**Navigation:**

* **Move to cell:** Arrow keys
* **Go to beginning/end of data:** Ctrl + ↑/↓, Ctrl + ←/→
* **Go to last cell:** Ctrl + Home
* **Navigate between worksheets:** Ctrl + Page Up/Page Down
* **Jump to a specific cell:** Ctrl + G, type cell reference, Enter
* **Navigate to the edge of data region:** Ctrl + Arrow key (in the direction you want to go)
* **Navigate to the last cell with data in a column or row:** Ctrl + ↓ (down arrow) or Ctrl + → (right arrow)
* **Navigate to the first cell with data in a column or row:** Ctrl + ↑ (up arrow) or Ctrl + ← (left arrow)
* **Toggle between displaying formulas and values:** Ctrl + ` (grave accent, usually located next to the 1 key)

**Selection Techniques:**

* **Select entire column:** Ctrl + Spacebar
* **Select entire row:** Shift + Spacebar
* **Select the entire worksheet:** Ctrl + A
* **Select non-adjacent cells:** Ctrl + Click on each cell
* **Select a range:** Click and drag, or Shift + Arrow keys

**Sheet Tabs:**

* **Switch between sheets:** Ctrl + Page Up/Page Down
* **Move to the next/previous sheet:** Ctrl + Shift + Page Up/Page Down
* **Navigate to the last sheet:** Ctrl + End, then press Page Down
* **Create a new worksheet:** Shift + F11

**View Options:**

* **Zoom In/Out:** Ctrl + Scroll wheel or Ctrl + Alt + +/-
* **Split the worksheet:** View > Split
* **Freeze panes:** View > Freeze Panes
* **New Window:** View > New Window

**Scrolling:**

* **Scroll vertically:** Scroll wheel or use the scroll bar
* **Scroll horizontally:** Shift + Scroll wheel or use the scroll bar while holding down Shift

**Find and Replace:**

* **Find:** Ctrl + F
* **Find and Replace:** Ctrl + H
* **Find next occurrence:** Enter after performing a Find

**Data Entry:**

* **Enter data:** Enter key
* **Edit cell:** F2
* **Autofill:** Drag the fill handle (bottom-right corner of a cell) or use Ctrl + D (fill down) / Ctrl + R (fill right)
* **Flash Fill:** Ctrl + E
* **Insert current date:** Ctrl + ;
* **Insert current time:** Ctrl + Shift + :

**Editing Techniques:**

* **Undo:** Ctrl + Z
* **Redo:** Ctrl + Y
* **Cut:** Ctrl + X
* **Copy:** Ctrl + C
* **Paste:** Ctrl + V
* **Paste Special:** Alt + E, S (values only), Alt + E, N (formats only), Alt + E, A (all)
* **Delete cell contents:** Delete key
* **Clear formatting:** Ctrl + Spacebar, then Ctrl + \_
* **Fill series:** Ctrl + Shift + L (Excel recognizes patterns and fills series accordingly)
* **Transpose data:** Copy data, right-click destination, choose Paste Special > Transpose

**Cell Navigation and Selection:**

* **Move to the edge of data region:** Ctrl + Arrow key (in the direction you want to go)
* **Select entire column:** Ctrl + Spacebar
* **Select entire row:** Shift + Spacebar
* **Select non-adjacent cells:** Ctrl + Click on each cell
* **Select a range:** Click and drag, or Shift + Arrow keys
* **Extend selection:** Shift + Arrow key

**Cell Formatting:**

* **Format Painter:** Ctrl + Shift + C (Copy), Ctrl + Shift + V (Paste)
* **Increase/Decrease Decimal:** Alt + H, 0 (zero) / Alt + H, 9
* **Number format dialog:** Ctrl + Shift + $
* **Merge cells:** Alt + H, M
* **Wrap text:** Alt + H, W

**Text Editing:**

* **Insert line break in cell:** Alt + Enter
* **Change text case:** Ctrl + Shift + U (uppercase), Ctrl + Shift + L (lowercase)

**Advanced Editing:**

* **Find and Replace:** Ctrl + F / Ctrl + H
* **Go to Special:** Ctrl + G, Alt + S (Choose option)
* **Comments:** Ctrl + Alt + M (add or edit a comment in a cell)

**Handling Errors:**

* **Trace Precedents/Dependents:** Formulas > Trace Precedents/Dependents
* **Error checking options:** Formulas > Error Checking

**Data Validation:**

* **Create data validation:** Data > Data Tools > Data Validation
* **Input Message:** Data > Data Tools > Data Validation > Input Message
* **Error Alert:** Data > Data Tools > Data Validation > Error Alert

**Formulas:**

* **Enter formula:** = (equals sign)
* **Edit formula:** F2
* **AutoSum (Sum function):** Alt + =
* **Function Wizard:** Shift + F3
* **Evaluate Formula:** Alt + M, V
* **Toggle Formula Auditing Toolbar:** Alt + M, A, A

**Formula Shortcuts:**

* **Insert Function:** Shift + F3
* **Cycle through formula reference types (absolute, relative, mixed):** F4
* **Complete entry and stay in the current cell:** Ctrl + Enter
* **Insert argument names in a formula:** Shift + Ctrl + A
* **Cycle through open workbooks:** Ctrl + Tab
* **Show/Hide formulas in cells:** Ctrl + ` (grave accent, usually located next to the 1 key)

