NFC-IET UNIVERSITY, MULTAN



LAB REPORT

ICT (“Information & Communication Technology Fundamental”)

## For the degree of Bachelor of Science

In Computer Science

Session [2k24]

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**Section B**

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## 

## December 2024

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## **LAB 1**

Typing Practices (Typing tutor), internal components of Computer (Recognition+ understanding)

**Objective**

1. To develop accurate and efficient typing skills through the use of a typing tutor application.
2. To recognize and understand the functions of the internal components of a computer.

**Materials Required**

1. Computer system with typing tutor software installed (e.g., Typing.com, Key Blaze, or Typing Master).
2. Access to a dismantled or demonstrative computer setup for internal component analysis.
3. Notebook and pen for taking notes.

### ****Part 1: Typing Practices Using Typing Tutor****

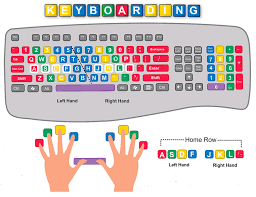
**Procedure**

1. Launch the typing tutor software.
2. Select a typing course appropriate for your skill level (beginner, intermediate, or advanced).
3. Follow the structured lessons provided by the application:
   * Practice home row keys.
   * Progress to top and bottom row keys.
   * Complete exercises focused on speed and accuracy improvement.
4. Record typing speed and accuracy after completing each session.
5. Repeat practice over multiple days to observe improvements.

**Observations**

* Initial typing speed: \_\_\_ words per minute (wpm).
* Accuracy rate: \_\_\_%.
* Improvements observed after consistent practice:
  + Speed increased to \_\_\_ wpm.
  + Accuracy improved to \_\_\_%.

**Conclusion**  
Typing tutor software enhances typing speed and accuracy through structured practice. Regular sessions build muscle memory and efficiency.



### ****Part 2: Recognition and Understanding of Internal Computer Components****

**Procedure**

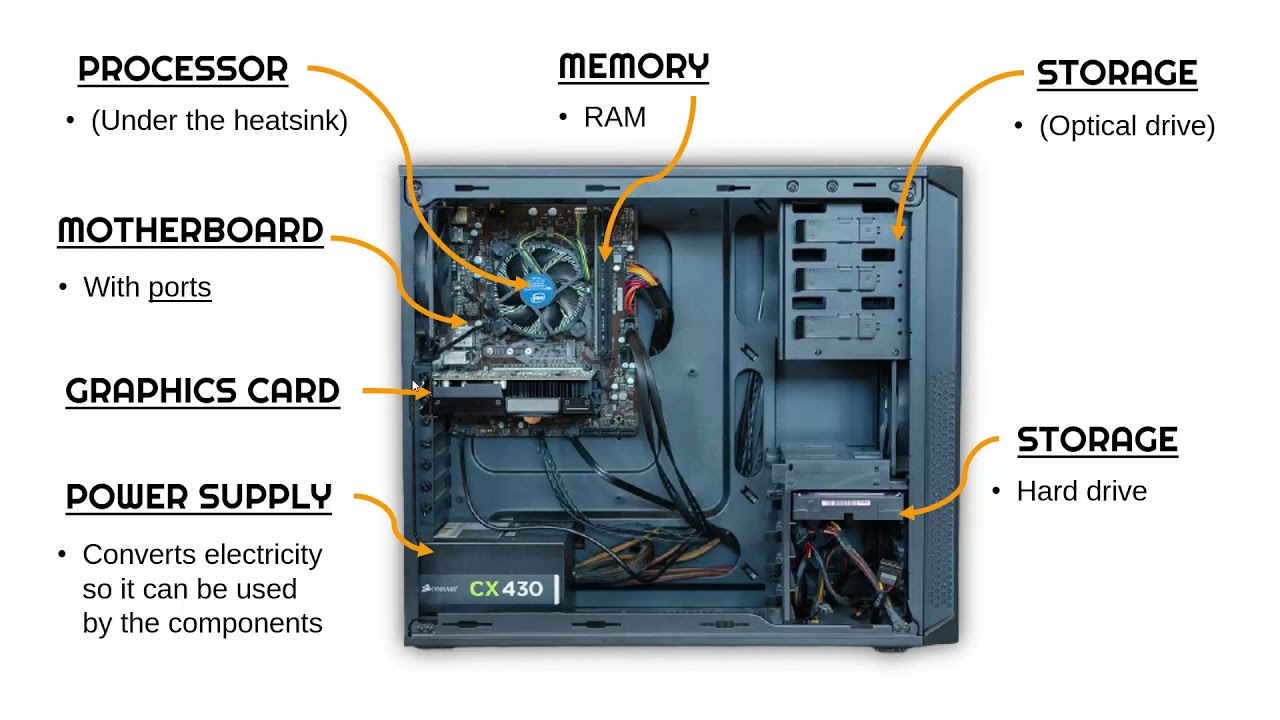
1. Open the computer case or examine a dismantled computer system.
2. Identify and study the following internal components:
   * **Central Processing Unit (CPU)**: Understand its role as the brain of the computer.
   * **Motherboard**: Recognize it as the main circuit board connecting all components.
   * **Random Access Memory (RAM)**: Note its function in temporarily storing data for active processes.
   * **Storage Devices**: Differentiate between HDD (Hard Disk Drive) and SSD (Solid-State Drive).
   * **Power Supply Unit (PSU)**: Observe its role in providing electrical power.
   * **Cooling System**: Understand the purpose of fans and heat sinks.
   * **Peripheral Ports**: Locate USB, HDMI, and other connectors.
3. Take notes on each component's physical appearance, placement, and function.

**Observations**

|  |  |  |
| --- | --- | --- |
| Component | Function | Observations |
| CPU | Processes instructions | Located on the motherboard with a heat sink. |
| Motherboard | Connects and integrates all parts | Large circuit board with various connectors. |
| RAM | Temporary data storage for active tasks | Inserted in slots on the motherboard. |
| Storage Devices | Long-term data storage | HDD is bulkier; SSD is compact and faster. |
| PSU | Supplies power | Box-like structure connected to a power cable. |
| Cooling System | Maintains optimal temperature | Includes fans and thermal paste for heat dissipation. |

**Conclusion**  
The internal components of a computer work together seamlessly to perform tasks. Understanding their functions helps in troubleshooting and upgrading systems.

**Overall Conclusion**  
The lab session improved typing proficiency and provided a foundational understanding of computer hardware components. These skills are essential for efficient computer operation and maintenance.



## **LAB 2**

Windows installation, CPU assembling

### ****Objective****

1. To understand and execute the step-by-step process of installing the Windows operating system on a computer.
2. To assemble a CPU and its associated components for a fully functional computer system.

