



EXCEL FOR DATA ANALYTICS

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**Empowering Learners in Computer Science &
Data Analytics**

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INTRODUCTION TO EXCEL

- Microsoft Excel is a powerful spreadsheet software developed by Microsoft, part of the Microsoft Office suite (now also available as part of Microsoft 365).
- It is used for organizing, analyzing, and visualizing data in tabular form.
- Excel allows users to create spreadsheets with multiple worksheets, perform complex calculations, generate charts and graphs, and automate tasks through macros and formulas.

FEATURES OF EXCEL

1. Workbooks and Worksheets:

- Excel organizes data in workbooks, which contain multiple worksheets.
- Each worksheet is made up of rows and columns forming a grid where data is entered.

2. Formulas and Functions:

- Excel supports a wide range of formulas and functions to perform calculations on data

3. Data Analysis Tools:

- Excel provides tools such as PivotTables, Conditional Formatting, and Data Validation to analyze and interpret data effectively.

4. Charts and Graphs:

- Excel can generate various types of charts (e.g., bar, line, pie charts) to visually represent data and trends, making it easier to understand and present.

5. Automation and Macros:

- With VBA (Visual Basic for Applications), Excel allows users to automate repetitive tasks by creating macros—scripts that run a series of commands automatically.

FUNCTIONS IN EXCEL

In Excel, functions are predefined formulas that allow you to perform various calculations and operations easily.

1. MATHEMATICAL FUNCTIONS

SUM: Adds up a range of cells.

Ex: =SUM(A1:A5)

AVERAGE: Calculates the average of a range of cells.

Ex: =AVERAGE(A5:A10)

COUNT: Counts the number of cells containing numbers.

Ex: =COUNT(A10:A14)

MIN: Finds the smallest value in a range.

Ex: = MIN(A15:A18)

MAX: Finds the largest value in a range.

Ex: =MAX(A20:A30)

MOD: Returns the remainder after division.

Ex: =MOD(A14:A19)

ROUND: Rounds a number to a specified number of decimal places.

Ex: =ROUND(A1:A10)

2.TEXT FUNCTIONS

CONCATENATE: Combines multiple text strings into one.

Ex: =CONCATENATE (A1, "; ";, B1)

LEFT: Extracts a specified number of characters from the left of a text string.

Ex:- =LEFT(A1, 5)

RIGHT: Extracts a specified number of characters from the right of a text string.

Ex: - =RIGHT(A1, 3)

UPPER: Converts text to uppercase.

Ex: - =UPPER(A1)

LOWER: Converts text to lowercase.

Ex: - =UPPER(A1)

FIND: locate text within a string.

Ex:FIND("R";"ANJIRAJU")//
returns 5

REPLACE: Replace existing text using a position

Ex:=REPLACE("XYZ123";4,3,"
ABC")// returns "XYZABC";

TRIM: Remove extra spaces from text.

Ex: =TRIM (" ANJIRAJU. ")// returns
"ANJIRAJU.";

LEN: count the number of characters in a string.

Ex: =LEN("ANJIRAJU ")// returns 8

3.LOGICAL FUNCTIONS

IF: Performs a conditional test and returns one value if true and another if false.

Ex: - =IF(A1>10, "Yes", "No")

AND: Returns TRUE if all conditions are true.

Ex: - =AND(A1>5, B1<10)

OR: Returns TRUE if at least one condition is true.

Ex: - =OR(A1>5, B1<10)

NOT: Reverses the logic of its argument (TRUE becomes FALSE, and FALSE becomes TRUE).

Ex: - =NOT(A1>10)

SWITCH: - The Excel SWITCH function compares one value against a list of values and returns a result corresponding to the first match found. When no match is found, SWITCH can return an optional default value.

Ex: - = SWITCH

**(TRUE,A1>=1000,"Gold",A1>=500,
"Silver","Bronze")**

4. DATE & TIME FUNCTIONS

TODAY: Returns the current date. Only date is display.

Ex: - =TODAY()

NOW: Returns the current date and time.

Ex: - NOW()

DATE: Returns the date based on year, month, and day inputs.

Ex: - =DATE(2024, 12, 20)

YEAR: Extracts the year from a date.

Ex: - = YEAR ("23-Aug-2012") // returns 2012

MONTH: Extracts the month from a date.

Ex: - = MONTH ("23-Aug-2012") // returns 8

DAY: Extracts the day from a date.