**Named Ranges:**

* **Define a named range:** Formulas > Define Name
* **Use named ranges in formulas:** Type the name instead of cell reference
* **Go to named range:** Ctrl + F3

**Auditing Formulas:**

* **Trace Precedents/Dependents:** Formulas > Trace Precedents/Dependents
* **Error checking options:** Formulas > Error Checking
* **Evaluate Formula step by step:** Formulas > Evaluate Formula

**Text Functions:**

* **CONCATENATE:** =CONCATENATE(text1, text2, ...)
* **LEFT:** =LEFT(text, num\_chars)
* **RIGHT:** =RIGHT(text, num\_chars)
* **MID:** =MID(text, start\_num, num\_chars)
* **LEN:** =LEN(text)

**Logical Functions:**

* **IF:** =IF(logical\_test, value\_if\_true, value\_if\_false)
* **AND/OR/NOT:** =AND(logical1, logical2, ...), =OR(logical1, logical2, ...), =NOT(logical)

**Lookup and Reference Functions:**

* **VLOOKUP:** =VLOOKUP(lookup\_value, table\_array, col\_index\_num, [range\_lookup])
* **HLOOKUP:** =HLOOKUP(lookup\_value, table\_array, row\_index\_num, [range\_lookup])
* **INDEX-MATCH:** =INDEX(return\_range, MATCH(lookup\_value, lookup\_range, 0))
* **OFFSET:** =OFFSET(reference, rows, cols, [height], [width])

**Math and Statistical Functions:**

* **SUM:** =SUM(number1, number2, ...)
* **AVERAGE:** =AVERAGE(number1, number2, ...)
* **COUNT/COUNTA/COUNTIF:** =COUNT(range), =COUNTA(range), =COUNTIF(range, criteria)
* **MAX/MIN:** =MAX(number1, number2, ...), =MIN(number1, number2, ...)

**Date and Time Functions:**

* **TODAY:** =TODAY()
* **NOW:** =NOW()
* **DATE/DATEDIF:** =DATE(year, month, day), =DATEDIF(start\_date, end\_date, "unit")

**Array Formulas:**

* **Array entry (Ctrl + Shift + Enter):** When working with array formulas
* **SUMPRODUCT:** =SUMPRODUCT(array1, array2, ...)
* **TRANSPOSE:** =TRANSPOSE(array)

**Dynamic Arrays (Excel 365 and Excel 2019):**

* **UNIQUE:** =UNIQUE(array)
* **FILTER:** =FILTER(array, include, [if\_empty])
* **SORT:** =SORT(array, [sort\_index], [sort\_order], [by\_col])

**Cell Referencing:**

* **Relative reference:** Example: **A1**
  + Moves with the formula when copied or filled to another cell.
* **Absolute reference:** Example: **$A$1**
  + Stays fixed when the formula is copied or filled to another cell.
* **Mixed reference (row absolute, column relative):** Example: **$A1**
  + Column reference is absolute, but row reference is relative.
* **Mixed reference (row relative, column absolute):** Example: **A$1**
  + Row reference is absolute, but column reference is relative.
* **Range reference:** Example: **A1:B10**
  + Refers to a range of cells from A1 to B10.
* **3D reference (across multiple sheets):** Example: **Sheet2:Sheet4!A1**
  + References cell A1 on Sheet2, Sheet3, and Sheet4.

**Using Names in Formulas:**

* **Define a named range:** **Formulas > Define Name**
  + Assign a meaningful name to a cell or range for easier reference.
* **Use named ranges in formulas:** Example: **=Sales \* TaxRate**
  + Replaces cell references with defined names for clarity.
* **Go to named range:** **Ctrl + F3**
  + Opens the Name Manager, where you can edit or delete named ranges.

**Hyperlinking:**

* **Insert hyperlink:** **Ctrl + K**
  + Links to another sheet, file, or web address from a cell.

**External References:**

* **Link to another workbook:** Example: **=[WorkbookName]Sheet1!A1**
  + Pulls data from another workbook.

**Structured References (Tables):**

* **Refer to a column in a table:** Example: **TableName[ColumnName]**
  + Automatically adjusts as the table expands.

**Indirect Function:**

* **Dynamic cell referencing:** Example: **=INDIRECT("Sheet1!" & "A1")**
  + Allows the creation of dynamic references.

**Special Characters:**

* **Intersection Operator:** Example: **Sheet1:Sheet2!A1**
  + Refers to the intersection of cell A1 on Sheet1 and Sheet2.
* **Union Operator:** Example: **Sheet1:Sheet2!A1,B2**
  + Refers to the union of cells A1 on Sheet1, B2 on Sheet1, A1 on Sheet2, and B2 on Sheet2.

**Formula Auditing:**

* **Trace Precedents/Dependents:** **Formulas > Trace Precedents/Dependents**
  + Visualizes the relationships between cells in a formula.
* **Show Formulas:** **Ctrl + \** (grave accent, usually located next to the 1 key)
  + Toggles between displaying formulas and results.

**Handling Errors:**

* **IFERROR Function:** Example: **=IFERROR(Formula, "Error Message")**
  + Displays a custom message instead of an error.