### ****Materials Required****

* A computer system with an empty hard drive or existing OS to be overwritten
* Windows installation media (USB or DVD)
* Screwdrivers and thermal paste
* Internal components: CPU, motherboard, RAM, storage drive (HDD/SSD), power supply unit (PSU), cooling system, and case
* Monitor, keyboard, and mouse for testing

### ****Part 1: Windows Installation****

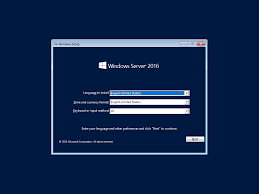
**Procedure**

1. **Preparation**
   * Ensure the computer system has no existing operating system or backup required data if necessary.
   * Create a bootable USB/DVD with Windows installation files.
   * Insert the USB/DVD into the computer and restart it.
2. **BIOS/UEFI Configuration**
   * Access the BIOS/UEFI settings by pressing the designated key (e.g., F2, DEL, or F12) during boot.
   * Set the boot priority to the USB/DVD.
3. **Installing Windows**
   * Restart the computer to boot from the USB/DVD.
   * Follow the on-screen instructions to choose the language, time, and keyboard preferences.
   * Click "Install Now" and enter the product key if prompted.
   * Select the installation type: "Custom" for a fresh installation.
   * Partition the hard drive if necessary and select the primary partition for installation.
   * Wait for Windows to copy and install files.
   * Configure initial settings, such as user account creation and privacy options.

**Observations**

* Installation time: \_\_\_ minutes
* Successful installation indicated by the Windows desktop screen.

**Conclusion**  
The Windows installation process is systematic and requires proper preparation. Following steps accurately results in a fully functional OS.



### ****Part 2: CPU Assembling****

**Procedure**

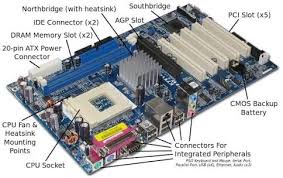
1. **Motherboard Preparation**
   * Place the motherboard on a non-conductive surface.
   * Install the CPU into the socket by lifting the retention lever, aligning the CPU pins, and locking it in place.
2. **Cooling System Installation**
   * Apply a small amount of thermal paste on the CPU surface.
   * Attach the heat sink or cooling fan on top of the CPU and secure it using screws or clips.
3. **RAM Installation**
   * Insert RAM sticks into the designated slots, ensuring the notch aligns with the slot’s divider.
4. **Storage Drive and PSU Installation**
   * Mount the HDD/SSD in its bay and connect the SATA cable to the motherboard and PSU.
   * Install the PSU into its compartment and connect cables to the motherboard and other components.
5. **Assembling the Case**
   * Mount the motherboard inside the case and secure it with screws.
   * Connect all necessary cables (power, data, and front-panel connectors).
6. **Final Checks and Boot Test**
   * Ensure all components are securely connected.
   * Power on the system to check for successful boot.

**Observations**

* Assembly time: \_\_\_ minutes
* System boot: Successful / Unsuccessful
* Errors encountered: None / Describe error (e.g., loose connections, BIOS misconfiguration).

**Conclusion**  
Assembling a CPU requires precision and attention to detail. Understanding the functions and placements of components is crucial for a successful setup.

### ****Overall Conclusion****

The lab provided hands-on experience in Windows installation and CPU assembly. These skills are essential for configuring and troubleshooting computer systems.  


## **LAB 3**

Motherboard and its internal structure

### ****Objective****

To study the physical structure and functional components of a motherboard and understand how it connects and interacts with other computer components.

### ****Materials Required****

* A dismantled or functional computer system
* Motherboard (ATX, micro-ATX, or mini-ITX)
* Tools: Screwdriver, anti-static wrist strap
* Notebook for observations

### ****Introduction****

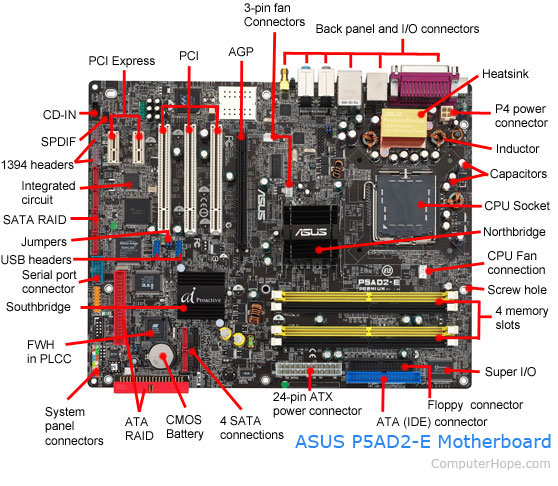
The motherboard is the primary circuit board in a computer system. It acts as a central hub, connecting the CPU, memory, storage, and other peripherals. Its layout and internal structure determine compatibility and functionality.

### ****Procedure****

1. **Observation of Physical Layout**
   * Remove the computer case and place the motherboard on a non-conductive surface.
   * Identify its form factor (e.g., ATX, micro-ATX, mini-ITX).
   * Note the arrangement of slots, connectors, and components.
2. **Identifying Key Components**  
   Examine and understand the following motherboard components:

|  |  |
| --- | --- |
| **Component** | **Description** |
| **CPU Socket** | Slot for the CPU, with pins or pads depending on the type (LGA, PGA, or BGA). |
| **RAM Slots (DIMM Slots)** | Slots for installing memory modules (DDR4, DDR5, etc.). |
| **Chipset** | Controls communication between the CPU, memory, and peripherals. |
| **Expansion Slots** | PCIe slots for GPUs, network cards, and other peripherals. |
| **Power Connectors** | ATX 24-pin connector and CPU power connectors (4-pin or 8-pin). |
| **Storage Connectors** | SATA and NVMe M.2 connectors for storage devices. |
| **Input/Output Ports** | USB, HDMI, Ethernet, audio, and other external device connectors. |
| **BIOS/UEFI Chip** | Non-volatile memory storing the motherboard's firmware. |
| **CMOS Battery** | Powers the BIOS/UEFI to retain system settings. |
| **Cooling System Mounts** | Mounting points for CPU coolers and case fans. |

1. **Tracing Circuit Connections**
   * Follow the traces from the CPU socket to the chipset to understand data flow.
   * Observe power distribution paths from the PSU connectors to various components.
2. **Testing Functions**
   * Power on the system and check for POST (Power-On Self-Test) signals using a connected monitor.
   * Use BIOS/UEFI settings to verify component recognition (e.g., CPU, RAM, storage).