Ex: - = DAY (2022-11-25) // returns 11

DATEDIF: - Get days, months, or years between two dates

Ex: - =DATEDIF("1-Jan2022","1-Mar 2024","y") // returns 2 Years

=DATEDIF("1-Jan-2022","1-Mar 2024","m") // returns 26 Months

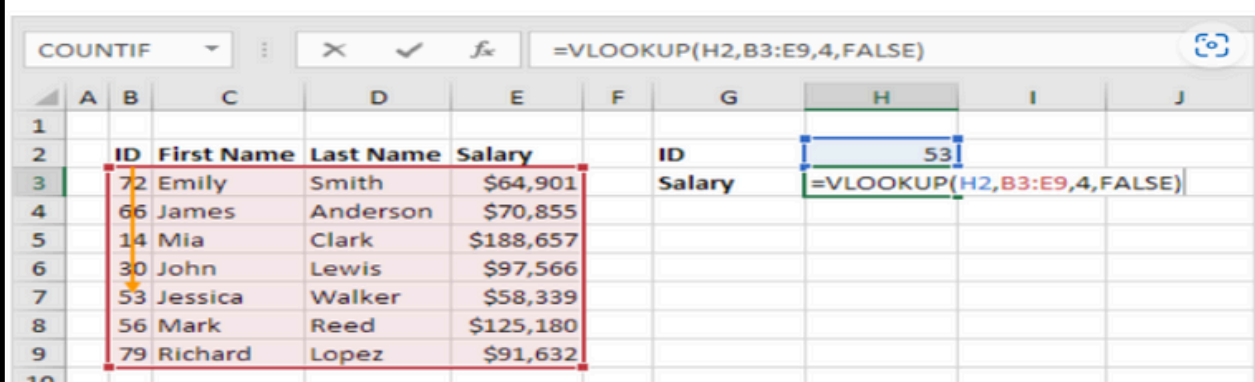
=DATEDIF("1-Jan-2022","1-Mar 2024","d") // returns 790 Days

5. LOOKUP & REFERENCE FUNCTIONS

VLOOKUP:- Searches for a value in the first column of a table and returns a value from another column in the same row.

EX:

1. The VLOOKUP function below looks up the value 53 (first argument) in the leftmost column of the red table (second argument).



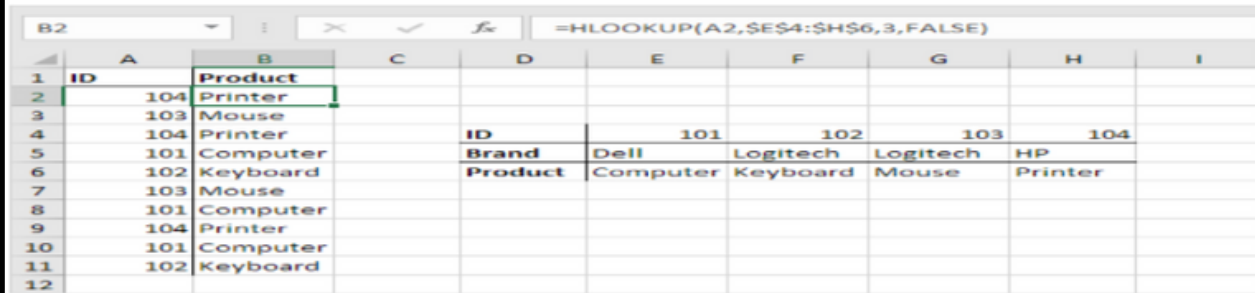
The screenshot shows an Excel spreadsheet with a formula bar containing `=VLOOKUP(H2,B3:E9,4,FALSE)`. The spreadsheet has columns A through J and rows 1 through 10. A red-shaded table is located in columns B through E, rows 3 through 9. The table has the following data:

ID	First Name	Last Name	Salary
72	Emily	Smith	\$64,901
66	James	Anderson	\$70,855
14	Mia	Clark	\$188,657
30	John	Lewis	\$97,566
53	Jessica	Walker	\$58,339
56	Mark	Reed	\$125,180
79	Richard	Lopez	\$91,632

In column H, row 2, the value 53 is entered. In column H, row 3, the formula `=VLOOKUP(H2,B3:E9,4,FALSE)` is entered, which returns the salary for the employee with ID 53, which is \$58,339.

HLOOKUP: - Like VLOOKUP but searches horizontally in the first row.

In a similar way, you can use the HLOOKUP (Horizontal lookup) function.



The screenshot shows an Excel spreadsheet with a formula bar containing `=HLOOKUP(A2,E4:H6,3,FALSE)`. The spreadsheet has columns A through I and rows 1 through 12. A table is located in columns E through H, rows 4 through 6. The table has the following data:

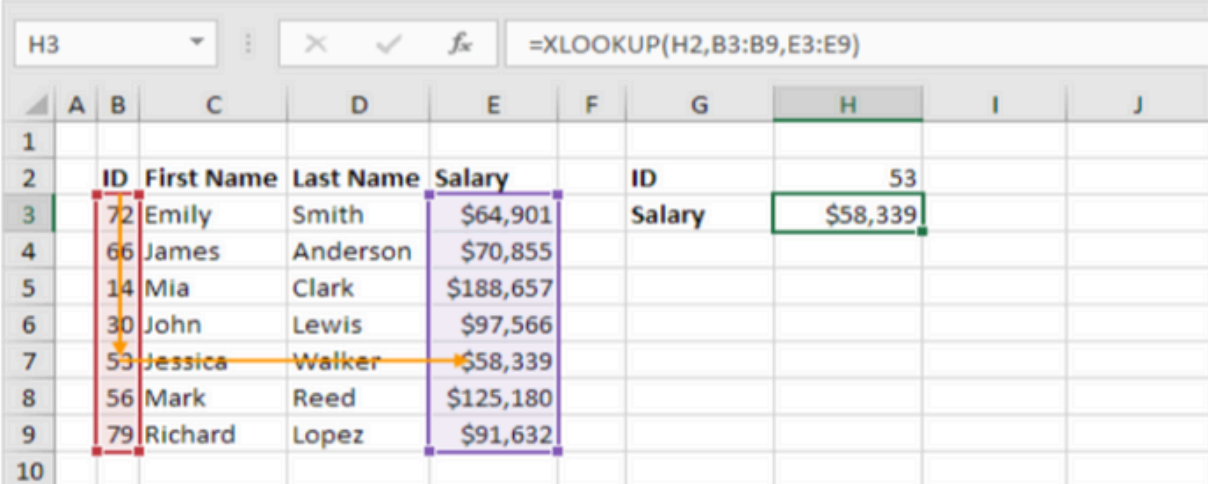
ID	101	102	103	104
Brand	Dell	Logitech	Logitech	HP
Product	Computer	Keyboard	Mouse	Printer

In column A, row 2, the value 104 is entered. In column B, row 2, the value 104 is entered. In column E, row 4, the value 101 is entered. In column F, row 4, the value 102 is entered. In column G, row 4, the value 103 is entered. In column H, row 4, the value 104 is entered. In column E, row 5, the value 101 is entered. In column F, row 5, the value 102 is entered. In column G, row 5, the value 103 is entered. In column H, row 5, the value 104 is entered. In column E, row 6, the value 101 is entered. In column F, row 6, the value 102 is entered. In column G, row 6, the value 103 is entered. In column H, row 6, the value 104 is entered. In column E, row 7, the value 101 is entered. In column F, row 7, the value 102 is entered. In column G, row 7, the value 103 is entered. In column H, row 7, the value 104 is entered. In column E, row 8, the value 101 is entered. In column F, row 8, the value 102 is entered. In column G, row 8, the value 103 is entered. In column H, row 8, the value 104 is entered. In column E, row 9, the value 101 is entered. In column F, row 9, the value 102 is entered. In column G, row 9, the value 103 is entered. In column H, row 9, the value 104 is entered. In column E, row 10, the value 101 is entered. In column F, row 10, the value 102 is entered. In column G, row 10, the value 103 is entered. In column H, row 10, the value 104 is entered. In column E, row 11, the value 101 is entered. In column F, row 11, the value 102 is entered. In column G, row 11, the value 103 is entered. In column H, row 11, the value 104 is entered. In column E, row 12, the value 101 is entered. In column F, row 12, the value 102 is entered. In column G, row 12, the value 103 is entered. In column H, row 12, the value 104 is entered.

Note: if you have Excel 365 or Excel 2021, you can also use XLOOKUP to perform a horizontal lookup.

XLOOKUP: – XLOOKUP is a modern replacement for the VLOOKUP function. It is a flexible and versatile function that can be used in a wide variety of situations. XLOOKUP can find values in vertical or horizontal ranges, can perform approximate and exact matches, and supports wildcards (* ?) for partial matches.

2. Next, it simply returns the value in the same row from the range E3:E9 (third argument).



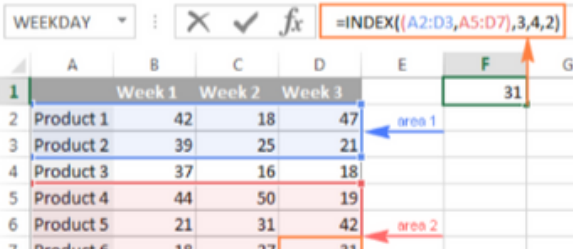
The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J
1										
2		ID	First Name	Last Name	Salary		ID	53		
3		72	Emily	Smith	\$64,901		Salary	\$58,339		
4		66	James	Anderson	\$70,855					
5		14	Mia	Clark	\$188,657					
6		30	John	Lewis	\$97,566					
7		53	Jessica	Walker	\$58,339					
8		56	Mark	Reed	\$125,180					
9		79	Richard	Lopez	\$91,632					
10										

The formula bar shows: `=XLOOKUP(H2,B3:B9,E3:E9)`

INDEX: Returns the value of a cell in a specific row and column of a range.

For example, the formula `=INDEX(A2:D3, A5:D7, 3, 4, 2)` returns the value of cell D7, which is at the intersection of the 3rd row and 4th column in the second area (A5:D7).