**Data Analysis:**

* **Sort data:** **Alt + H, S**
  + Sorts the selected range or entire sheet based on the selected column.
* **Filter data:** **Ctrl + Shift + L**
  + Toggles AutoFilter on or off, allowing you to filter data based on specific criteria.
* **Advanced Filter:** **Data > Sort & Filter > Advanced**
  + Allows you to apply more complex criteria for filtering data.
* **Data Validation:** **Data > Data Tools > Data Validation**
  + Defines rules to control the type of data that can be entered in a cell.
* **Consolidate Data:** **Data > Data Tools > Consolidate**
  + Combines data from multiple ranges into a single range.
* **What-If Analysis:** **Data > What-If Analysis**
  + Tools like Goal Seek, Scenario Manager, and Data Tables for analyzing different scenarios.

**PivotTables:**

* **Create a PivotTable:** **Alt + N, V**
  + Summarizes and analyzes data from a range into a concise table.
* **PivotChart:** **Alt + N, C**
  + Creates a chart directly from a PivotTable.
* **Slicers:** **PivotTable Tools > Analyze > Insert Slicer**
  + Filters data in a PivotTable or PivotChart with interactive buttons.

**Data Tables:**

* **One Variable Data Table:** **Data > What-If Analysis > Data Table**
  + Shows how changes in one or two variables can affect the results of a formula.

**Statistical Functions:**

* **AVERAGEIF/AVERAGEIFS:** **=AVERAGEIF(range, criteria)**
  + Calculates the average of a range based on a given condition.
* **COUNTIF/COUNTIFS:** **=COUNTIF(range, criteria)**
  + Counts the number of cells that meet a specified condition.
* **SUMIF/SUMIFS:** **=SUMIF(range, criteria, sum\_range)**
  + Adds up numbers based on a specified condition.

**Database Functions:**

* **DSUM/DCOUNT/DAVERAGE:** **=DSUM(database, field, criteria)**
  + Performs calculations on a database that matches specific conditions.

**Scenario Manager:**

* **Create a Scenario:** **Data > What-If Analysis > Scenario Manager**
  + Allows you to create and save different sets of input values for a worksheet.

**Solver:**

* **Optimization Tool:** **Data > Analysis > Solver**
  + Finds the optimal solution for a formula by changing the input values.

**Power Query:**

* **Data Transformation:** **Data > Get Data**
  + Import, transform, and combine data from various sources.

**Conditional Formatting:**

* **Color Scales/Icon Sets:** **Home > Conditional Formatting**
  + Visualizes data trends and patterns using colors and icons.

**Data Analysis Add-ins:**

* **Descriptive Statistics:** **Data > Data Analysis > Descriptive Statistics**
  + Generates various statistical measures for a range of data.
* **Histogram:** **Data > Data Analysis > Histogram**
  + Creates a histogram chart based on input data and bin range.

**Cell Formatting:**

* **Format Painter:** **Ctrl + Shift + C** (Copy), **Ctrl + Shift + V** (Paste)
  + Copies formatting from one cell and applies it to another.
* **Clear Formatting:** **Home > Editing > Clear > Clear Formats**
  + Removes formatting (font, color, etc.) from selected cells.
* **Number Formats:** **Ctrl + Shift + $** (Currency), **Ctrl + Shift + %** (Percentage), **Ctrl + Shift + #** (Date), **Ctrl + Shift + !** (Number)
  + Applies predefined number formats.
* **Cell Styles:** **Home > Styles > Cell Styles**
  + Provides a gallery of predefined styles for cells.

**Conditional Formatting:**

* **Highlight Cells Rules:** **Home > Conditional Formatting > Highlight Cells Rules**
  + Highlights cells based on specified rules (greater than, less than, etc.).
* **Data Bars/Color Scales/Icon Sets:** **Home > Conditional Formatting**
  + Visualizes data trends and patterns using bars, colors, and icons.
* **New Rule:** **Home > Conditional Formatting > New Rule**
  + Allows you to create custom formatting rules.

**Custom Formatting:**

* **Custom Number Format:** **Ctrl + 1**
  + Opens the Format Cells dialog box for customizing number formats.
* **Text Control:** **'** (apostrophe)
  + Forces the content of a cell to be treated as text.

**Alignment and Text Control:**

* **Wrap Text:** **Alt + H, W**
  + Wraps text within a cell.
* **Merge and Center:** **Home > Alignment > Merge & Center**
  + Merges selected cells and centers the content.
* **Text Orientation:** **Alt + H, F, R** (Rotate text up), **Alt + H, F, E** (Rotate text down)
  + Adjusts the orientation of text within a cell.

**Font Formatting:**

* **Bold/Italic/Underline:** **Ctrl + B** (Bold), **Ctrl + I** (Italic), **Ctrl + U** (Underline)
  + Applies or removes formatting to the selected text.
* **Font Color:** **Home > Font > Font Color**
  + Changes the color of the font.
* **Strikethrough/Subscript/Superscript:** **Ctrl + 5** (Strikethrough), **Ctrl + =** (Subscript), **Ctrl + Shift + =** (Superscript)
  + Applies special formatting to the text.

