1	MIN			Product		
2 All Products	10			File Folders	23	
3				Paper	42	
4				Paper	33	
5				Pens	10	
6				Pens	74	
7				Staplers	92	
8				Staplers	66	
9				File Folders	29	
10				Paper	15	
11				Paper	35	
12				Pens	60	
13				Pens	13	
14				Staplers	62	
15				Staplers	60	
16				File Folders	11	
17				File Folders	28	
18						

MAX: To find the maximum value, use the MAX function.

To find the highest value in a range of cells, use the MAX function. For example, this formula will find the highest value in cells H2:H17

=MAX(H2:H17)

LARGE: The Microsoft Excel LARGE function returns the nth largest value from a set of values.

Syntax: **LARGE(array, nth_position)**

Where:

array: A range or array from which you want to return the nth largest value.

nth_position: The position from the largest to return.

Returns: The LARGE function returns a numeric value.

If *nth_position* is larger than the number of values in *array*, the LARGE function will return the #NUM! error.

If *array* is empty, the LARGE function will return the #NUM! error.

A	B	C
1	4	32
2	32	
3	5.7	
4	-2.3	
5	8	
6		
7		

=LARGE(A1:A5, 1)

Result: 32

=LARGE(A1:A5, 2)

Result: 8

=LARGE({6, 23, 5, 2.3}, 2)

Result: 6

SMALL: The Microsoft Excel SMALL function returns the nth smallest value from a set of values.

Syntax: **SMALL(array, nth_position)**

Where:

array: A range or array from which you want to return the nth smallest value.

nth_position: The position from the smallest to return.

Returns: The SMALL function returns a numeric value.

Ex: =SMALL(A1:A5, 1)

Result: -2.3
 $=SMALL(A1:A5, 2)$
 Result: 4

Creating Dates & Times

<u>DATE</u>	Returns a date, from a user-supplied year, month and day Syntax:=date(year,month,day) For ex: =date(2012,5,12)
<u>TIME</u>	Returns a time, from a user-supplied hour, minute and second $=time(hour,minute,second)$
<u>DATEVALUE</u>	Converts a text string showing a date, to an integer that represents the date in Excel's date-time code. Syntax:=datevalue(date_text)

Current Date & Time

<u>NOW</u>	Returns the current date & time. For Ex: =now() it display date and as well as time
<u>TODAY</u>	Returns today's date. For Ex: type =today() it gives current date

Extracting The Components of a Time

<u>MINUTE</u>	Returns the minute part of a user-supplied time Syntax:=minute(serial_number) $=MINUTE("12:34:45 PM")$. It display 34
<u>SECOND</u>	Returns the seconds part of a user-supplied time Syntax: =second(serial_number) For ex: =second("10:33:35 PM") it displays 35

Extracting The Components of a Date

<u>DAY</u>	Returns the day (of the month) from a user-supplied date Syntax:=day(serial_number) For ex: =DAY("2/12/2017").
-------------------	--

It will display as 12

MONTH Returns the month from a user-supplied date

Syntax:=month(serial_number)

For ex: =month("2/12/2017").

It will display 2

YEAR Returns the year from a user-supplied date

Syntax:=year(serial_number)

For ex: =year("2/12/2017").

It will display 2017

WEEKDAY Returns an integer representing the day of the week for a supplied date

Syntax: =day(serial_number)

For ex: =WEEKDAY("3/22/2017")

Lookup & Reference Functions:

These functions help you to work with arrays of data, and are particularly useful when you need to cross reference between different data sets.

Vlookup:

The VLOOKUP (Vertical lookup) function looks for a value in the leftmost column of a table, and then returns a value in the same row from another column you specify. When you need to find things in a table or a range by row. For example, look up a price of an automotive part by the part number.

In its simplest form, the VLOOKUP function says:

=VLOOKUP(Value you want to look up, range where you want to lookup the value, the column number in the range containing the return value, Exact Match or Approximate Match – indicated as 0/FALSE or 1/TRUE).

The syntax of the function is:

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

where the arguments are as follows:

<code>lookup_value</code>	- The value that you want to look up.
<code>table_array</code>	- The data array or table, containing the search values in the left hand columns and the return values in another column.
<code>col_index_num</code>	- The column number, within the supplied <code>table_array</code> , that you want to return a value from.
<code>[range_lookup]</code>	<ul style="list-style-type: none"> - An optional logical argument, that describes what the function should return in the event that it does not find an exact match to the <code>lookup_value</code>. <p>The <code>[range_lookup]</code> can be set to TRUE or FALSE, meaning:</p> <ul style="list-style-type: none"> <code>TRUE</code> - If the function cannot find an exact match to the supplied <code>lookup_value</code>, it should use the closest match <u>below</u> the supplied value. Note: if this option is used, the left-hand column of the <code>table_array</code> <u>must</u> be in ascending order. <code>FALSE</code> - If the function cannot find an exact match to the supplied <code>lookup_value</code>, it should return an error.

Vlookup Examples: Example 1 - Vlookup Requiring an Exact Match

	A	B	C	D	E
1	Item Description	Cost (\$)	Current Item:	Current Item Cost (\$)	
2	Tinned Tomatoes	\$0.90	Cornflakes	=VLOOKUP(D2, A:B, 2, FALSE)	- returns the value \$3.50
3	Tinned Tuna	\$1.50			
4	Cornflakes	\$3.50			
5	Shortcake Biscuits	\$1.00			

6	Toothpaste	\$4.10			
7	Tinned Baked Beans	\$0.99			
8	White Sliced Bread	\$0.80			
	.	.			
9	.	.			

Columns A and B of the spreadsheet below list an inventory of grocery items and their prices. In cell E2 of the spreadsheet, the Vlookup function is used to look up the price of an item from the inventory.

The above Vlookup function returns the price for "Cornflakes", which is **\$3.50**.

In this example:

- The `lookup_value` is the text string "Cornflakes", which is located in cell D2;
- The `table_array` is defined as columns A-B of the spreadsheet;
- The `col_index_num` is set to 2, to denote that the value returned should be taken from column 2 of the `table_array`;
- The `[range_lookup]` argument is set to FALSE, to indicate that we only want a result to be returned if an exact match to the `lookup_value` is found.

Ex2:

A		B		C	
1	ID	Last name	First name	Title	Birth date
2	101	Davis	Sara	Sales Rep	12/08/68
3	102	Fontana	Olivier	VP (Sales)	02/19/52
4	103	Leal	Karina	Sales Rep	08/30/63
5	104	Patten	Michael	Sales Rep	09/19/58
6	105	Burke	Brian	Sales Manager	03/04/55
7	106	Sousa	Luis	Sales Rep	07/02/63
8					
9					
10	Formula	<code>=VLOOKUP(B3,B2:E7,2,TRUE)</code>			
11	Result	Olivier			
12					

VLOOKUP looks for *Fontana* in the first column (column B) in table_array B2:E7, and returns *Olivier* from the second column (column C) of the table_array. TRUE returns an exact match.

HLOOKUP function: (Horizontal Lookup)

Searches for a value in the top row of a table or an array of values, and then returns a value in the same column from a row you specify in the table or array. Use HLOOKUP when your comparison values are located in a row across the top of a table of data, and you want to look down a specified number of rows. Use VLOOKUP when your comparison values are located in a column to the left of the data you want to find.