The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G
1		Week 1	Week 2	Week 3			
2	Product 1	42	18	47			
3	Product 2	39	25	21			
4	Product 3	37	16	18			
5	Product 4	44	50	19			
6	Product 5	21	31	42			
7	Product 6	18	27	31			

The formula bar shows: `=INDEX(A2:D3,A5:D7,3,4,2)`

Area 1 is highlighted in blue (A2:D3) and Area 2 is highlighted in red (A5:D7).

MATCH: Searches for a value in a range and returns its relative position.

The MATCH function returns the position of a value in a given range.

B2									
	A	B	C	D	E	F	G	H	I
1									
2	Yellow	3							
3									
4					Green				
5					Blue				
6					Yellow				
7					White				
8									

Explanation: Yellow found at position 3 in the range E4:E7. The third argument is optional. Set this argument to 0 to return the position of the value that is exactly equal to lookup_value (A2) or a #N/A error if not found. Use **INDEX** and **MATCH** in Excel and impress your boss.

6. STATISTICAL FUNCTIONS

MEDIAN: Returns the median of a range of numbers.

To find the median (or middle number), use the MEDIAN function.

A3																	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8		
2																	
3	6																
4																	

STDEV: Estimates the standard deviation based on a sample.

To calculate the standard deviation, use the STDEV function.

A3																	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8		
2																	
3	2.82																
4																	

Note: standard deviation is a number that tells you how far numbers are from their mean. Learn more about this topic on our page about [standard deviation](#).

MODE:

To find the most frequently occurring number, use the MODE function.

A3																	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8		
2																	
3	8																
4																	

Note: visit our page about the [MODE function](#) to learn more about this Excel function.

8. INFORMATION FUNCTIONS

ISBLANK: Checks whether a cell is empty.

Copy the formulas down to a few more cells and you will get this result:

	A	B	C	D
1	Value	Is blank?	Is not blank?	
2	100	FALSE	TRUE	
3	1-May-20	FALSE	TRUE	
4		TRUE	FALSE	
5	Orange	FALSE	TRUE	
6	#NAME?	FALSE	TRUE	
7		TRUE	FALSE	

ISNUMBER: Checks whether a value is a number.

If a cell contains a formula, ISNUMBER checks the result of the formula:

```
=ISNUMBER(2+2) // returns TRUE
=ISNUMBER(2^3) // returns TRUE
=ISNUMBER(10 &" apples") // returns FALSE
```

ISERROR: Checks for errors in a formula.

2. The ISERROR function in Excel checks whether a value is an error and returns TRUE or FALSE.

C2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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DATA MANIPULATION IN EXCEL

- Data manipulation in Excel involves various techniques to organize, analyze, and transform data to make it more usable and insightful.
- It can include sorting, filtering, formatting, combining data, and using formulas to transform and summarize data.

1. SORTING DATA

Ascending or Descending Order: Sorting data helps organize it in a meaningful order, either alphabetically or numerically.

How to Sort:

- Select the range of data.
- Go to the Data tab.
- Use the Sort A to Z (ascending) or Sort Z to A (descending) buttons.

Custom Sorting: If you want a custom order (e.g., days of the week), you can set custom sorting.

2. FILTERING DATA

AutoFilter: Filters data to display only the rows that meet certain criteria.

How to Filter:

- Select your data range (including headers).
- Go to the Data tab and click on Filter.
- Use the dropdowns in each column header to set your filter conditions.

You can filter by:

- Text (e.g., contains, starts with)
- Numbers (e.g., greater than, less than)
- Dates (e.g., before, after a specific date)

Advanced Filter: More complex filtering, where you can use multiple criteria and even extract data to another location.

How to Use:

- Go to Data > Advanced (in the Sort & Filter group) and configure the filter criteria.

3. USING CONDITIONAL FORMATTING

Highlighting Data: You can automatically apply different formatting to data based on certain conditions.

How to Apply:

- Select your data range.
- Go to Home tab > Conditional Formatting.
- Choose from options like Highlight Cell Rules, Data Bars, Colour Scales, etc.

Example: Highlight cells that are greater than a certain value or have duplicate values.

4. DATA VALIDATION

Setting Data Validation: Ensure that only valid data is entered into cells (e.g., only numbers, dates, or specific choices).

How to Set:

- Select the range.
- Go to Data tab > Data Validation.
- Define the type of data allowed (e.g., whole numbers, dates, or a custom rule).

Drop-Down Lists: Allow users to select from predefined values.

Example: Go to Data Validation, select List, and provide a range or manually input the options.

5. PIVOT TABLES FOR DATA SUMMARY

Create Pivot Tables: Pivot Tables are a powerful way to summarize and manipulate large sets of data. You can group, filter, and aggregate data dynamically.