**Borders:**

* **Borders Menu:** **Home > Font > Borders**
  + Provides various options for adding borders to cells.
* **Outline Borders:** **Alt + H, B** (Outline Borders)
  + Adds a border around the selected range.
* **Remove Borders:** **Alt + H, N** (Clear Borders)
  + Removes borders from the selected range.

**Cell Fill:**

* **Fill Color:** **Home > Font > Fill Color**
  + Changes the background color of cells.

**Cell Size:**

* **Row Height/Column Width:** **Home > Format > Row Height** or **Column Width**
  + Adjusts the height of rows or the width of columns.
* **AutoFit Row Height/Column Width:** **Home > Format > AutoFit Row Height** or **Column Width**
  + Adjusts the row height or column width to fit the contents.

**Themes and Styles:**

* **Themes:** **Page Layout > Themes**
  + Applies a consistent set of fonts, colors, and effects to the entire workbook.
* **Cell Styles:** **Home > Styles > Cell Styles**
  + Applies predefined styles to cells.

**Conditional Formatting:**

* **Highlight Cells Rules:** **Home > Conditional Formatting > Highlight Cells Rules**
  + Highlights cells based on specified rules (greater than, less than, etc.).
* **Data Bars/Color Scales/Icon Sets:** **Home > Conditional Formatting**
  + Visualizes data trends and patterns using bars, colors, and icons.
* **New Rule:** **Home > Conditional Formatting > New Rule**
  + Allows you to create custom formatting rules.

**General Shortcuts:**

* **Save:** **Ctrl + S**
* **Undo:** **Ctrl + Z**
* **Redo:** **Ctrl + Y**
* **Cut:** **Ctrl + X**
* **Copy:** **Ctrl + C**
* **Paste:** **Ctrl + V**
* **Select All:** **Ctrl + A**
* **Print:** **Ctrl + P**
* **Open a New Workbook:** **Ctrl + N**
* **Close Workbook:** **Ctrl + W**
* **Insert New Worksheet:** **Shift + F11**

**Navigation Shortcuts:**

* **Move to the Next Sheet:** **Ctrl + Page Down**
* **Move to the Previous Sheet:** **Ctrl + Page Up**
* **Go to the Beginning of Data:** **Ctrl + ↑**
* **Go to the End of Data:** **Ctrl + ↓**
* **Go to the Last Cell:** **Ctrl + Home**
* **Navigate between Open Workbooks:** **Ctrl + Tab**

**Formatting Shortcuts:**

* **Bold:** **Ctrl + B**
* **Italic:** **Ctrl + I**
* **Underline:** **Ctrl + U**
* **Strikethrough:** **Ctrl + 5**
* **Subscript:** **Ctrl + =**
* **Superscript:** **Ctrl + Shift + =**
* **Increase Font Size:** **Ctrl + ]**
* **Decrease Font Size:** **Ctrl + [**

**Cell Editing Shortcuts:**

* **Edit Cell:** **F2**
* **Enter Formula:** **= (equals sign)**
* **Autofill:** **Ctrl + E**
* **Flash Fill:** **Ctrl + E**
* **Toggle Formula Auditing Toolbar:** **Alt + M, A, A**
* **Evaluate Formula Step by Step:** **Alt + M, V**

**Selection and Range Shortcuts:**

* **Select Entire Column:** **Ctrl + Spacebar**
* **Select Entire Row:** **Shift + Spacebar**
* **Select Non-Adjacent Cells:** **Ctrl + Click**
* **Extend Selection:** **Shift + Arrow Key**

**Data Analysis Shortcuts:**

* **Insert Function:** **Shift + F3**
* **AutoSum:** **Alt + =**
* **Sort Ascending/Descending:** **Alt + H, S, A/D**
* **Filter Toggle:** **Ctrl + Shift + L**
* **Create PivotTable:** **Alt + N, V**

**Window and View Shortcuts:**

* **Split Window:** **View > Split**
* **Freeze Panes:** **View > Freeze Panes**
* **Switch between Open Windows:** **Ctrl + F6**

**Workbook Management Shortcuts:**

* **New Workbook:** **Ctrl + N**
* **Open Workbook:** **Ctrl + O**
* **Save As:** **F12**

**Miscellaneous Shortcuts:**

* **Insert Current Date:** **Ctrl + ;**
* **Insert Current Time:** **Ctrl + Shift + :**
* **Insert Hyperlink:** **Ctrl + K**
* **Show/Hide Ribbon:** **Ctrl + F1**

**Named Ranges:**

* **Define a Named Range:** **Formulas > Define Name**
  + Assign a meaningful name to a cell or range for easier reference.
* **Create a Named Range from Selection:** **Formulas > Create from Selection**
  + Automatically creates named ranges based on labels in adjacent cells.
* **Go to Named Range:** **Ctrl + F3**
  + Opens the Name Manager, allowing you to edit or delete named ranges.
* **Use Named Ranges in Formulas:** Type the name instead of the cell reference.
  + Example: **=Sales \* TaxRate**
* **Navigate through Named Ranges:** Use the Name Box dropdown to select and jump to named ranges.
* **Edit Named Ranges:** **Formulas > Name Manager > Edit**
  + Modify the range or formula associated with a named range.
* **Apply Named Range to Data Validation:** **Data > Data Tools > Data Validation**
  + Use named ranges to create dropdown lists in data validation.
* **Dynamic Named Ranges (Excel Tables):**
  + If your data is in an Excel Table, the table columns automatically become dynamic named ranges.