The syntax of the function is:

HLOOKUP(*lookup_value*, *table_array*, *row_index_num*, [*range_lookup*])

Where the function arguments are as follows:

<i>lookup_value</i>	-	The value that you want to search for, in the first row of the supplied data array.						
<i>table_array</i>	-	The data array or table, containing the data to be searched in the top row, and the return values in any other row.						
<i>row_index_num</i>	-	The row number, within the supplied <i>table_array</i> , that you want the corresponding value to be returned from.						
<i>[range_lookup]</i>	-	An optional logical argument, which can be set to TRUE or FALSE, meaning: <table> <tr> <td>TRUE</td> <td>-</td> <td>if the function cannot find an exact match to the supplied <i>lookup_value</i>, it should use the closest match <u>below</u> the supplied value. Note: If <i>[range_lookup]</i> is set to TRUE, the top row of the <i>table_array</i> <u>must</u> be in ascending order.</td> </tr> <tr> <td>FALSE</td> <td>-</td> <td>if the function cannot find an exact match to the supplied <i>lookup_value</i>, it should return an error.</td> </tr> </table>	TRUE	-	if the function cannot find an exact match to the supplied <i>lookup_value</i> , it should use the closest match <u>below</u> the supplied value. Note: If <i>[range_lookup]</i> is set to TRUE, the top row of the <i>table_array</i> <u>must</u> be in ascending order.	FALSE	-	if the function cannot find an exact match to the supplied <i>lookup_value</i> , it should return an error.
TRUE	-	if the function cannot find an exact match to the supplied <i>lookup_value</i> , it should use the closest match <u>below</u> the supplied value. Note: If <i>[range_lookup]</i> is set to TRUE, the top row of the <i>table_array</i> <u>must</u> be in ascending order.						
FALSE	-	if the function cannot find an exact match to the supplied <i>lookup_value</i> , it should return an error.						

Ex:

Axes	Bearings	Bolts
4	4	9

5	7	10
6	8	11

Formula	Description	Result
=HLOOKUP("Axles", A1:C4, 2, TRUE)	Looks up "Axles" in row 1, and returns the value from row 2 that's in the same column (column A).	4
=HLOOKUP("Bearings", A1:C4, 3, FALSE)	Looks up "Bearings" in row 1, and returns the value from row 3 that's in the same column (column B).	7
=HLOOKUP("B", A1:C4, 3, TRUE)	Looks up "B" in row 1, and returns the value from row 3 that's in the same column. Because an exact match for "B" is not found, the largest value in row 1 that is less than "B" is used: "Axles," in column A.	5
=HLOOKUP("Bolts", A1:C4, 4)	Looks up "Bolts" in row 1, and returns the value from row 4 that's in the same column (column C).	11
=HLOOKUP(3, {1,2,3;"a","b","c";"d","e","f"}, 2, TRUE)	Looks up the number 3 in the three-row array constant, and returns the value from row 2 in the same (in this case, third) column. There are three rows of values in the array constant, each row separated by a semicolon (;). Because "c" is found in row 2 and in the same column as 3, "c" is returned.	C

Copy the example data in the following table, and paste it in cell A1 of a new Excel worksheet. For formulas to show results, select them, press F2, and then press Enter. If you need to, you can adjust the column widths to see all the data.

Excel Financial Functions

Excel provides a number of functions to make calculating financial data very easy. These functions perform many of the common financial calculations, such as the calculation of yield, interest rates, duration, valuation and depreciation. Spreadsheets are frequently used for financial information, because of their ability to re-calculate the entire sheet automatically, after a change to a single cell is made. Microsoft Excel is the most important tool of Investment Bankers and Financial

Analysts. They spent more than 70% of the time on preparing Excel Models, formulating Assumptions, Valuations, Calculations, Graphs etc. The following are some of the financial functions with syntax and examples.

1. FV() - FUTURE VALUE (FV):

Calculates the future value of an investment with periodic constant payments and a constant interest rate. If you want to find out the future value of a particular investment which has a constant interest rate and periodic payment, use the following formula –

Syntax: **FV (Rate, Nper, [Pmt], PV, [Type])**

- Rate = It is the interest rate/period
- Nper = Number of periods
- [Pmt] = Payment/period
- PV = Present Value
- [Type] = When the payment is made (if nothing is mentioned, it's assumed that the payment has been made at the end of the period)

EX:A has invested US \$100 in 2016. The payment has been made yearly. The interest rate is 10% p.a. What would be the FV in 2019?

Solution: In excel, we will put the equation as follows –

A	B	C	D
1			
2			
3	Rate	10%	
4	nper	3	
5	pmt	1	
6	pv	-100	
7	type	0	
8			
9	=FV(C3,C4,C5,C6,C7)		
10			

$$= \text{FV}(10\%, 3, 1, -100)$$

$$= \text{US \$}129.79$$

2. PV() - PRESENT VALUE (PV) :

Calculates the present value of an investment (i.e. the total amount that a series of future periodic constant payments is worth now). If you know how to calculate FV, it's easier for you to find out PV.

Syntax: $PV = (\text{Rate}, \text{Nper}, [\text{Pmt}], \text{FV}, [\text{Type}])$

- Rate = It is the interest rate/period
- Nper = Number of periods
- [Pmt] = Payment/period
- FV = Future Value
- [Type] = When the payment is made (if nothing is mentioned, it's assumed that the payment has been made at the end of the period)

EX: *The future value of an investment is US \$100 in 2019. The payment has been made yearly. The interest rate is 10% p.a. What would be the PV as of now?*

Solution: In excel, we will put the equation as follows –

A	B	C	D	E
	Rate	10%		
	nper	3		
	pmt	1		
	FV	-100		
	type	0		
		=PV(C2,C3,C4,C5,C6)		

$$= PV (10\%, 3, 1, -100)$$

$$= \text{US } \$72.64$$

3. NPV - NET PRESENT VALUE (NPV):

Calculates the net present value of an investment, based on a supplied discount rate, and a series of periodic cash flows. Net Present Value is the sum total of positive and negative cash flows over the years. Here's how we will represent it in excel –

Syntax: $NPV = (\text{Rate}, \text{Value 1}, [\text{Value 2}], [\text{Value 3}]\dots)$

- Rate = Discount rate for a period

- Value 1, [Value 2], [Value 3]... = Positive or negative cash flows
- Here, negative values would be considered as payments and positive values would be treated as inflows.

EX: Here is a series of data from which we need to find NPV –

Details	In US \$
Rate of Discount	5%
Initial Investment	-1000
Return from 1 st year	300
Return from 2 nd year	400
Return from 3 rd year	400
Return from 4 th year	300

Find out the NPV.

Solution: In Excel, we will do the following –

A	B	C	D	E
1	Details	In US \$		
2	Rate of Discount	5%		
3	Initial Investment	-1000		
4	Return from 1 st year	300		
5	Return from 2 nd year	400		
6	Return from 3 rd year	400		
7	Return from 4 th year	300		
8				
9				
10	=NPV(C3,C5:C8)+C4			
11				
12				

$$=NPV(5\%, B4:B7) + B3$$

$$= \text{US \$}240.87$$

4. PMT

In excel, PMT denotes the periodical payment required to pay off for a particular period of time with a constant interest rate. Calculates the payments required to reduce a loan, from a supplied present value to a specified future value. Let's have a look at how to calculate it in excel –

Syntax: $\text{PMT} = (\text{Rate}, \text{Nper}, \text{PV}, [\text{FV}], [\text{Type}])$

- Rate = It is the interest rate/period
- Nper = Number of periods
- PV = Present Value
- [FV] = An optional argument which is about the future value of a loan (if nothing is mentioned, FV is considered as “0”)
- [Type] = When the payment is made (if nothing is mentioned, it's assumed that the payment has been made at the end of the period)

EX: US \$1000 need to be paid in full in 3 years. Interest rate is 10% p.a. and the payment needs to be done yearly. Find out the PMT.