How to Create a Pivot Table:

- Select your data range.
- Go to Insert tab > PivotTable.
- Drag and drop fields into rows, columns, values, and filters to organize and summarize your data.

Example: Summarize sales by region and product.

6. TEXT-TO-COLUMNS

Split Data: Split data in a column into multiple columns, such as splitting a full name into first and last names.

How to Set:

- Select the column.
- Go to Data tab > Text to Columns.
- Choose either Delimited (if there is a specific separator like commas or spaces) or Fixed width (split based on specific positions).

7. REMOVING DUPLICATES

Remove Duplicates: Clean up your data by removing duplicate entries.

How to Remove:

- Select your data range.
- Go to Data tab > Remove Duplicates.
- Choose which columns to check for duplicates.

8. CONSOLIDATING DATA

Consolidate Data from Multiple Sheets: Combine data from multiple ranges or sheets into one summary table.

How to Consolidate:

- Go to Data tab > Consolidate.
- Choose the function (e.g., sum, average) and the ranges to consolidate.

Using Formulas: You can also consolidate data manually using formulas like SUMIF, VLOOKUP, INDEX, etc.

9. GROUPING AND UNGROUPING DATA

Group Data: You can group rows or columns to collapse or expand data for better organization.

How to Group:

- Select the rows or columns.
- Go to Data tab > Group.

Ungroup Data: To expand the grouped data, select the grouped rows/columns, and click Ungroup.

10. CONVERTING DATA TYPES

Convert Text to Numbers: Sometimes numbers stored as text need to be converted to actual numbers for calculations.

DATA VISUALIZATION

Data visualization in Excel allows you to present data in a graphical format, making it easier to understand patterns, trends, and insights. Excel offers a wide range of visualization tools, from simple charts to complex dashboards.

1. CHARTS IN EXCEL

Excel provides a variety of chart types to help visualize your data. To create a chart, follow these general steps:

- Select your data (including headers).
- Go to the Insert tab on the ribbon.
- Choose a chart type from the Charts section.

Common Chart Types in Excel:

- **Column Chart:** Useful for comparing data across categories (e.g., sales by month).

Example: A bar chart showing sales in different regions.

How to Create: Insert > Bar or Column Chart > Clustered Column.

- **Line Chart:** Ideal for displaying trends over time, such as sales growth or stock prices.

Example: A line chart showing revenue over several months.

How to Create: Insert > Line Chart.

- **Pie Chart:** Best for showing proportions or percentages of a whole, like market share.

Example: A pie chart showing the distribution of sales across different product categories.

How to Create: Insert > Pie Chart.

- **Scatter Plot:** Displays relationships between two variables. Often used for scientific or statistical data.

Example: A scatter plot showing the relationship between advertising spending and sales.

How to Create: Insert > Scatter (X, Y) Chart.

- **Area Chart:** Used to show the magnitude of change over time and visualize cumulative totals.

Example: Showing the cumulative sales growth of a company over time.

How to Create: Insert > Area Chart.

- **Doughnut Chart:** Similar to a pie chart but with a hole in the center, often used for showing parts of a whole with additional data.

How to Create: Insert > Doughnut Chart.

- **Radar Chart:** Useful for displaying multivariate data with three or more variables, often used for comparing performance across multiple categories.

How to Create: Insert > Radar Chart

2. FORMATTING CHARTS

Once you've created a chart, you can customize it to make it more informative and visually appealing:

- **Chart Title:** Click on the chart title to edit it, providing a clear description of what the chart represents.
- **Legend:** Display a legend to help identify different data series in the chart.
- **Axis Titles:** Add axis titles to clarify what each axis represents (e.g., Time, Revenue, etc.).
- **Data Labels:** Display actual values on the chart to make the data easier to interpret.

Right-click the data series > Add Data Labels.

- **Change Colors:** Use different colors to distinguish between categories or data series.

Right-click on a series > Format Data Series > Fill.

3. CONDITIONAL FORMATTING FOR VISUALIZATION

- **Heat Maps:** Use conditional formatting to create heat maps, where cells change colour based on their values.

How to Apply:

- Select your data range.
- Go to Home tab > Conditional Formatting > Colour Scales (choose a colour gradient)

- **Data Bars:** Represent values as horizontal bars within cells.

How to Apply:

Select your range > Conditional Formatting > Data Bars.

- **Icon Sets:** Display icons based on the value of the cell (e.g., traffic light icons for performance).

How to Apply:

Select your range > Conditional Formatting > Icon Sets..

4. SPARKLINES

Sparklines are mini charts that fit within a single cell to give a quick visual representation of data trends.

How to Create:

- Select a cell where you want to add a sparklin.
- Go to Insert > Sparklines (Line, Column, or Win/Loss).
- Define the data range for the sparkline.

5. PIVOT CHARTS

Pivot charts are linked to pivot tables and can dynamically update as you change the pivot table data. This is helpful for interactive data analysis.