**Specialized Named Ranges:**

* **Table Columns as Named Ranges:**
  + Automatically created when you refer to a column in a structured Excel Table.
* **Worksheet Level Named Ranges:**
  + Scoping the name to a specific worksheet.
* **Workbook Level Named Ranges:**
  + Scoping the name to the entire workbook.

**Named Range Shortcuts:**

* **Create Named Range on Active Selection:** **Ctrl + Shift + F3**
  + Opens the Create Names dialog box to define names based on the current selection.
* **Create Names from Selection (top row):** **Ctrl + Shift + N**
  + Creates names from the top row of your selection.
* **Create Names from Selection (left column):** **Ctrl + Shift + B**
  + Creates names from the left column of your selection.

**Using Names in Formulas:**

* **Create a Formula using Named Ranges:**
  + Example: **=Expenses - Deductions**
* **Using Dynamic Named Ranges in Formulas:**
  + If your named range is dynamic, it automatically adjusts to changes in the data.

**Validation and Auditing:**

* **Check for Errors in Named Ranges:** **Formulas > Error Checking > Manage Rules**
  + Identify and manage errors in formulas that use named ranges.
* **Trace Dependents/Precedents for Named Ranges:**
  + **Formulas > Trace Dependents/Precedents**

**Using Named Ranges in Charts:**

* **Create Dynamic Charts using Named Ranges:**
  + Make your charts dynamic by referring to named ranges.
* **Change Chart Data Source:**
  + Use named ranges to easily update the data source for charts.

**Named Range Best Practices:**

* **Use Descriptive Names:**
  + Choose names that clearly represent the data or purpose.
* **Update Named Ranges as Data Changes:**
  + Regularly review and update named ranges if your data changes.
* **Avoid Spaces and Special Characters in Names:**
  + Stick to alphanumeric characters and underscores.
* **Use Workbook Scoping Wisely:**
  + Consider scoping the name to the worksheet or workbook based on your needs.

**Data Validation:**

* **Create Data Validation Rule:** **Data > Data Tools > Data Validation**
  + Sets criteria to control the type of data that can be entered in a cell.
* **Data Validation Shortcut:** **Alt + D, L**
  + Opens the Data Validation dialog box.
* **Data Validation Criteria:**
  + Choose from options such as Whole Number, Decimal, List, Date, Time, Text Length, and Custom.
* **List Data Validation:**
  + Create a dropdown list of predefined values for a cell.
* **Input Message:**
  + Add a message that appears when a cell is selected to provide guidance on valid entries.
* **Error Alert:**
  + Display a warning or information message if an invalid entry is made.

**Advanced Data Validation:**

* **Custom Formula:**
  + Create a custom formula to determine the validity of an entry.
* **Using Formulas in Data Validation:**
  + Utilize Excel formulas to create dynamic validation criteria.

**Dynamic Dropdown Lists:**

* **Dependent Dropdown Lists:**
  + Create cascading dropdown lists where the options in one list depend on the selection in another.
* **Indirect Function for Dynamic Lists:**
  + Use the **INDIRECT** function to create dynamic dropdown lists.

**Circle Invalid Data:**

* **Highlight Invalid Data:**
  + **Home > Styles > Conditional Formatting > New Rule > Format cells that contain** to highlight invalid entries.

**Data Validation Shortcuts:**

* **Copy Data Validation Rule Down:** **Ctrl + D**
  + Copies the data validation rule from the above cell.
* **Go to the Next/Previous Data Validation Cell:** **Alt + ↓** and **Alt + ↑**
  + Navigates between cells with data validation.

**Data Validation Auditing:**

* **Trace Dependents/Precedents for Data Validation Cells:**
  + **Formulas > Trace Dependents/Precedents**
* **Error Checking:**
  + **Formulas > Error Checking** to manage and audit errors in data validation.

**Data Validation with Named Ranges:**

* **Use Named Ranges in Data Validation Lists:**
  + Reference named ranges in the list for data validation.

**Clear Data Validation:**

* **Clear Data Validation Rules:** **Home > Editing > Clear > Clear Rules**

**Protecting Data Validation:**

* **Protect Worksheet/Workbook:**
  + **Review > Protect Sheet** or **Review > Protect Workbook** to prevent changes to data validation settings.

**Data Validation Best Practices:**

* **Clear Instructions:**
  + Provide clear and concise input messages for users.
* **Use Dropdown Lists for Consistency:**
  + Utilize dropdown lists to ensure consistent data entry.
* **Test and Review Validation Rules:**
  + Regularly review and test data validation rules to ensure they meet current requirements.

**Conditional Data Validation:**

* **Conditional Data Validation Rules:**
  + Create rules that change based on the value entered in another cell.

**Creating Excel Tables:**

* **Create Table:** **Insert > Table** or **Ctrl + T**
  + Converts a range of data into a table.
* **Table Styles:** After creating a table, various styles are available under the "Table Tools Design" tab.