Solution: In excel, we will compute it in the following manner –

A	B	C	D	E	F
1					
2	Rate	10%			
3	nper	3			
4	PV	1000			
5	fv				
6	type				
7					
8		=PMT(C2,C3,C4,C5,C6)			
9					

$$= \text{PMT}(10\%, 3, 1000)$$

$$= -402.11$$

5. IRR() - INTERNAL RATE OF RETURN:

Calculates the internal rate of return for a series of periodic cash flows. To understand whether any new project or investment is profitable or not, firm uses IRR. If IRR is more than the hurdle rate (acceptable rate/average cost of capital), then it's profitable for the firm and vice-versa.

Syntax: $\text{IRR} = (\text{Values}, [\text{Guess}])$

- Values = Positive or negative cash flows (an array of values)
- [Guess] = An assumption of what you think IRR should be

EX: Here is a series of data from which we need to find IRR –

Details	In US \$
Initial Investment	-1000

Return from 1st year	300
Return from 2nd year	400
Return from 3rd year	400
Return from 4th year	300

Find out IRR.

Solution: Here's how we will compute IRR in excel –

A	B	C	D	E
1				
2	Details	In US \$		
3	Initial Investment	-1000		
4	Return from 1st year	300		
5	Return from 2nd year	400		
6	Return from 3rd year	400		
7	Return from 4th year	300		
8				
9	=IRR(C3:C7,0.1)			
10				

= IRR (A2:A6, 0.1)

= 15%

6. NPER()- FINANCIAL FUNCTION IN EXCEL

It is simply the number of periods one requires to pay off the loan. Returns the number of periods for an investment with periodic constant payments and a constant interest rate

Syntax: **NPER = (Rate, PMT, PV, [FV], [Type])**

- Rate = It is the interest rate/period
- PMT = Amount paid per period
- PV = Present Value
- [FV] = An optional argument which is about the future value of a loan (if nothing is mentioned, FV is considered as “0”)
- [Type] = When the payment is made (if nothing is mentioned, it's assumed that the payment has been made at the end of the period)

EX: US \$200 is paid per year for a loan of US \$1000. Interest rate is 10% p.a. and the payment needs to be done yearly. Find out the NPER.

Solution: We need to calculate NPER in the following manner –

A	B	C	D	E	F
1					
2	Rate	10%			
3	PMT	-200			
4	Loan	1000			
5					
6		=NPER(C2,C3,C4)			
7					

= NPER (10%, -200, 1000)

= 7.27 years

7. RATE()

Calculates the interest rate required to pay off a specified amount of a loan, or reach a target amount on an investment over a given period. Through [RATE function](#), we can calculate the interest rate needed to pay to pay off the loan in full for a given period of time.

Syntax: **RATE = (NPER, PMT, PV, [FV], [Type], [Guess])**

- Nper = Number of periods
- PMT = Amount paid per period
- PV = Present Value
- [FV] = An optional argument which is about the future value of a loan (if nothing is mentioned, FV is considered as “0”)
- [Type] = When the payment is made (if nothing is mentioned, it's assumed that the payment has been made at the end of the period)
- [Guess] = An assumption of what you think RATE should be

EX: US \$200 is paid per year for a loan of US \$1000 for 6 years and the payment needs to be done yearly. Find out the RATE.

Solution:

A	B	C	D	E	F
1					
2	Years	6.00			
3	PMT	-200			
4	Loan	1000			
5					
6		=RATE(C2,C3,C4,0,0,0.1)			
7					

= RATE (6, -200, 1000, 0.1)

= 5%

8. TYPE():

The Excel TYPE function returns a numeric code representing "type" in 5 categories: number = 1, text = 2, logical = 4, error = 16, and array = 64. Use TYPE when the operation of a formula depends on the type of value in a particular cell. Use TYPE to test the value in a particular cell so that other functions that depend on the type can perform as expected. You can use TYPE to find out the type of data that is returned by a function or formula.

Syntax : =TYPE (value)

- value - The value to check the type of.

Ex:

Value	Result	Notes
10	1	
apple	2	
FALSE	4	
#DIV/0!	16	
	64	=TYPE({"a","b","c"})

9. IPMT():

Get principal for given period by using IPMT function. The Excel IPMT function can be used to calculate the interest portion of a given loan payment in a given payment period. For example, you can use IPMT to get the principal amount of a payment for the first period, the last period, or any period in between.

Syntax: =IPMT (rate, per, nper, pv, [fv], [type])

- **rate** - The interest rate per period.
- **per** - The payment period of interest.
- **nper** - The total number of payment periods.
- **pv** - The present value, or total value of all payments now.
- **fv** - [optional] The cash balance desired after last payment is made. Defaults to 0.

- **type** - [optional] When payments are due. 0 = end of period. 1 = beginning of period. Default is 0.

Ex:

The screenshot shows an Excel spreadsheet titled "exceljet_ipmt.xlsx". The formula bar at the top displays "=IPMT(C6/12,1,C8,-C5)". The spreadsheet contains the following data:

	A	B	C	D	E	F
1						
2			IPMT (rate, per, nper, pv, [fv], [type])			
3			IPMT to get interest amount of payment in a given period			
4						
5	Loan amount		\$5,000			
6	Interest rate		4.50%			
7	Monthly payment		\$93.22			
8	Periods (term in months)		60			
9	Compounding periods per year		12			
10						
11	Interest amount in period 1		\$18.75			
12						

The formula in cell C11 is `=IPMT(C6/12,1,C8,-C5)`. The result \$18.75 is displayed in cell C11.

10. CUMIPMT():

Get cumulative interest paid on a loan by using CUMIPMT function. The Excel CUMIPMT function is a financial function that returns the cumulative interest paid on a loan between a start period and an end period. You can use CUMIPMT to calculate and verify the total interest paid on a loan, or the interest paid between any two payment periods.

Syntax: =CUMIPMT (rate, nper, pv, start_period, end_period, type)

Arguments

- **rate** - The interest rate per period.
- **nper** - The total number of payments for the loan.
- **pv** - The present value, or total value of all payments now.
- **start_period** - First payment in calculation.
- **end_period** - Last payment in calculation.
- **type** - When payments are due. 0 = end of period. 1 = beginning of period.

Ex:

The screenshot shows a Microsoft Excel spreadsheet titled "exceljet_cumipmt.xlsx". The formula bar at the top displays the formula =CUMIPMT(C6/12,C8,C5,1,60,0). The spreadsheet contains the following data:

	A	B	C	D	E	F
1						
2	CUMIPMT (rate, nper, pv, start_period, end_period, type)					
3	Get interest paid between any two loan payment periods					
4						
5	Loan amount	\$5,000				
6	Interest rate	4.50%				
7	Monthly payment	\$93.22				
8	Periods (term in months)	60				
9	Compounding periods per year	12				
10						
11	Total interest over loan term	-\$592.91				
12						

The formula in cell C11 is =CUMIPMT(C6/12,C8,C5,1,60,0), which calculates the total interest paid over the entire term of the loan.

What is a Pivot Table?

A pivot table is a special Excel tool that allows you to summarize and explore data interactively.