How to Create:

- First, create a Pivot Table.
- Then, go to the PivotTable Analyze or Analyze tab and select PivotChart.
- Choose the chart type and format it as needed.

6. COMBO CHARTS

Combo charts allow you to combine two or more chart types into one (e.g., a column and line chart). This is useful when comparing different data sets with varying scales.

How to Create:

- Select your data.
- Go to Insert > Combo Chart > Custom Combination
- Choose the chart types for each data series.

7. 3D CHARTS

3D charts can add depth to your data visualization, but they should be used sparingly as they can distort the data.

How to Create:

- Choose a chart type, such as 3D Column or 3D Surface, from the Insert tab > 3D Chart..

8. USING THE DATA MODEL AND POWER PIVOT

For large datasets, Excel's Power Pivot and Data Model features allow you to create more advanced and interactive visualizations.

How to Use:

- Use Power Pivot to create a data model that combines data from multiple sources.
- Then, use Pivot Tables and Pivot Charts to visualize the data.

9. DASHBOARDS

Dashboards are comprehensive views of your data, often combining multiple charts, pivot tables, and KPIs (Key Performance Indicators) in one place.

How to Create a Dashboard:

- Organize your data and create various charts and tables on a single worksheet.
- Use Slicers and Timelines to add interactivity and allow users to filter the data.
- Slicers: Go to Insert > Slicer (for PivotTables or tables) to filter data in your charts.
- Timelines: Go to Insert > Timeline (for time-based data) to filter data by date.

PIVOT TABLES IN EXCEL

A Pivot Table in Excel is a powerful tool that allows you to summarize, analyze, and present large amounts of data in a more readable and meaningful format. It helps to group data, calculate totals, averages, and much more, without the need for complex formulas.

1. HOW TO CREATE A PIVOT TABLE

To create a Pivot Table in Excel, follow these steps:

Step-by-Step Guide to Creating a Pivot Table

1. Select Your Data:

- Ensure your data is organized in columns with headers. Each column should represent a field, and the first row should contain descriptive headers
- (e.g., "Date," "Sales," "Product," "Region").

2. Insert a Pivot Table:

- Go to the Insert tab in the Ribbon.
- Click on PivotTable in the Tables group.
- In the dialog box, Excel will automatically select the data range (you can adjust it if necessary).
- Choose where you want the Pivot Table to be placed (either in a New Worksheet or an Existing Worksheet).

3. Set Up the Pivot Table:

- Once the Pivot Table is created, a PivotTable Field List will appear on the right side of the Excel window.

- You will see a list of fields (columns) from your original data. Drag and drop these fields into the following areas:

Rows: Used to group data (e.g., "Region," "Product").

Columns: Used to display data across the top of the table (e.g., "Month," "Year").

Values: Used for calculations, such as sum, count, average, etc. (e.g., "Sales").

Filters: Used to filter the data based on specific criteria (e.g., "Date," "Salesperson").

Example:

If you want to summarize sales by product and region, you would:

- Drag Product to the Rows area.
- Drag Region to the Columns area.
- Drag Sales to the Values area (it will default to Sum).

2. HOW TO USE A PIVOT TABLE

Once the Pivot Table is created, you can interact with it to analyze your data more effectively. Here are some key features and actions you can take to use your Pivot Table:

1. Grouping Data

You can group data by date, number ranges, or text.

- **Group by Date:** Right-click on a date field in the Pivot Table, then select Group. You can group by months, years, days, or quarters.
- **Group by Number:** Right-click on a number field, choose Group, and specify a range (e.g., group sales amounts into ranges).
- **Group by Text:** You can group categories of text, like regions or products, into meaningful groups.

2. Sorting Data

Right-click on a row or column label in the Pivot Table and choose Sort to sort the data in ascending or descending order.

3. Filtering Data

You can apply filters to focus on specific subsets of data. There are two ways to filter:

- **Using the Filter Area:** Drag a field into the Filters area. For example, you can drag Date or Product Category into the Filters area to filter your Pivot Table by specific dates or categories.
- **Using the Drop-down Menu:** Click the drop-down arrow next to row or column labels to filter the data.

4. Refreshing Pivot Table Data

If the data in your original table changes, the Pivot Table needs to be updated to reflect those changes. To do this:

- Right-click on the Pivot Table and select Refresh.
- Alternatively, click on the PivotTable Analyze tab, and click Refresh.

5. Formatting Pivot Table Data

- You can format numbers or dates within a Pivot Table. Right-click on the field you want to format, choose Value Field Settings, and select the desired format.
- You can also apply Conditional Formatting to highlight values that meet specific criteria (e.g., sales greater than \$10,000).

3. DATA VALIDATION (SETTING RULES FOR DATA INPUT)

Data Validation in Excel allows you to control the type of data entered into a cell, ensuring data integrity and consistency. This is especially useful when you want to restrict the kind of information users can enter (e.g., only allowing numbers, dates, or specific choices).