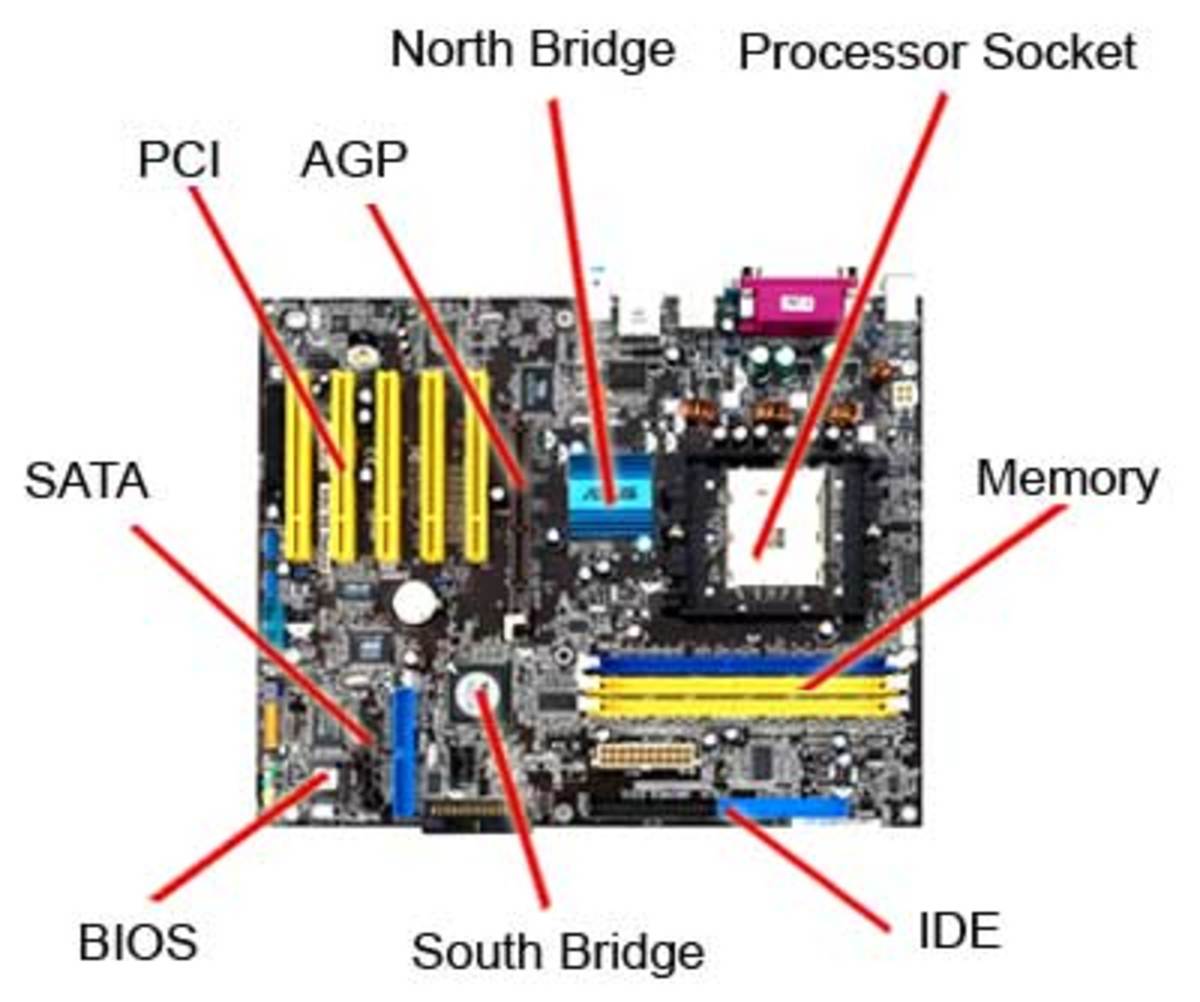


### ****Observations****

|  |  |  |
| --- | --- | --- |
| **Component** | **Function** | **Observations** |
| CPU Socket | Holds the CPU securely and facilitates communication with the chipset. | \_\_\_ (e.g., LGA type, supports Intel/AMD). |
| RAM Slots | Provides connections for memory modules. | \_\_\_ (e.g., 2 DIMM slots, DDR4 compatible). |
| Chipset | Manages data flow between components. | \_\_\_ (e.g., Intel Z790 chipset). |
| Expansion Slots | Adds functionality like graphics or sound. | \_\_\_ (e.g., PCIe 4.0 x16 slot for GPUs). |
| Storage Connectors | Connects storage devices to the system. | \_\_\_ (e.g., 4 SATA ports, 2 M.2 slots). |
| Input/Output Ports | Connects external devices to the system. | \_\_\_ (e.g., 4 USB 3.0 ports, 1 HDMI port). |
| BIOS/UEFI Chip | Initializes hardware and loads the operating system. | \_\_\_ (e.g., AMI firmware, UEFI interface). |
| CMOS Battery | Maintains real-time clock and BIOS settings. | \_\_\_ (e.g., CR2032 battery). |

### ****Conclusion****

The motherboard is a complex and critical component of a computer system. It facilitates communication between the CPU, memory, storage, and peripherals. Understanding its structure and functions is essential for building, upgrading, and troubleshooting systems.



## **LAB 4**

Introduction to MS office, MS Word basic features

### ****Objective****

1. To understand the MS Office suite and its applications.
2. To explore and utilize the basic features of MS Word for document creation and formatting.

### ****Materials Required****

* A computer system with Microsoft Office installed (preferably Office 2016 or later).
* Notebook and pen for observations.

### ****Introduction****

Microsoft Office is a suite of productivity software that includes applications like MS Word, Excel, PowerPoint, and more. MS Word is widely used for creating, editing, and formatting text documents, making it an essential tool for personal and professional tasks.

### ****Procedure****

#### ****Part 1: Introduction to MS Office****

1. Open the MS Office suite and explore its applications:
   * **MS Word**: For document creation and text editing.
   * **MS Excel**: For data analysis and spreadsheet management.
   * **MS PowerPoint**: For creating presentations.
   * **MS Outlook**: For email and calendar management.
   * **MS Access**: For database management.
2. Note the common interface features across MS Office applications:
   * **Ribbon**: Contains tabs like Home, Insert, Design, etc., with various tools.
   * **Quick Access Toolbar**: Shortcuts to frequently used functions.
   * **File Menu**: For opening, saving, and printing documents.