Table - A collection of data. It was first coined in MS Access. However, it is commonly used in Excel nowadays. A table in Excel has a header and there are no entirely blank rows or columns. (Example: Home > Format as Table)

Pivot - The ability to alter the perspective of retrieved data.

Pivot Table - The ability to create a brand new table based on existing data for the purpose of viewing, reporting and analyzing data.

A Pivot Table is a summary of a large dataset that usually includes the total figures, average, minimum, maximum, etc. let's say you have a sales data for different regions, with a pivot table, you can summarize the data by region and find the average sales per region, the maximum and minimum sale per region, etc. Pivot tables allow us to analyze, summarize and show only relevant data in our reports.

In other words, pivot tables extract meaning from that seemingly endless jumble of numbers on your screen. And more specifically, it lets you group your data together in different ways so you can draw helpful conclusions more easily.

Creating a pivot table:

Specifying PivotTable Data Before creating a PivotTable you must know what you want to analyze. There are three questions you have to ask before proceeding: —

- What do you want your column headers to be?
- What do you want your row headers to be?
- What data do you want to analyze?

By understanding the layout, you will have a better perspective on how to create a PivotTable.

Ex: Our data set consists of 213 records and 6 fields. Order ID, Product, Category, Amount, Date and Country.

	A	B	C	D	E	F	G	H
1	Order ID	Product	Category	Amount	Date	Country		
2	1	Carrots	Vegetables	\$4,270	1/6/2016	United States		
3	2	Broccoli	Vegetables	\$8,239	1/7/2016	United Kingdom		
4	3	Banana	Fruit	\$617	1/8/2016	United States		
5	4	Banana	Fruit	\$8,384	1/10/2016	Canada		
6	5	Beans	Vegetables	\$2,626	1/10/2016	Germany		
7	6	Orange	Fruit	\$3,610	1/11/2016	United States		
8	7	Broccoli	Vegetables	\$9,062	1/11/2016	Australia		
9	8	Banana	Fruit	\$6,906	1/16/2016	New Zealand		
10	9	Apple	Fruit	\$2,417	1/16/2016	France		
11	10	Apple	Fruit	\$7,421	1/16/2016	Canada		

Insert a Pivot Table

To insert a pivot table, execute the following steps.

1. Click any single cell inside the data set.
2. On the Insert tab, in the Tables group, click PivotTable.

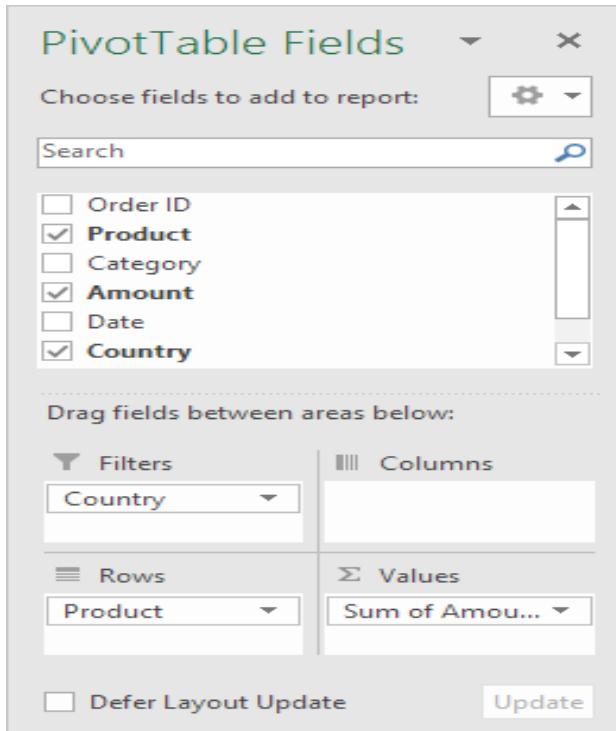
The following dialog box appears. Excel automatically selects the data for you. The default location for a new pivot table is New Worksheet.

3. Click OK.

Drag fields

The PivotTable Fields pane appears. To get the total amount exported of each product, drag the following fields to the different areas.

1. Product field to the Rows area.
2. Amount field to the Values area.
3. Country field to the Filters area.



As a result, Bananas are our main export product. That's how easy pivot tables can be!

Sort

To get Banana at the top of the list, sort the pivot table.

1. Click any cell inside the Sum of Amount column.
2. Right click and click on Sort, Sort Largest to Smallest.

Filter

Because we added the Country field to the Filters area, we can filter this pivot table by Country. For example, which products do we export the most to France?

1. Click the filter drop-down and select France.

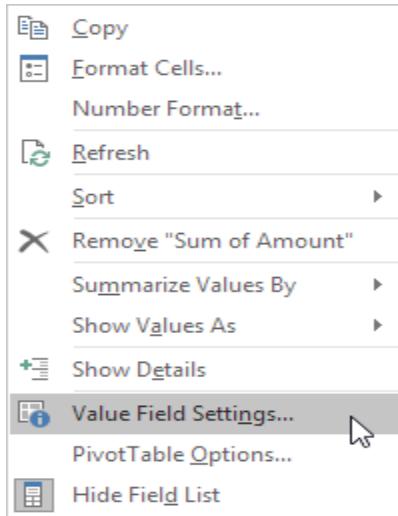
Result. Apples are our main export product to France.

Note: you can use the standard filter (triangle next to Row Labels) to only show the amounts of specific products.

Change Summary Calculation

By default, Excel summarizes your data by either summing or counting the items. To change the type of calculation that you want to use, execute the following steps.

1. Click any cell inside the Sum of Amount column.
2. Right click and click on Value Field Settings.



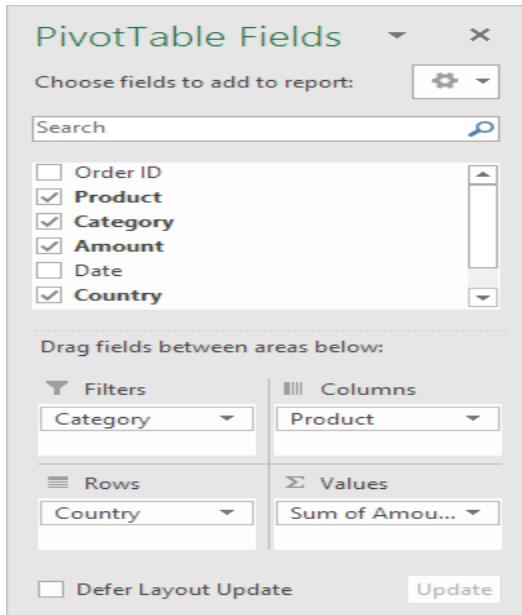
3. Choose the type of calculation you want to use. For example, click Count.
4. Click OK.

Result. 16 out of the 28 orders to France were 'Apple' orders.

Two-dimensional Pivot Table

It's perfectly ok to drag more than one field to an area in a pivot table. If you drag a field to the Rows area and Columns area, you can create a two-dimensional pivot table. First, insert a pivot table. Next, to get the total amount exported to each country, of each product, drag the following fields to the different areas.

1. Country field to the Rows area.
2. Product field to the Columns area.
3. Amount field to the Values area.
4. Category field to the Filters area.



Grouping Data:

Grouping data in a PivotTable can help you show a subset of data to analyze. For example, you may want to group an unwieldy list of dates or times (date and time fields in the PivotTable) into quarters and months.

You can generally **group Items in a Pivot Table in 2 different ways**:

1. Automatically.
2. Manually.

The grouping option that's more suitable for a situation depends on the type of data you're working with.