Types of Data Validation:

- Whole numbers or decimal numbers.
- Dates (e.g., allowing only dates within a certain range).
- Text length (limiting the number of characters in a cell).
- List (allowing only pre-defined choices from a dropdown).

How to Set Up Data Validation:

1. Select the cell or range of cells where you want to apply the validation.
2. Go to the Data tab, and in the Data Tools group, click Data Validation.
3. In the Data Validation dialog box, choose the type of validation you want:
 - Under the Settings tab, select the validation criteria.
 - For whole numbers, choose "Whole Number" and set the conditions (e.g., between 1 and 100).
 - For list values, choose "List" and enter the allowed values (e.g., "Yes, No, Maybe").

4. Optionally, you can also add an Input Message that shows when the cell is selected (e.g., "Enter a number between 1 and 100").

5. Under the Error Alert tab, you can set a custom error message that will appear if the user tries to enter invalid data.

Example:

1. List Validation: To create a drop-down list for entering status options (e.g., "Pending," "Completed," "In Progress"):

- Go to Data Validation > Settings.
- Select List in the Allow box.
- In the Source field, type the items separated by commas: Pending, Completed, In Progress.
- Now, only those three options will be available in the cell dropdown.

2. Number Range Validation: To restrict data entry to whole numbers between 1 and 100:

- Go to Data Validation > Settings.
- Select Whole Number in the Allow box.
- Set the range to Between 1 and 100.

EXCEL MACROS

A macro is a series of commands or actions that you can record and save in Excel. Instead of performing these tasks manually each time, you can run the macro to perform them automatically. Macros can range from simple tasks like formatting a worksheet to more complex automation, such as running calculations or generating reports.

Before you can **create or run macros**, you need to enable them:

1. Go to the "File" tab and click on Options.
2. In the Excel Options dialog box, click on Trust Centre and then Trust Centre Settings.
3. Under Macro Settings, select Enable all macros and ensure Trust access to the VBA project object model is checked. This will allow you to create and run macros.

Note: Enabling macros can expose your system to potential security risks, so it is important to only enable macros from trusted sources.

Recording a Basic Macro

One of the easiest ways to create a macro is to record it. When you record a macro, Excel tracks your actions and generates the corresponding VBA code. Here's how to record a simple macro:

Steps to Record a Macro:

1. Start Recording:

- Go to the View tab on the Ribbon.
- In the Macros group, click on Record Macro

Running a Recorded Macro

To run the macro you just recorded, follow these steps:

1. Go to the View tab.
2. In the Macros group, click Macros, then select View Macros.
3. In the Macro Name list, select the macro you want to run.
4. Click Run.

Saving a Workbook with Macros

Excel workbooks containing macros must be saved as a macro-enabled workbook. Here's how:

1. Go to File > Save As.
2. Choose the location where you want to save the file.
3. Under Save as type, select Excel Macro-Enabled Workbook (.xlsm).
4. Click Save

Security Considerations

- Macro Security: Macros can potentially contain harmful code, so always be cautious when opening workbooks with macros from unknown sources. Excel has several security levels to protect you from unsafe macros.

You can adjust your security settings for macros under File > Options > Trust Center > Trust Center Settings > Macro Settings.

SHORTCUTS AND TIPS IN EXCEL

Excel offers a range of keyboard shortcuts and tips that can greatly improve your productivity and efficiency when working with spreadsheets. Whether you're navigating through large datasets, formatting cells, or performing calculations, mastering these shortcuts can save you time and effort. Here's a comprehensive list of essential Excel shortcuts and tips to boost your workflow:

1. Excel Navigation Shortcuts

Move between cells:

- **Arrow keys:** Move one cell in the direction of the arrow.
- **Ctrl + Arrow key:** Jump to the edge of the data region in the direction of the arrow.
- **Home:** Jump to the beginning of the current row.
- **Ctrl + Home:** Jump to the top-left corner (A1) of the worksheet.
- **Ctrl + End:** Jump to the last used cell in the worksheet.

Switch between sheets:

- **Ctrl + Page Up:** Move to the previous worksheet.
- **Ctrl + Page Down:** Move to the next worksheet.

Jump to a specific cell:

- **Ctrl + G or F5:** Open the "Go To" dialog box to jump to a specific cell (e.g., A10, D25).

2. Excel Selection Shortcuts

Select entire row or column:

- **Shift + Spacebar:** Select the entire row of the active cell.
- **Ctrl + Spacebar:** Select the entire column of the active cell.

Select the entire worksheet:

- **Ctrl + A:** Select the entire worksheet (pressing twice selects all data, not just the empty rows or columns).

Extend selection:

- **Shift + Arrow keys:** Extend selection by one cell in the direction of the arrow.
- **Ctrl + Shift + Arrow keys:** Extend selection to the edge of the data region in the direction of the arrow.