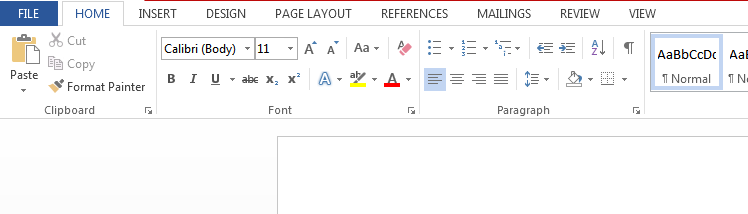


#### ****Part 2: Exploring MS Word Basic Features****

1. Open MS Word and create a new document.
2. Explore the **Home Tab** features:
   * Text formatting (font, size, bold, italic, underline).
   * Paragraph alignment (left, center, right, justify).
   * Bullets and numbering for lists.
3. Use the **Insert Tab**:
   * Insert a table, picture, or shape.
   * Add a header, footer, or page number.
4. Apply styles using the **Design Tab**:
   * Choose a document theme.
   * Apply built-in text styles for headings and paragraphs.
5. Use the **Layout Tab**:
   * Adjust page margins, orientation (portrait/landscape), and size.
   * Set line spacing and paragraph indentation.
6. Use the **Review Tab**:
   * Check spelling and grammar.
   * Use the thesaurus for synonyms.
7. Save the document in different formats:
   * Save as a Word document (.docx).
   * Save as a PDF.

### ****Observations****

|  |  |  |
| --- | --- | --- |
| **Feature** | **Functionality** | **Observations** |
| Text Formatting | Changes font style, size, and appearance. | Easy to use for highlighting key information. |
| Paragraph Alignment | Aligns text to left, right, center, or justify. | Justify is useful for professional documents. |
| Insert Tools | Adds elements like images and tables to the document. | Images can be resized and positioned easily. |
| Page Layout | Configures page size, margins, and orientation. | Flexible options for different document types. |
| Spelling & Grammar Check | Identifies and corrects language errors. | Suggests corrections for better writing. |



### ****Conclusion****

MS Word provides user-friendly tools for creating and editing professional documents. Mastering its basic features enhances productivity and document presentation.

## **LAB 5**

MS word advanced features including mail merge, table of contents, section breaks and references, headers/footers efficiently

### ****Objective****

1. To understand and apply advanced features in MS Word, including mail merge, table of contents, section breaks, references, and efficient use of headers and footers.
2. To enhance document creation and formatting skills for professional and academic purposes.

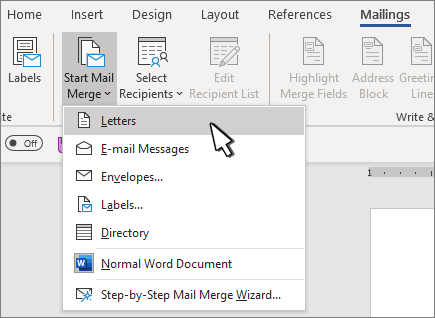
### ****Materials Required****

* A computer system with Microsoft Word (Office 2016 or later) installed.
* Sample data for mail merge (e.g., a list of names and addresses in Excel).
* Notebook and pen for notes and observations.

### ****Procedure****

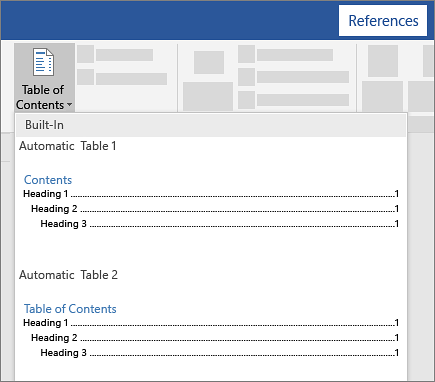
#### ****Part 1: Mail Merge****

1. Open MS Word and create a new document.
2. Go to the **Mailings Tab** and click on **Start Mail Merge**.
   * Choose a document type (e.g., letters or labels).
3. Click on **Select Recipients** and choose an existing Excel file or create a new list.
4. Insert merge fields (e.g., name, address) in the desired locations in the document.
5. Preview the results using the **Preview Results** option.
6. Complete the merge by clicking **Finish & Merge** and save or print the personalized documents.



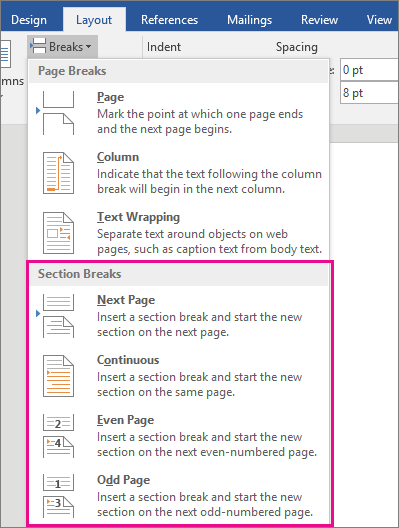
#### ****Part 2: Table of Contents****

1. Create a document with headings and subheadings using built-in styles (e.g., Heading 1, Heading 2).
2. Place the cursor at the desired location for the Table of Contents.
3. Go to the **References Tab** and click **Table of Contents**.
   * Choose an automatic style or customize the format.
4. Update the Table of Contents when changes are made by clicking **Update Table**.



#### ****Part 3: Section Breaks****

1. Divide the document into multiple sections using section breaks:
   * Go to the **Layout Tab** and click on **Breaks**.
   * Choose a type of section break (Next Page, Continuous, Even/Odd Page).
2. Format each section independently (e.g., different headers/footers, page numbering styles).

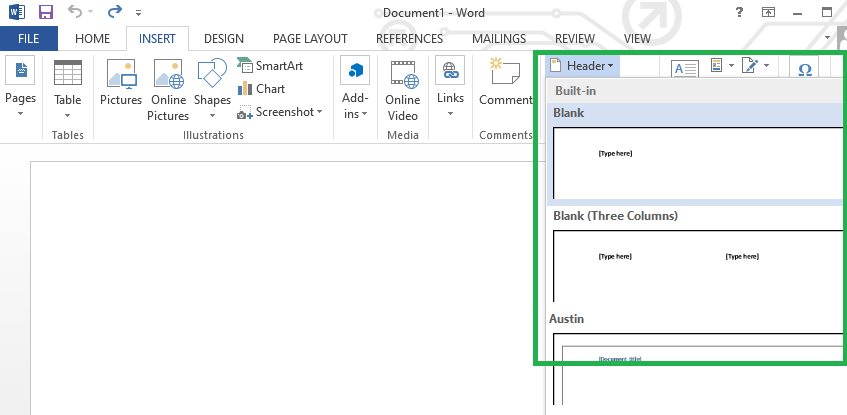


#### ****Part 4: References****

1. Go to the **References Tab** to insert citations and a bibliography:
   * Add sources using the **Manage Sources** option.
   * Insert in-text citations by selecting a source.
   * Generate a bibliography at the end of the document.
2. Use the **Insert Footnote** option for additional details or explanations.
3. Use the **Cross-reference** tool to create dynamic links within the document.

#### ****Part 5: Headers and Footers****

1. Double-click on the top (header) or bottom (footer) of the page to activate the editing area.
2. Add text, page numbers, and other elements.
3. Use the **Design Tab** to configure headers and footers:
   * Different headers/footers for odd and even pages.
   * Different first-page header/footer.
4. Close the header/footer section when finished.