Group Products

The Product field contains 7 items. Apple, Banana, Beans, Broccoli, Carrots, Mango and Orange.

To create two groups, execute the following steps.

1. In the pivot table, select Apple and Banana.
2. Right click and click on Group.
3. In the pivot table, select Beans, Broccoli, Carrots, Mango and Orange.
4. Right click and click on Group.

The screenshot shows a Microsoft Excel spreadsheet with a PivotTable. The PivotTable has 'Country' in the Row Labels area and 'Sum of Amount' in the Values area. The data includes groups like 'Group1' (Grand Total: 531552) and 'Group2' (Grand Total: 57281). A context menu is open over the 'Group1' group, with the 'Group...' option highlighted. Other options in the menu include Copy, Format Cells..., Refresh, Sort, Filter, Subtotal "Product2", Expand/Collapse, Ungroup..., Move, Remove "Product2", Field Settings..., PivotTable Options..., and Hide Field List.

A	B	C	D	E
1 Country	(All)			
2				
3 Row Labels	Sum of Amount			
4 + Group1	531552			
5 + Beans	57281			
6 + Broccoli				
7 + Carrots				
8 + Mango				
9 + Orange				
10 Grand Total	104439			
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				

Note: to change the name of a group (Group1 or Group2), select the name, and edit the name in the formula bar. To ungroup, select the group, right click and click on Ungroup.

5. To collapse the groups, click the minus signs.

Conclusion: Apple and Banana (Group1) have a higher total than all the other products (Group2) together.

Group Dates

To create the pivot table below, instead of the Product field, add the Date field to the Rows area. The Date field contains many items. 1/6/2016, 1/7/2016, 1/8/2016, 1/10/2016, 1/11/2016, etc.

To group these dates by quarters, execute the following steps.

A	B	C	D	E
1				
2				
3	Row Labels	Sum of Amount		
4	1/6/2016	4270		
5	1/7/2016			
6	1/8/2016			
7	1/10/2016			
8	1/11/2016	12672		
9	1/16/2016			
10	1/18/2016			
11	1/20/2016			
12	1/22/2016			
13	1/24/2016			
14	1/27/2016			
15	1/28/2016			
16	1/30/2016			
17	2/2/2016			
18	2/4/2016			
19	2/11/2016			
20	2/14/2016			
21	2/17/2016			
22	2/18/2016			
23	2/20/2016			
24	2/21/2016			
25	2/22/2016	8802		

1. Click any cell inside the column with dates.
2. Right click and click on Group.
3. Select Quarters and click OK.

Note: also see the options to group by seconds, minutes, hours, etc.

Conclusion: Quarter 2 is the best quarter.

Update Pivot Table

Any changes you make to the data set are not automatically picked up by the pivot table. Refresh the pivot table or change the data source to update the pivot table with the applied changes.

Refresh

If you change any of the text or numbers in your data set, you need to refresh the pivot table.

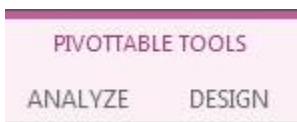
At any time, you can click **Refresh** to update the data for the PivotTables in your workbook. You can refresh the data for PivotTables connected to external data, such as a database (SQL Server, Oracle, Access, or other). You can also refresh data from a source table in the same or a different workbook. And you

can set your workbook to refresh its PivotTable data automatically when you open it.

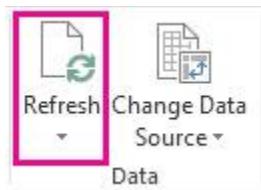
By default, PivotTables are not refreshed automatically, but you can specify that the PivotTable is automatically refreshed when you open the workbook that contains the PivotTable.

Manually refresh

1. Click anywhere in the PivotTable to show the **PivotTable Tools** on the ribbon.



2. Click **Analyze > Refresh**, or press Alt+F5.

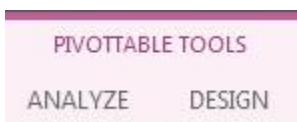


If refreshing takes longer than you expect, click **Analyze > Refresh arrow > Refresh Status** to check the refresh status.

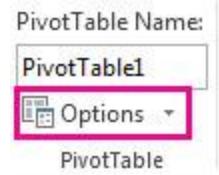
To stop refreshing, click **Cancel Refresh**.

Refresh data automatically when opening the workbook

1. Click anywhere in the PivotTable to show the **PivotTable Tools** on the ribbon.



2. Click **Analyze > Options**.



3. On the **Data** tab, check the **Refresh data when opening the file** box.

Formatting a Pivot Table

Excel 2016 makes formatting a new pivot table you've added to a worksheet as quick and easy as formatting any other table of data or list of data. All you need to do is click a cell of the pivot table to add the PivotTable Tools contextual tab to the Ribbon and then click its Design tab to display its command buttons.

The Design tab is divided into three groups:

- **Layout** group that enables you to add subtotals and grand totals to the pivot table and modify its basic layout
- **PivotTable Style Options** group that enables you to refine the pivot table style you select for the table using the PivotTable Styles gallery to the immediate right
- **PivotTable Styles** group that contains the gallery of styles you can apply to the active pivot table by clicking the desired style thumbnail

To change the layout:

On the **Design** tab, in the **Layout** group, click **Report Layout**, and then do one of the following:

- To keep related data from spreading horizontally off of the screen and to help minimize scrolling, click **Show in Compact Form**.

In compact form, fields are contained in one column and indented to show the nested column relationship.

- To outline the data in the classic PivotTable style, click **Show in Outline Form**.
- To see all data in a traditional table format and to easily copy cells to another worksheet, click **Show in Tabular Form**.

Change the Default PivotTable Style

When you create a pivot table, a default PivotTable Style is automatically applied. You can change the default PivotTable Style in a workbook, so a different style is automatically applied.

Follow these steps to change the default PivotTable Style for a workbook:

1. Select a cell in any pivot table.
2. On the Ribbon, under the PivotTable Tools tab, click the Design tab.
3. In the PivotTable Style gallery, right-click on the style that you want to set as the default.
4. In the context menu, click on Set As Default

Modify a PivotTable Style

You can't change any of the built-in PivotTable styles, but you can create a Custom PivotTable style in your workbook, with the formatting that you need.

1. First, choose one of these ways to get started:
 - copy an existing style, to start with its formatting
 - create a new style, to start from scratch
2. Next, follow the instructions here, to modify the Custom Style.
3. Finally, follow the steps to apply the new custom style to a pivot table.

Slicers:

Slicers in Excel are graphic filters for tables, pivot tables and pivot charts. Due to their visual qualities, slicers fit especially well with dashboards and summary reports, but you can use them anywhere to make filtering data faster and easier.

Slicers provide buttons that you can click to filter table data, or PivotTable data. In addition to quick filtering, slicers also indicate the current filtering state, which makes it easy to understand what exactly is shown in a filtered PivotTable.

Basically, slicers and pivot table filters do the same thing - show some data and hide other. And each method has its strengths and weaknesses:

- Pivot table filters a bit clumsy. With slicers, filtering a pivot table is as simple as clicking a button.
- Filters are tied to one pivot table, slicers can be connected to multiple pivot tables and pivot charts.
- Filters are locked to columns and rows. Slicers are floating objects and can be moved anywhere. For example, you can put a slicer next to your pivot chart or even within the chart area and have the chart contents updated in real time on a button click.

Ex: Consider the above table used for pivot tables.

To insert a slicer, execute the following steps.