**Table Navigation:**

* **Navigate Inside a Table:**
  + Use the Tab key to move horizontally, and Enter key to move vertically within the table.
* **Total Row:**
  + **Table Tools Design > Total Row** adds a row at the bottom with functions like Sum, Average, etc.
* **Filtering in Tables:**
  + **Table Tools Design > Filter** enables filter options in the header row.

**Working with Table Data:**

* **Add Total Row Calculation:**
  + Click on the Total Row cell at the bottom of a column and choose a function.
* **Sorting in Tables:**
  + Click on the column header to sort the table based on that column.
* **Removing Duplicates in Tables:**
  + **Table Tools Design > Remove Duplicates**

**Expanding and Resizing Tables:**

* **Resize Table Columns:**
  + Drag the column boundary in the header row.
* **Inserting Rows/Columns in Tables:**
  + **Table Tools Design > Insert Rows** or **Insert Columns**
* **Expanding the Table:**
  + As you add data below or to the right of the table, it expands automatically.

**Table References and Structured Formulas:**

* **Referencing Table Columns in Formulas:**
  + Use structured references like **TableName[ColumnName]** in formulas.
* **Structured Formulas in Tables:**
  + Use formulas in tables that automatically extend as new data is added.

**Table Tools Design Options:**

* **Rename Table:**
  + Change the table name in **Table Tools Design > Table Name**.
* **Table Styles and Formatting:**
  + Explore various styles and formatting options.
* **Convert to Range:**
  + If needed, you can convert a table back to a range using **Table Tools Design > Convert to Range**.

**Data Entry in Tables:**

* **Automatic Column Expansion:**
  + As you enter data in the last row, the table expands automatically.
* **Tab Through Table Cells:**
  + Pressing Tab moves you to the next cell within the table.

**Table Shortcuts:**

* **Create Table Shortcut:**
  + **Ctrl + T** to quickly create a table from a selected range.
* **Select Table Column:**
  + Click the column header to select the entire column.
* **Select Table Row:**
  + Click the row header to select the entire row.

**Table Relationships:**

* **Create Relationships Between Tables:**
  + Useful when working with multiple related tables.

**Table Slicers:**

* **Insert Slicer:**
  + **Table Tools Design > Insert Slicer** to filter table data interactively.

**Exporting Table Data:**

* **Export Table to SharePoint List:**
  + **Table Tools Design > Export > Export Table to SharePoint List**

**Table Best Practices:**

* **Give Descriptive Names:**
  + Name your tables descriptively for easy reference.
* **Use Tables for Dynamic Ranges:**
  + When your data is likely to expand, use tables for dynamic ranges.
* **Explore Table Styles and Formatting:**
  + Experiment with different table styles and formatting options.

**Statistical Functions:**

* **STDEV.P/STDEV.S:**
  + Calculates the standard deviation based on the entire population or a sample.
* **VAR.P/VAR.S:**
  + Calculates the variance based on the entire population or a sample.
* **CORREL:**
  + Calculates the correlation coefficient between two ranges of data.
* **FORECAST.ETS:**
  + Uses exponential smoothing to predict future values based on existing data.

**Database Functions:**

* **DSUM/DCOUNT/DAVERAGE:**
  + Performs calculations on a database that matches specific conditions.
* **DGET/DMAX/DMIN:**
  + Extracts specific data from a database based on criteria.

**Lookup and Reference Functions:**

* **INDEX/MATCH:**
  + A powerful combination for looking up values in a table based on criteria.
* **OFFSET:**
  + Returns a reference offset from a starting cell or range of cells.
* **INDIRECT:**
  + Returns the value of a cell specified by a text string.

**Math Functions:**

* **SUMPRODUCT:**
  + Multiplies corresponding components in the given arrays and returns the sum of those products.
* **MOD:**
  + Returns the remainder of a division operation.
* **ROUNDUP/ROUNDDOWN:**
  + Rounds a number up or down, away from or towards zero, respectively.

**Text Functions:**

* **CONCAT:**
  + Concatenates a list or range of text strings.
* **TEXT:**
  + Converts a value to text in a specified format.
* **SEARCH/REPLACE:**
  + Searches for a specific substring or replaces occurrences in a text string.

**Logical Functions:**

* **IFERROR:**
  + Returns a specified value if a formula results in an error, otherwise, returns the result of the formula.
* **IFS/SWITCH:**
  + Evaluates multiple conditions and returns a value corresponding to the first true condition.
* **AND/OR/NOT:**
  + Logical functions for combining multiple conditions.

**Date and Time Functions:**

* **DATEDIF:**
  + Calculates the difference between two dates in years, months, or days.
* **NETWORKDAYS:**
  + Calculates the number of whole workdays between two dates, excluding weekends.
* **EOMONTH:**
  + Returns the last day of the month, n months away from a specified date.

**Array Formulas:**

* **Array Entry (Ctrl + Shift + Enter):**
  + Enables the use of arrays in formulas for more complex calculations.
* **TRANSPOSE:**
  + Transposes the rows and columns of a given range.
* **INDEX with Multiple Criteria:**
  + Use INDEX function with multiple criteria for more advanced lookups.

**Financial Functions:**

* **IRR/NPV:**
  + Calculates the internal rate of return or net present value of a series of cash flows.
* **XNPV/XIRR:**
  + Calculates the net present value or internal rate of return for a schedule of cash flows that is not necessarily periodic.