### ****Observations****

| **Feature** | **Functionality** | **Observations** |
| --- | --- | --- |
| Mail Merge | Generates personalized documents from a data source. | Useful for mass mailings with consistent formatting. |
| Table of Contents | Creates a navigable summary of the document. | Updates dynamically as changes are made. |
| Section Breaks | Divides documents into independently formatted sections. | Enables unique layouts within the same document. |
| References | Manages citations, footnotes, and bibliographies. | Saves time for academic and research writing. |
| Headers/Footers | Adds consistent information across pages. | Flexible and customizable for different sections. |

### ****Conclusion****

MS Word’s advanced features streamline document creation and organization. Tools like mail merge, Table of Contents, and references enhance productivity and professionalism in various document types.

## **LAB 6**

Using Mendeley, Grammarly & PDF Element, Automation with Macros Create and run macros for repetitive tasks, PDF to word conversion, Referencing Tools & Citations, referencing tools for citations, footnotes, and endnotes

### ****Objective****

1. To understand and use tools like Mendeley, Grammarly, and PDF Element for referencing, editing, and managing documents.
2. To create and run macros for automating repetitive tasks in MS Word.
3. To perform PDF to Word conversions and utilize referencing tools for citations, footnotes, and endnotes.

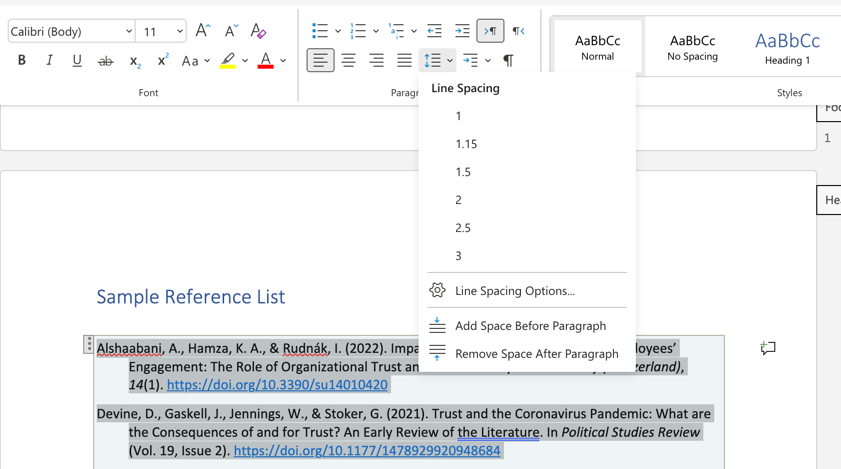
### ****Materials Required****

* A computer system with the following software installed:
  + **Mendeley Desktop** or Mendeley Reference Manager
  + **Grammarly** (Desktop or plugin for Word)
  + **PDF Element**
  + **MS Word**
* Sample document for testing and practice.

### ****Procedure****

#### ****Part 1: Using Mendeley for Referencing****

1. **Set Up Mendeley**:
   * Install Mendeley and create an account.
   * Import research articles or PDFs into the library.
2. **Insert Citations**:
   * Install the Mendeley Word plugin.
   * In MS Word, click on the **References Tab** and select **Insert Citation** from the Mendeley toolbar.
   * Search for the source in the Mendeley library and insert it into the document.
3. **Generate Bibliography**:
   * Place the cursor at the end of the document and click **Insert Bibliography**.
   * Choose a referencing style (e.g., APA, MLA).



#### ****Part 2: Using Grammarly for Writing Assistance****

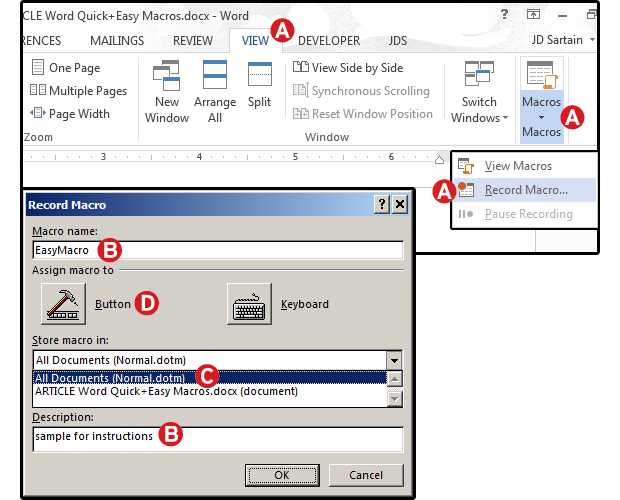
1. Install Grammarly as a desktop app or Word plugin.
2. Open a document in Word, activate Grammarly, and observe suggestions for:
   * Grammar corrections.
   * Spelling errors.
   * Style improvements (e.g., tone, conciseness).
3. Accept or reject suggestions based on the context of the document.

#### ****Part 3: Using PDF Element for PDF to Word Conversion****

1. Open PDF Element and load a sample PDF.
2. Use the **Convert** option to select the output format as Word (.docx).
3. Save the converted file and open it in MS Word for verification.

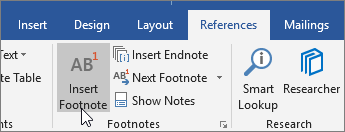
#### ****Part 4: Automation with Macros in MS Word****

1. **Enable Macros**:
   * Go to **File > Options > Trust Center > Trust Center Settings**.
   * Enable macros for the document.
2. **Create a Macro**:
   * Go to the **View Tab** and click on **Macros > Record Macro**.
   * Assign a name and optional shortcut key for the macro.
   * Perform repetitive tasks (e.g., formatting a heading, inserting text) while recording.
3. **Run the Macro**:
   * Stop the recording.
   * Run the macro using the assigned shortcut or from the Macros menu.



#### ****Part 5: Referencing Tools for Citations, Footnotes, and Endnotes****

1. **Insert Citations**:
   * Use Mendeley or the built-in **References Tab** in MS Word.
   * Choose **Manage Sources** to add or edit citations.
2. **Insert Footnotes and Endnotes**:
   * Place the cursor where the footnote or endnote is needed.
   * Click **References > Insert Footnote/Endnote**.
   * Add explanatory text or references.
3. **Update References**:
   * Ensure citations and footnotes are updated automatically when edits are made.



### ****Observations****

|  |  |  |
| --- | --- | --- |
| **Tool/Feature** | **Functionality** | **Observations** |
| Mendeley | Manages references, inserts citations, generates bibliographies. | Efficient for research and academic writing. |
| Grammarly | Provides grammar, spelling, and style suggestions. | Improved clarity and professionalism of writing. |
| PDF Element | Converts PDFs to editable Word documents. | Retains formatting in most cases. |
| Macros | Automates repetitive tasks. | Saves time and ensures consistency. |
| Footnotes/Endnotes | Adds supplementary information or detailed references. | Useful for academic and professional documents. |

### ****Conclusion****

The tools explored enhance document creation, editing, and management. Mendeley simplifies referencing, Grammarly improves writing quality, and PDF Element facilitates document conversions. Macros streamline repetitive tasks, while referencing tools ensure proper citation and formatting.