1. Click any cell inside the pivot table.
2. On the Analyze tab, in the Filter group, click Insert Slicer.
3. Check Category and click OK.
4. For example, click Fruit to only show the fruit exported to each country.

Note: the report filter (cell B1) changes to Fruit. Hold down CTRL to include fruit and vegetables.

How to insert a slicer for pivot chart

To be able to filter a pivot chart with a slicer, you can actually make a slicer for your pivot table like explained above, and it will control both the pivot table and the pivot chart.

To integrate a slicer with your pivot chart more closely like shown in the screenshot above, carry out these steps:

1. Click anywhere in your pivot chart.
2. On the *Analyze* tab, in the *Filter* group, click **Insert Slicer**.
3. Select the checkboxes for the slicer(s) you want to create, and click *OK*.

This will insert the already familiar slicer box in your worksheet:

Once you have a slicer, you can use it to filter the pivot chart data straight away. Or, you may want to make a few improvements, for example, hide the filter buttons on the chart, which have become redundant since you are going to use the slicer for filtering.

How to select multiple items in a slicer

There are 3 ways to select multiple items in an Excel slicer:

- Click the slicer buttons while holding the **Ctrl** key.
- Click the **Multi-Select** button (please see the screenshot below), and then click on the items one by one.

Pivot charts:

After creating a pivot table in Excel 2016, you can create a pivot chart to display its summary values graphically.

Sometimes it's hard to see the big picture when your raw data hasn't been summarized. Your first instinct may be to create a PivotTable, but not everyone can look at numbers in a table and quickly see what's going on. PivotCharts are a great way to add data visualizations to your data.

Create a PivotChart

1. Select a cell in your table.
2. Select **Insert > PivotChart** .
3. Select **OK**.

Create a chart from a PivotTable

1. Select a cell in your table.
2. Select **PivotTable Tools > Analyze > PivotChart** .
3. Select a chart.
4. Select **OK**.

Filter Pivot Chart

To filter this pivot chart, execute the following steps.

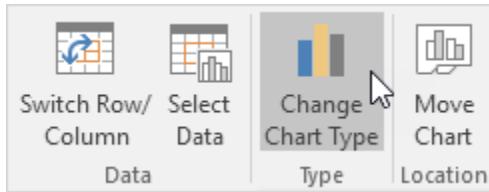
1. Use the standard filters (triangles next to Product and Country). For example, use the Country filter to only show the total amount of each product exported to the United States.

2. Remove the Country filter.
3. Because we added the Category field to the Filters area, we can filter this pivot chart (and pivot table) by Category. For example, use the Category filter to only show the vegetables exported to each country.

Change Pivot Chart Type

You can change to a different type of pivot chart at any time.

1. Select the chart.
2. On the Design tab, in the Type group, click Change Chart Type.



3. Choose Pie.

4. Click OK.

What if analysis:

Excel includes many powerful tools to perform complex mathematical calculations, including **what-if analysis**. This feature can help you **experiment** and **answer questions** with your data, even when the data is incomplete.

By using What-If Analysis tools in Excel, you can use several different sets of values in one or more formulas to explore all the various results.

What-If Analysis is the process of changing the values in cells to see how those changes will affect the outcome of formulas on the worksheet.

Three kinds of What-If Analysis tools come with Excel:

1. Scenarios
2. Goal Seek
3. Data Tables.

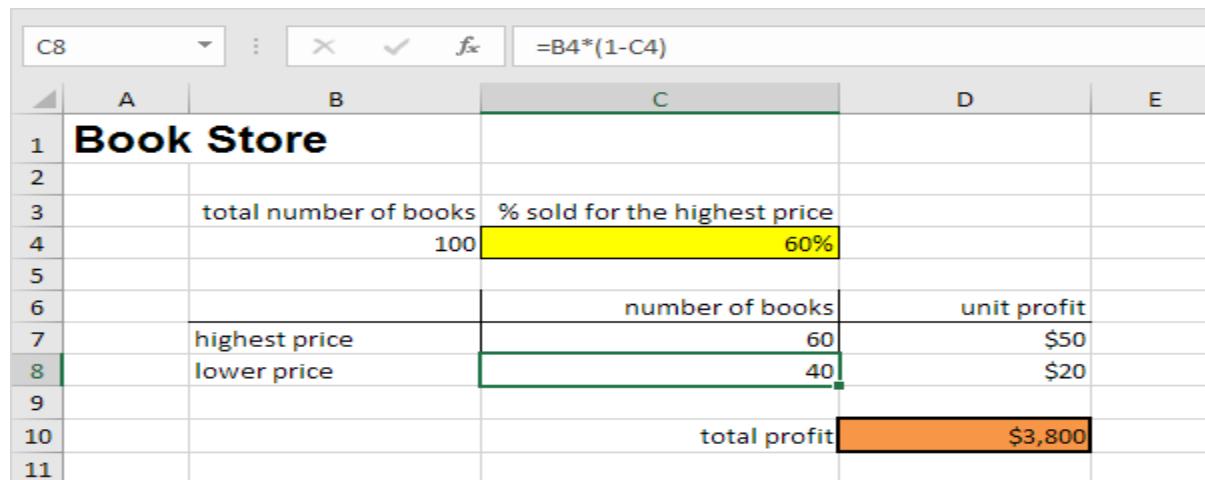
Scenarios and Data tables take sets of input values and determine possible results. A Data Table works with only one or two variables, but it can accept many different values for those variables. A Scenario can have multiple variables, but it can only accommodate up to 32 values. Goal Seek works differently from Scenarios and Data

Tables in that it takes a result and determines possible input values that produce that result.

A **Scenario** is a set of values that Excel saves and can substitute automatically in cells on a worksheet. You can create and save different groups of values on a worksheet and then switch to any of these new scenarios to view different results.

The following example helps you master what-if analysis quickly and easily.

Assume you own a book store and have 100 books in storage. You sell a certain % for the highest price of \$50 and a certain % for the lower price of \$20.



The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E
1	Book Store				
2					
3	total number of books	% sold for the highest price			
4	100	60%			
5					
6		number of books	unit profit		
7	highest price	60	\$50		
8	lower price	40	\$20		
9					
10		total profit	\$3,800		
11					

The formula in cell C8 is =B4*(1-C4). The cell C4 is highlighted in yellow, indicating it is the variable being tested.

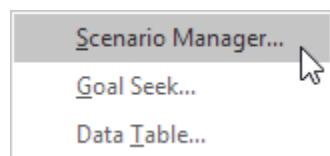
If you sell 60% for the highest price, cell D10 calculates a total profit of $60 * \$50 + 40 * \$20 = \$3800$.

Create Different Scenarios

But what if you sell 70% for the highest price? And what if you sell 80% for the highest price? Or 90%, or even 100%? Each different percentage is a different scenario. You can use the Scenario Manager to create these scenarios.