**Engineering Functions:**

* **BESSELI/BESSELJ/BESSELK/BESSELY:**
  + Calculate Bessel functions of the first and second kind.
* **BIN2DEC/DEC2BIN:**
  + Convert binary numbers to decimal or vice versa.

**Math Constants:**

* **PI/PI()/E:**
  + Access mathematical constants like pi and e in formulas.

**Dynamic Arrays (Excel 365 and Excel 2019):**

* **UNIQUE/FILTER/SORT:**
  + Perform unique, filter, and sort operations directly in formulas.

**Review and Collaboration:**

* **Comments:**
  + Add comments to cells for discussions and annotations.
  + **Insert Comment:** **Right-click > New Comment** or **Review > New Comment**.
  + **Navigate Comments:** **Review > Next/Previous**.
* **Track Changes:**
  + Track changes made by different users.
  + **Enable/Disable Track Changes:** **Review > Track Changes > Highlight Changes**.
  + **Accept/Reject Changes:** **Review > Track Changes > Accept/Reject Changes**.
* **Protect Workbook/Worksheet:**
  + Control access to the workbook or specific worksheets.
  + **Protect Workbook:** **Review > Protect Workbook**.
  + **Protect Worksheet:** **Review > Protect Sheet**.
* **Shared Workbooks:**
  + Allow multiple users to edit a workbook simultaneously.
  + **Share Workbook:** **Review > Share Workbook**.
  + **Track Changes in Shared Workbook:** **Review > Track Changes > Highlight Changes**.
* **Comments Thread:**
  + Engage in threaded conversations within comments.
  + **Reply to Comments:** **Right-click > Reply**.
* **Co-Authoring (Excel Online):**
  + Collaborate in real-time with others online.
  + **Share Workbook Online:** **File > Share > Share with People**.
* **Versions:**
  + Track and revert to previous versions of the workbook.
  + **Manage Versions:** **File > Info > Version History**.
* **Merge Workbooks:**
  + Combine changes made by different users into a single workbook.
  + **Review Tab > Compare > Merge Workbooks**.
* **Password Protection:**
  + Secure the workbook with a password.
  + **Protect Workbook with Password:** **Review > Protect Workbook > Protect Structure and Windows**.
* **Workbook Comparison:**
  + Compare two workbooks for differences.
  + **Review Tab > Compare > Compare**.
* **Hyperlink to Comments:**
  + Create hyperlinks directly to specific comments for quick navigation.
  + **Right-click Comment > Copy Hyperlink**.
* **Collaborative Editing (Excel 365):**
  + Simultaneously edit a workbook with others in real-time.
* **Smart Lookup:**
  + Use Bing to search for information without leaving Excel.
  + **Review > Smart Lookup**.
* **Cell History (Excel 365):**
  + View and restore previous versions of a cell's content.
* **Task Panes:**
  + Use task panes like Comments, Changes, and Share to manage collaboration.
* **Reviewing Toolbar:**
  + Customize the Reviewing Toolbar for quick access to collaboration tools.
* **Shared PivotTables:**
  + Share PivotTable reports, and changes made to filters and layouts.
* **Inking:**
  + Use the Ink feature to annotate with a digital pen or stylus.
* **Resume Reading:**
  + Easily pick up where you left off with the Resume Reading feature.
* **Workbook Statistics:**
  + View workbook statistics, including the number of comments and changes.

**Excel Online Collaboration:**

* **Co-Authoring in Excel Online:**
  + Real-time collaboration without needing to install Excel.
* **Share Links:**
  + Share a link to the workbook for online collaboration.
* **Excel Online Chat:**
  + Communicate with collaborators using the built-in chat feature.
* **Excel Online Comment Notifications:**
  + Receive notifications when someone comments on the shared workbook.

**Macros:**

* **Enable Macros:**
  + Enable macros by going to **File > Options > Trust Center > Trust Center Settings > Macro Settings**.
* **Record a Macro:**
  + **View > Macros > Record Macro**.
  + Specify a name, location, shortcut key (optional), and description.
  + Perform actions in Excel; they will be recorded.
* **Run a Macro:**
  + **View > Macros > View Macros > Run**.
  + Or use the assigned shortcut key.
* **Assign a Macro to a Button:**
  + **Developer > Insert > Button (in the Form Controls group)**.
  + Assign a macro to the button.
* **Edit a Macro:**
  + **View > Macros > View Macros > Edit**.
  + Modify the VBA code in the Visual Basic for Applications (VBA) editor.
* **Delete a Macro:**
  + **View > Macros > View Macros > Delete**.
* **Macro Security:**
  + Set the security level for running macros in **File > Options > Trust Center > Trust Center Settings**.

**VBA (Visual Basic for Applications):**

* **Open the VBA Editor:**
  + **Alt + F11** or **Developer > Code > Macros > Visual Basic**.
* **Write VBA Code:**
  + Develop custom procedures using the VBA programming language.
* **Debugging Macros:**
  + Use breakpoints, step into/over, and watch variables to debug macros.
* **VBA Modules:**
  + Organize code into modules for better management.
* **UserForms:**
  + Create custom forms for user interaction using the UserForm object.
* **VBA Object Browser:**
  + **F2** opens the Object Browser for exploring available objects and properties.