## 

## **LAB 7**

Mail managements, Collaborative Tools & Document Protection,( Track changes and comments for collaborative work, Master reviewing and comparing documents, Protect documents with passwords and control editing permissions)

### ****Objective****

1. To explore mail management and collaborative tools in MS Word.
2. To learn advanced collaboration features like track changes, comments, and document comparison.
3. To understand document protection techniques, including password protection and editing permissions.

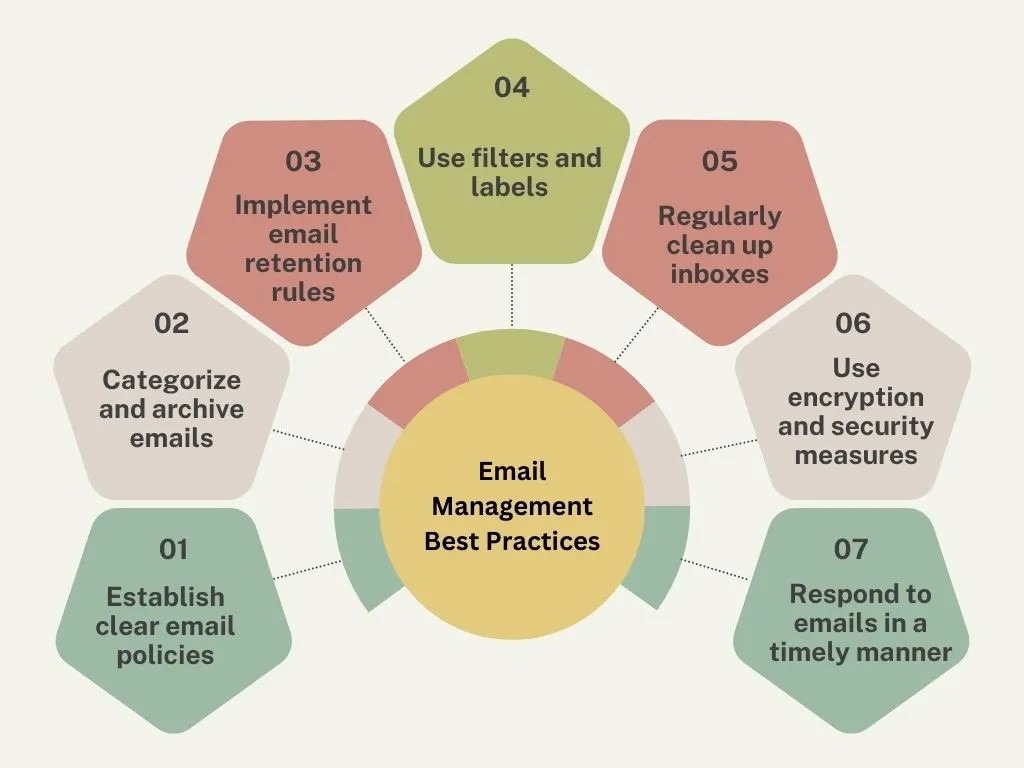
### ****Materials Required****

* A computer system with Microsoft Word (Office 2016 or later) installed.
* Email account for mail management features.
* Sample documents for collaborative editing and protection tasks.

### ****Procedure****

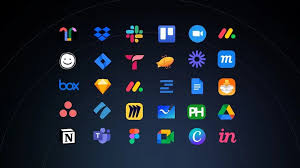
#### ****Part 1: Mail Management****

1. **Using MS Word with Email**:
   * Create a document in MS Word.
   * Click on **File > Share > Email** to directly attach the document to an email message.
2. **Sending as a PDF**:
   * Save the document as a PDF or use the **Share > Email > Send as PDF** option to send a non-editable version of the document.
3. **Mail Merge**:
   * Use the **Mailings Tab** to create personalized email messages by linking Word with Excel data for mass mailing.



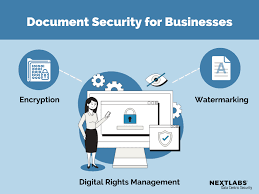
#### ****Part 2: Collaborative Tools****

1. **Track Changes**:
   * Enable **Track Changes** from the **Review Tab**.
   * Make edits to the document, and observe that all changes are highlighted with different colors and indicators.
   * Accept or reject changes using the respective options under the **Review Tab**.
2. **Adding Comments**:
   * Select text and click **Review > New Comment**.
   * Add suggestions or feedback in the comment box.
   * Resolve comments after addressing them.
3. **Comparing Documents**:
   * Open MS Word and go to **Review > Compare**.
   * Select two versions of a document and review the differences highlighted in the comparison.
4. **Using Cloud Collaboration**:
   * Save the document to OneDrive or SharePoint.
   * Share the document with collaborators by clicking **Share** in the top-right corner of Word.
   * Work on the document simultaneously with others in real-time.



#### ****Part 3: Document Protection****

1. **Password Protect a Document**:
   * Click **File > Info > Protect Document > Encrypt with Password**.
   * Enter and confirm a password to secure the document.
2. **Restrict Editing Permissions**:
   * Go to **File > Info > Protect Document > Restrict Editing**.
   * Specify the parts of the document that can be edited or set the entire document to "read-only" mode.
3. **Restrict Access**:
   * Use **File > Info > Protect Document > Restrict Access** (requires integration with Microsoft Azure).
   * Control who can open, edit, or copy the document.



### ****Observations****

|  |  |  |
| --- | --- | --- |
| **Feature** | **Functionality** | **Observations** |
| Mail Management | Direct integration with email for sharing documents. | Simplifies sharing of documents via email. |
| Track Changes | Highlights edits made by different collaborators. | Ensures transparency and accountability. |
| Comments | Provides a platform for feedback and discussion. | Enhances collaboration and resolves queries. |
| Document Comparison | Compares differences between two versions. | Useful for reviewing revisions. |
| Password Protection | Encrypts documents to prevent unauthorized access. | Adds an essential security layer. |
| Restrict Editing | Limits who can edit or modify a document. | Ensures document integrity during sharing. |

### ****Conclusion****

MS Word provides powerful features for mail management, collaborative work, and document protection. Features like track changes, comments, and document comparison streamline teamwork, while password protection and editing restrictions enhance security.

## **LAB 8**

Introduction to Excel and Basic Skills,Intermediate Formulas and Functions (Working with Multiple Worksheets, Using Functions (MIN, MAX, COUNT, IF, etc.)