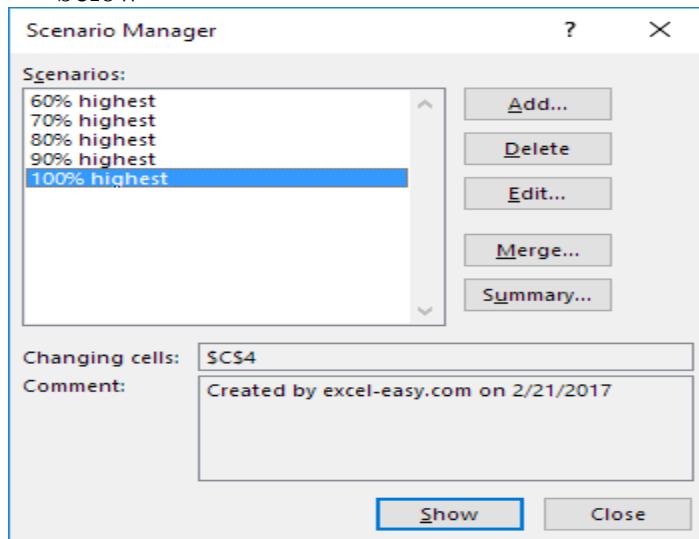
Note: You can simply type in a different percentage into cell C4 to see the corresponding result of a scenario in cell D10. However, what-if analysis enables you to easily compare the results of different scenarios. Read on.

1. On the Data tab, in the Forecast group, click What-If Analysis.
2. Click Scenario Manager.



The Scenario Manager dialog box appears.

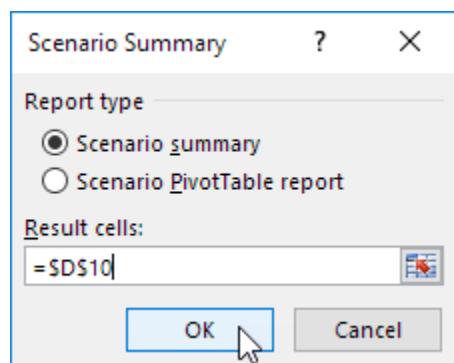
1. Add a scenario by clicking on Add.
2. Type a name (60% highest), select cell C4 (% sold for the highest price) for the Changing cells and click on OK.
3. Enter the corresponding value 0.6 and click on OK again.
4. Next, add 4 other scenarios (70%, 80%, 90% and 100%).
5. Finally, your Scenario Manager should be consistent with the picture below:



Scenario Summary

To easily compare the results of these scenarios, execute the following steps.

1. Click the Summary button in the Scenario Manager.
2. Next, select cell D10 (total profit) for the result cell and click on OK.

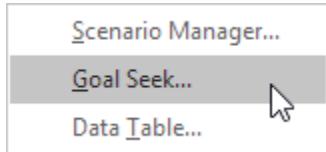


Conclusion: if you sell 70% for the highest price, you obtain a total profit of \$4100, if you sell 80% for the highest price, you obtain a total profit of \$4400, etc. That's how easy what-if analysis in Excel can be.

Goal Seek

What if you want to know how many books you need to sell for the highest price, to obtain a total profit of exactly \$4700? You can use Excel's Goal Seek feature to find the answer.

1. On the Data tab, in the Forecast group, click What-If Analysis.
2. Click Goal Seek.



The Goal Seek dialog box appears.

3. Select cell D10.
4. Click in the 'To value' box and type 4700.
5. Click in the 'By changing cell' box and select cell C4.
6. Click OK.

Result. You need to sell 90% of the books for the highest price to obtain a total profit of exactly \$4700.

Data Tables:

Instead of creating different scenarios, you can create a data table to quickly try out different values for formulas. You can create a one variable data table or a two variable data table.

Assume you own a book store and have 100 books in storage. You sell a certain % for the highest price of \$50 and a certain % for the lower price of \$20. If you sell 60% for the highest price, cell D10 below calculates a total profit of $60 * \$50 + 40 * \$20 = \$3800$.

One Variable Data Table

To create a one variable data table, execute the following steps.

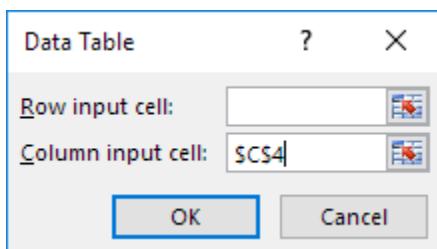
1. Select cell B12 and type =D10 (refer to the total profit cell).
2. Type the different percentages in column A.
3. Select the range A12:B17.

Book Store				
1				
2				
3	total number of books	% sold for the highest price		
4	100	60%		
5				
6		number of books	unit profit	
7	highest price	60	\$50	
8	lower price	40	\$20	
9				
10		total profit	\$3,800	
11				
12		\$3,800		
13	60%			
14	70%			
15	80%			
16	90%			
17	100%			
18				

We are going to calculate the total profit if you sell 60% for the highest price, 70% for the highest price, etc.

4. On the Data tab, in the Forecast group, click What-If Analysis.
5. Click Data Table.
6. Click in the 'Column input cell' box (the percentages are in a column) and select cell C4.

We select cell C4 because the percentages refer to cell C4 (% sold for the highest price). Together with the formula in cell B12, Excel now knows that it should replace cell C4 with 60% to calculate the total profit, replace cell C4 with 70% to calculate the total profit, etc.



Note: this is a one variable data table so we leave the Row input cell blank.

7. Click OK.

Result.

Conclusion: if you sell 60% for the highest price, you obtain a total profit of \$3800, if you sell 70% for the highest price, you obtain a total profit of \$4100, etc.

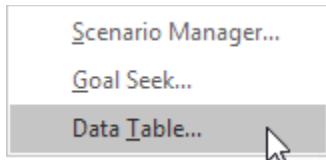
Two Variable Data Table

To create a two variable data table, execute the following steps.

1. Select cell A12 and type =D10 (refer to the total profit cell).
2. Type the different unit profits (highest price) in row 12.
3. Type the different percentages in column A.
4. Select the range A12:D17.

We are going to calculate the total profit for the different combinations of 'unit profit (highest price)' and '% sold for the highest price'.

5. On the Data tab, in the Forecast group, click What-If Analysis.
6. Click Data Table.



7. Click in the 'Row input cell' box (the unit profits are in a row) and select cell D7.
8. Click in the 'Column input cell' box (the percentages are in a column) and select cell C4.

We select cell D7 because the unit profits refer to cell D7. We select cell C4 because the percentages refer to cell C4. Together with the formula in cell A12, Excel now knows that it should replace cell D7 with \$50 and cell C4 with 60% to calculate the total profit, replace cell D7 with \$50 and cell C4 with 70% to calculate the total profit, etc.

9. Click OK.

Conclusion: if you sell 60% for the highest price, at a unit profit of \$50, you obtain a total profit of \$3800, if you sell 80% for the highest price, at a unit profit of \$60, you obtain a total profit of \$5200, etc.

Macros

What is a macro?

A macro is a piece of programming code that runs in Excel environment and helps automate routine tasks. **In a layman's language, a macro is a recording of your routine steps in Excel that you can replay using a single button.**

In other words, it is an action or a set of actions that you can use to **automate tasks**. Macros are recorded in the Visual Basic for Applications programming language. You can always run a macro by clicking the Macros command on the Developer tab on the ribbon.

The importance of macros in Excel

Let's say you work as a cashier for a water utility company. Some of the customers pay through the bank and at the end of the day, you are required to download the data from the bank and format it in a format that meets your business requirements.

Developer Tab

To turn on the Developer tab, execute the following steps.

1. Right click anywhere on the ribbon, and then click Customize the Ribbon.
2. Under Customize the Ribbon, on the right side of the dialog box, select Main tabs (if necessary).
3. Check the Developer check box.
4. Click OK.
5. You can find the Developer tab next to the View tab.

Command Button

To place a command button on your worksheet, execute the following steps.

1. On the Developer tab, click Insert.
2. In the ActiveX Controls group, click Command Button.
3. Drag a command button on your worksheet.