**Macro Security Best Practices:**

* **Enable Macros Only from Trusted Sources:**
  + Be cautious when enabling macros, and only run them from trusted sources.
* **Digitally Sign Macros:**
  + Sign your macros with a digital signature to verify their authenticity.
* **Regularly Update Macro Security Settings:**
  + Stay informed about macro security best practices and update settings accordingly.

**Advanced Macro Techniques:**

* **Looping Structures:**
  + Utilize For, Do While, and Do Until loops for repetitive tasks.
* **Error Handling:**
  + Implement error-handling mechanisms to gracefully handle unexpected issues.
* **User-Defined Functions (UDFs):**
  + Create custom functions using VBA for use in Excel formulas.
* **Automating Data Processing:**
  + Use macros to automate complex data processing tasks.
* **Interactive Macros:**
  + Incorporate user interaction using input boxes and message boxes.

**Macro Shortcuts:**

* **Quickly Open VBA Editor:**
  + **Alt + F11**.
* **Run Macro from Quick Access Toolbar:**
  + Add frequently used macros to the Quick Access Toolbar.
* **Assign Keyboard Shortcuts:**
  + Assign custom keyboard shortcuts to macros for quick execution.

**Macro Security Levels:**

* **Disable Macros:**
  + Temporarily disable macros when not needed.
* **Enable Macros for Current Session:**
  + Enable macros for the current Excel session without changing settings permanently.
* **Trusted Locations:**
  + Add specific folders as trusted locations for running macros.

**Macro Examples:**

* **Automate Data Import/Export:**
  + Create macros to automate importing and exporting data.
* **Format Data Automatically:**
  + Develop macros to format data based on specific criteria.
* **Generate Reports:**
  + Automate the process of generating reports with macros.

**Excel Online and Macros:**

* **Macro Compatibility:**
  + Macros are generally not supported in Excel Online; use the desktop version for full functionality.

**Customizing Excel:**

* **Customizing the Ribbon:**
  + **File > Options > Customize Ribbon**.
  + Add, remove, or rearrange tabs and commands on the Ribbon.
* **Quick Access Toolbar (QAT):**
  + Customize the Quick Access Toolbar above the Ribbon.
  + **File > Options > Quick Access Toolbar**.
* **Themes:**
  + Apply predefined color, font, and effect schemes to the entire workbook.
  + **Page Layout > Themes**.
* **Custom Views:**
  + Save and switch between different custom views of a worksheet.
  + **View > Custom Views**.

**Templates:**

* **Create a Workbook Template:**
  + Design a custom workbook template for consistent use.
  + **File > Save As > Excel Template (.xltx)**.
* **Personal Templates:**
  + Save templates in the "Custom Office Templates" folder for personal use.
  + **File > Options > Save > Default personal templates location**.

**Styles and Formatting:**

* **Cell Styles:**
  + Apply predefined styles or create custom styles.
  + **Home > Styles > Cell Styles**.
* **Conditional Formatting Rules:**
  + Create custom conditional formatting rules for data visualization.
  + **Home > Conditional Formatting**.
* **Format Painter:**
  + Copy formatting from one cell and apply it to another.
  + **Home > Format Painter**.

**Keyboard Shortcuts:**

* **Custom Keyboard Shortcuts:**
  + Assign custom shortcuts to commands.
  + **File > Options > Customize Ribbon > Customize**.
  + Select "Macros" in "Choose commands from" to assign shortcuts to macros.
* **Function Key Shortcuts:**
  + Assign specific functions to function keys.
  + **File > Options > Customize Ribbon > Customize > Keyboard Shortcuts**.

**Cell and Sheet Formatting:**

* **Custom Cell Formats:**
  + Create and apply custom number formats.
  + **Ctrl + 1** > **Number** tab.
* **Sheet Background:**
  + Add a background image to a worksheet.
  + **Page Layout > Background**.

**View Options:**

* **Freeze Panes:**
  + Lock rows or columns while scrolling.
  + **View > Freeze Panes**.
* **Custom Views:**
  + Save and switch between different views of a worksheet.
  + **View > Custom Views**.

**Advanced Customization:**

* **Custom Functions (UDFs):**
  + Develop and use custom user-defined functions (UDFs) in VBA.
* **Custom Add-ins:**
  + Create custom Excel add-ins for extended functionality.
  + **File > Options > Add-ins**.
* **Advanced Ribbon Customization:**
  + Modify the Ribbon extensively using XML.
  + Advanced customization may require knowledge of XML and VBA.

**Excel Online Customization:**

* **Limited Customization:**
  + Excel Online has limited customization options compared to the desktop version.
* **Basic Formatting:**
  + Basic formatting, such as font, color, and alignment, can be done in Excel Online.

**Collaborative Customization:**

* **Share Custom Templates:**
  + Share custom templates with collaborators.
* **Consistent Workbook Formatting:**
  + Ensure that collaborators use consistent formatting by sharing custom styles.

**Advanced Excel Customization:**

* **VBA Macros for Automation:**
  + Develop VBA macros to automate complex tasks and customize Excel behavior.
* **Advanced Themes and Styles:**
  + Create advanced custom themes and styles for a unique look.