3. Excel Data Entry Shortcuts

Fill data:

- **Ctrl + D:** Fill the selected cell with the contents of the cell above (down).
- **Ctrl + R:** Fill the selected cell with the contents of the cell to the left (right).

AutoFill:

- **Drag the fill handle:** Use the small square at the bottom-right corner of a cell to drag and auto-fill values, dates, or patterns (e.g., days of the week, numbers).
- **Ctrl + Shift + Arrow key:** Select the whole range for AutoFill, then press Ctrl + D or Ctrl + R.

Insert current date and time:

- **Ctrl + ;**: Insert the current date in the active cell.
- **Ctrl + Shift + ;**: Insert the current time in the active cell.

Fill in the formula bar:

- **Alt + E, S, V** (after copying): Paste values only (useful when you need to copy and paste without formatting).

4. Formatting Shortcuts

Bold, Italics, and Underline:

- **Ctrl + B**: Apply or remove bold formatting.
- **Ctrl + I**: Apply or remove italics.
- **Ctrl + U**: Apply or remove underline.

Open Format Cells Dialog:

- **Ctrl + 1**: Open the Format Cells dialog box where you can change number formatting, fonts, alignment, borders, and more.

Format as currency:

- **Ctrl + Shift + \$**: Apply currency formatting to the selected cells.

Format as percentage:

- **Ctrl + Shift + %**: Apply percentage formatting to the selected cells.

Format as number with two decimals:

- **Ctrl + Shift + !**: Apply number formatting with two decimal places.

Apply borders:

- **Ctrl + Alt + 0**: Add borders to selected cells.

5. Working with Formulas

Enter a formula:

- **=**: Start a formula in a cell (you must press = first to enter a formula).
- **Alt + =**: AutoSum (automatically inserts the SUM formula for the selected range).

Show formulas in the worksheet:

- **Ctrl + ` (backtick)**: Toggle between displaying formula results and the formulas themselves in the worksheet.

Absolute and relative references:

- **F4**: Toggle through absolute (e.g., \$A\$1), relative (e.g., A1), and mixed references (e.g., \$A1 or A\$1) in formulas.

6. Excel Editing Shortcuts

Undo and Redo:

- **Ctrl + Z**: Undo the last action.
- **Ctrl + Y**: Redo the last action.

Cut, Copy, Paste:

- **Ctrl + X**: Cut selected data.
- **Ctrl + C**: Copy selected data.
- **Ctrl + V**: Paste copied or cut data.

Clear contents:

- **Delete**: Clear the contents of the selected cell(s).
- **Alt + E, A, A**: Clear all formatting (no data).

7. Excel File and Workbook Shortcuts

Create a new workbook:

- **Ctrl + N**: Create a new Excel workbook.

Open an existing workbook:

- **Ctrl + O**: Open an existing workbook.

Save the workbook:

- **Ctrl + S:** Save the current workbook.

Print the workbook:

- **Ctrl + P:** Open the Print dialog.

Close the workbook:

- **Ctrl + W:** Close the current workbook.

8. Excel Miscellaneous Tips

Freeze Panes:

- **Use View > Freeze Panes** to lock headers or columns in place, allowing you to scroll without losing sight of key information.

Split the window:

- **Alt + W, S:** Split the Excel window into multiple panes for viewing different parts of the worksheet at once.

AutoFilter:

- **Ctrl + Shift + L:** Apply or remove AutoFilters from the selected data range. This is useful for quickly sorting or filtering data.

Hide/Unhide Rows or Columns:

- **Ctrl + 9:** Hide the selected rows.
- **Ctrl + Shift + 9:** Unhide hidden rows.
- **Ctrl + 0:** Hide the selected columns.
- **Ctrl + Shift + 0:** Unhide hidden columns.

Zoom In/Out:

- **Ctrl + Scroll Wheel:** Zoom in or out in the worksheet using the mouse scroll wheel while holding the Ctrl key.

Insert a hyperlink:

- **Ctrl + K:** Insert a hyperlink in the selected cell.

Convert text to columns:

- **Alt + A, E:** Open the "Text to Columns" wizard to split data in a single column into multiple columns (e.g., split first and last names).

9. Advanced Excel Tips

- **Quick Access Toolbar:** Customize the Quick Access Toolbar for fast access to your most frequently used tools (e.g., Save, Undo, Redo).
- **Use Named Ranges:** Assign a name to a range of cells to make formulas easier to understand. Use the Name Box next to the formula bar to define a name for the selected range.
- **Power Query:** Use Power Query (available in Excel 2016 and later) for advanced data cleaning and transformation tasks.
- **Flash Fill:** Automatically fill in values based on a pattern you provide. For example, if you have a list of names, type the first name and last name, and Excel will automatically fill in the rest. Press Ctrl + E to trigger Flash Fill.

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