Assign a Macro

To assign a macro (one or more code lines) to the command button, execute the following steps.

1. Right click CommandButton1 (make sure Design Mode is selected).

2. Click View Code.

The Visual Basic Editor appears.

3. Place your cursor between Private Sub CommandButton1_Click() and End Sub.

4. Add the code line shown below.

Note: the window on the left with the names Sheet1, Sheet2 and Sheet3 is called the Project Explorer. If the Project Explorer is not visible, click View, Project Explorer. To add the Code window for the first sheet, click Sheet1 (Sheet1).

5. Close the Visual Basic Editor.

6. Click the command button on the sheet (make sure Design Mode is deselected).

Result:

Congratulations. You've just created a macro in Excel!

Visual Basic Editor

To open the Visual Basic Editor, on the Developer tab, click Visual Basic.

Macro Recorder

The Macro Recorder, a very useful tool included in Excel VBA, records every task you perform with Excel. All you have to do is record a specific task once. Next, you can execute the task over and over with the click of a button. The Macro Recorder is also a great help when you don't know how to program a specific task in Excel VBA. Simply open the Visual Basic Editor after recording the task to see how it can be programmed.

Take a closer look at the macro

You can learn a little about the Visual Basic programming language by editing a macro.

To edit a macro, in the **Code** group on the **Developer** tab, click **Macros**, select the name of the macro, and click **Edit**. This starts the Visual Basic Editor.

See how the actions that you recorded appear as code. Some of the code will probably be clear to you, and some of it may be a little mysterious.

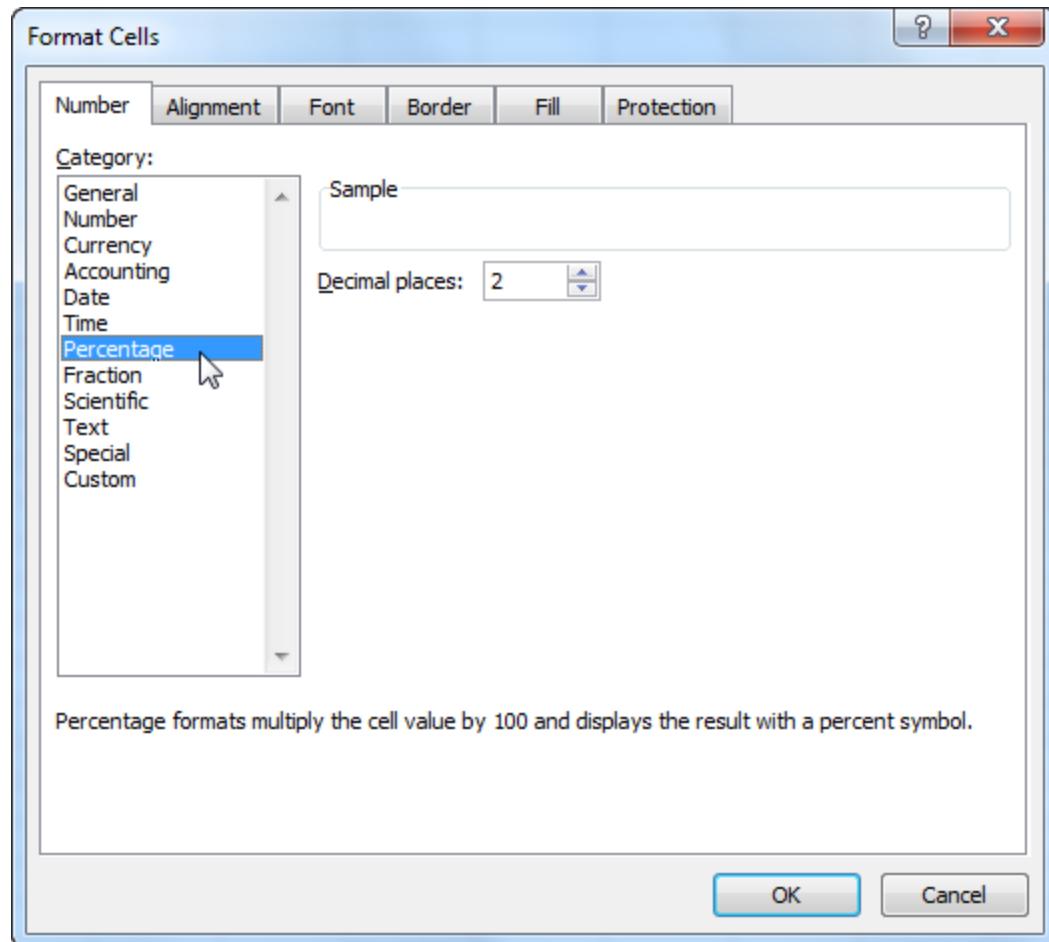
Experiment with the code, close the Visual Basic Editor, and run your macro again. This time, see if anything different happens!

Record a Macro

1. On the Developer tab, click Record Macro.
2. Enter a name.
3. Select This Workbook from the drop-down list. As a result, the macro will only be available in the current workbook.

Note: if you store your macro in Personal Macro Workbook, the macro will be available to all your workbooks (Excel files). This is possible because Excel stores your macro in a hidden workbook that opens automatically when Excel starts. If you store your macro in New Workbook, the macro will only be available in an automatically new opened workbook.

4. Click OK.
5. Right mouse click on the active cell (selected cell). Be sure not to select any other cell! Next, click Format Cells.
6. Select Percentage.



7. Click OK.
8. Finally, click Stop Recording.

Run a Recorded Macro

Now we'll test the macro to see if it can change the number format to Percentage.

1. Enter some numbers between 0 and 1.
2. Select the numbers.

	A	B
1	percentages	
2		0.2
3		0.6
4		0.8
5		0.6
6		1
7		0.4
8		

3. On the Developer tab, click Macros.
4. Click Run.

Absolute or Relative

During macro recording cell references can be made either relative to the start position or with an absolute address.

By default, recorded macros use absolute cell referencing.

This means the exact cell references are recorded into the macros.

You can switch back and forth between these two macro recording settings as many time as you want.

When you record a macro it will be recorded with "absolute recording" by default.

Relative reference macros record an offset from the active cell. Such macros will be useful if you have to repeat the steps at various places in the worksheet.

Use Relative References

By default, Excel records macros in absolute mode. However, sometimes it is useful to record macros in relative mode.

Recording in Absolute Mode

To record a macro in absolute mode, execute the following steps.

1. First, click Record Macro.
2. Next, select cell B3. Type Sales and press enter.

3. Type Production and press enter.

4. Type Logistics and press enter.

Result:

	A	B	C	D	E
1					
2					
3	Sales				
4	Production				
5	Logistics				
6					
7					
8					
9					
10					
11					
12					

5. Click Stop Recording.

6. Empty Range("B3:B5").

7. Select any cell on the sheet and run the recorded macro.

Result:

A macro recorded in absolute mode always produces the same result.

Recording in Relative Mode

Wouldn't it be nice to place these words anywhere on the sheet automatically? Not just Range("B3:B5"). This would make the macro much more flexible. Solution: record the macro in relative mode.

1. Select "Use Relative References".
2. First, select any single cell (for example, cell B8).
3. Next, click Record Macro.
4. Type Sales and press enter.
5. Type Production and press enter.
6. Type Logistics and press enter.

Result:

7. Click Stop Recording.
8. Select any other cell (for example, cell D4) and run the recorded macro.

Result:

Excel places the words relative to the initial selected cell. That's why it's called recording in relative mode.