## - Introduction to Cell Referencing: Relative, Absolute, and Mixed) Introduction to Sorting and Filtering Data

### ****Objective****

1. To understand the basic structure and functionality of Microsoft Excel.
2. To learn intermediate Excel skills, including working with multiple worksheets and using essential functions.
3. To gain knowledge of cell referencing and techniques for sorting and filtering data.

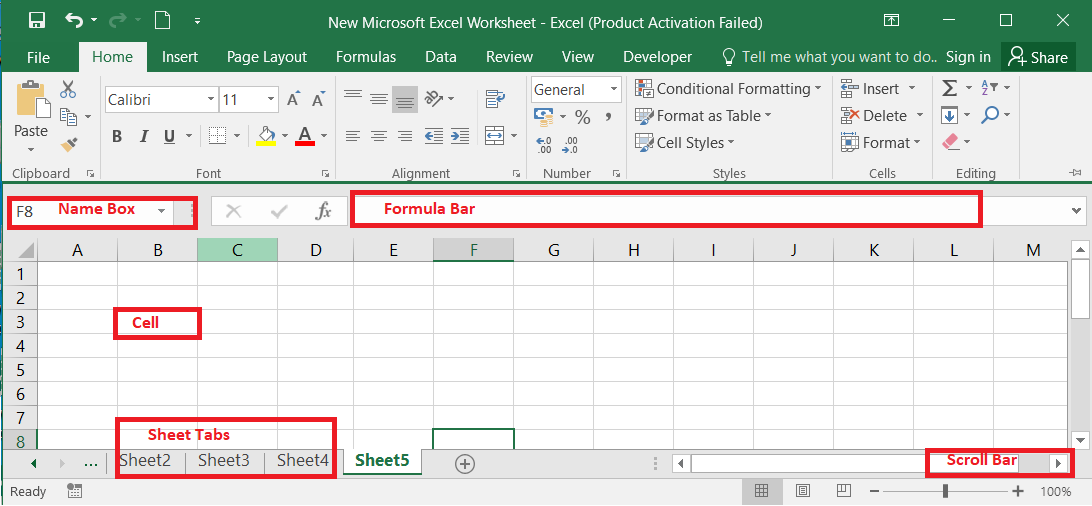
### ****Materials Required****

* A computer system with Microsoft Excel (Office 2016 or later) installed.
* Sample data for practice.

### ****Procedure****

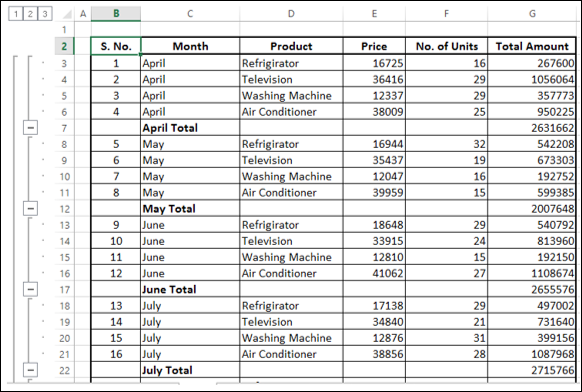
#### ****Part 1: Introduction to Excel and Basic Skills****

1. **Navigating the Excel Interface**:
   * Open Excel and familiarize yourself with the Ribbon, Formula Bar, and Worksheets.
   * Learn to enter data into cells, adjust column width, and format cells.
2. **Basic Operations**:
   * Perform basic arithmetic operations (addition, subtraction, multiplication, and division) using formulas.
   * Example: =A1+B1 to add values in cells A1 and B1.
3. **Saving and Opening Files**:
   * Save the workbook in .xlsx format.
   * Practice opening and saving files in different formats, such as .csv and .xls.



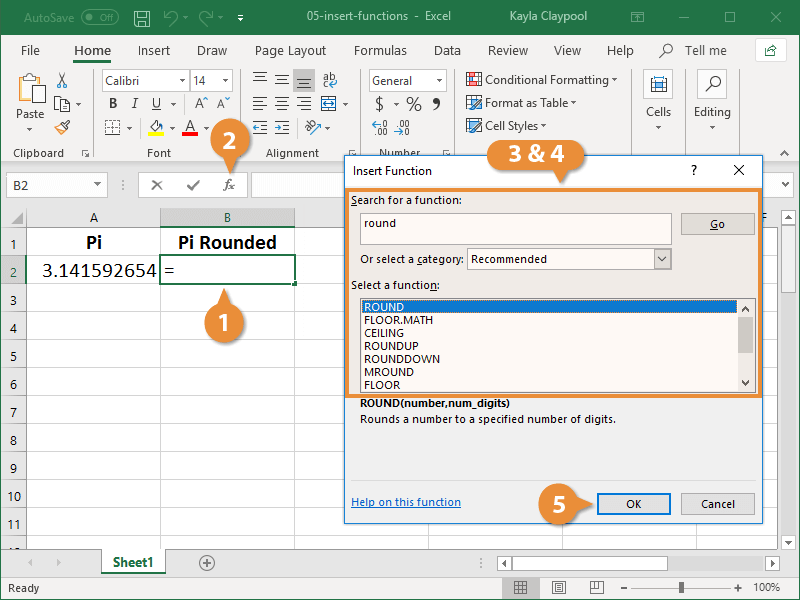
#### ****Part 2: Working with Multiple Worksheets****

1. **Adding and Renaming Worksheets**:
   * Click the "+" sign to add new worksheets.
   * Rename worksheets by double-clicking the tab and typing a new name.
2. **Linking Data Across Worksheets**:
   * Enter data in one worksheet and reference it in another.
   * Example: =Sheet1!A1 to reference cell A1 from Sheet1.
3. **Consolidating Data**:
   * Use the **Consolidate** tool (under the Data tab) to combine data from multiple worksheets.



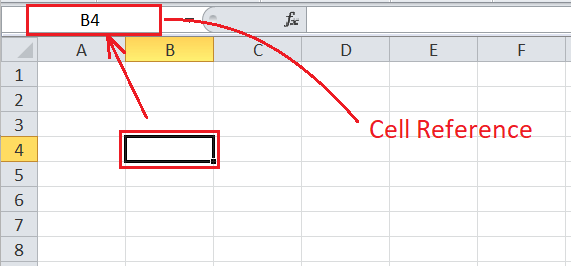
#### ****Part 3: Using Functions****

1. **Basic Functions**:
   * =MIN(range) to find the smallest value.
   * =MAX(range) to find the largest value.
   * =COUNT(range) to count numeric entries.
2. **Conditional Functions**:
   * Use =IF(condition, value\_if\_true, value\_if\_false) to apply logical tests.
   * Example: =IF(A1>50, "Pass", "Fail").



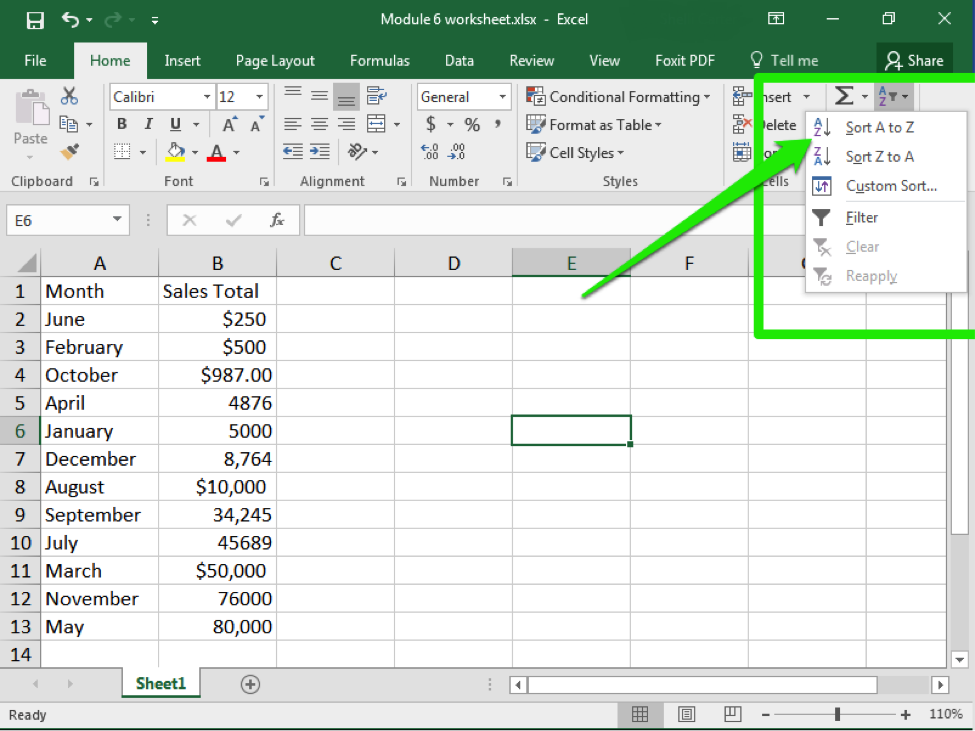
#### ****Part 4: Introduction to Cell Referencing****

1. **Relative Referencing**:
   * Use cell references that change when copied to another location.
   * Example: Copying =A1+B1 to the next row changes it to =A2+B2.
2. **Absolute Referencing**:
   * Fix a cell reference using $.
   * Example: $A$1 ensures the reference does not change when copied.
3. **Mixed Referencing**:
   * Lock either the row or column.
   * Example: $A1 locks the column, and A$1 locks the row.



#### ****Part 5: Sorting and Filtering Data****

1. **Sorting Data**:
   * Select a range of data.
   * Go to the **Data Tab** and click **Sort**.
   * Sort in ascending or descending order based on one or more columns.
2. **Filtering Data**:
   * Use the **Filter** tool under the Data tab to add drop-down menus for columns.
   * Filter data based on specific criteria (e.g., values greater than 50).



### ****Observations****

|  |  |  |
| --- | --- | --- |
| **Feature/Function** | **Description** | **Observations** |
| Basic Arithmetic Operations | Performs simple calculations in Excel. | Useful for basic data analysis. |
| Multiple Worksheets | Allows organization of data across sheets. | Simplifies handling of large datasets. |
| MIN, MAX, COUNT Functions | Finds minimum, maximum, and counts data entries. | Essential for summarizing data. |
| IF Function | Implements logical conditions in calculations. | Versatile for decision-making tasks. |
| Cell Referencing | Links and locks cell references for efficient formulas. | Reduces errors in repetitive calculations. |
| Sorting and Filtering | Organizes and analyzes data based on criteria. | Makes large datasets manageable. |

### ****Conclusion****

The lab introduced essential Excel skills for data entry, organization, and analysis. Intermediate features like multiple worksheets, logical functions, and data filtering enhance efficiency and provide powerful tools for handling data.

## **LAB 9**

Data Visualization and Advanced Features (Creating Charts and Graphs (Bar, Line, Pie),

Conditional Formatting,

Create Bar code, QR code

Working with Tables and Data Validation)

## Also add frequency function and Statistical analysis functions

### ****Objective****

1. To learn data visualization techniques such as creating charts and graphs in Excel.
2. To understand the use of conditional formatting, barcodes, QR codes, tables, and data validation.
3. To perform frequency analysis and apply statistical functions for data analysis.

### ****Materials Required****

* A computer system with Microsoft Excel (Office 2016 or later) installed.
* Sample datasets for visualization and analysis.
* Barcode/QR code add-ins (optional).

### ****Procedure****

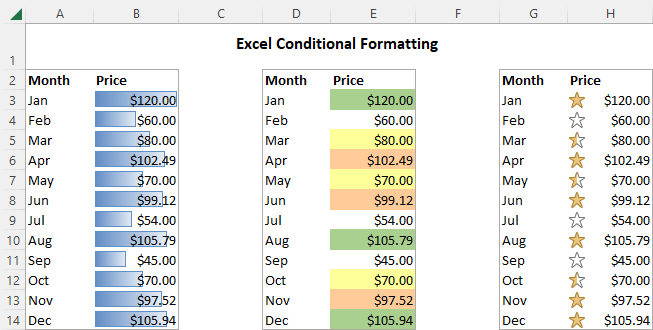
#### ****Part 1: Creating Charts and Graphs****

1. **Bar Chart**:
   * Enter sample data in two columns (e.g., categories and values).
   * Select the data and go to the **Insert Tab**.
   * Choose **Bar Chart** and select the desired style.
2. **Line Chart**:
   * Use time-series data (e.g., months and sales).
   * Select the data and insert a **Line Chart** from the **Insert Tab**.
3. **Pie Chart**:
   * Use categorical data with percentages.
   * Insert a **Pie Chart** and customize it by adding labels and legends.



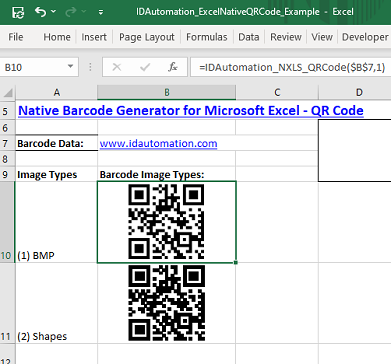
#### ****Part 2: Conditional Formatting****

1. Select a range of data and go to **Home > Conditional Formatting**.
2. Apply formatting rules, such as:
   * Highlighting cells greater than a specified value.
   * Adding data bars, color scales, or icon sets for visual emphasis.
3. Observe changes as you modify data.



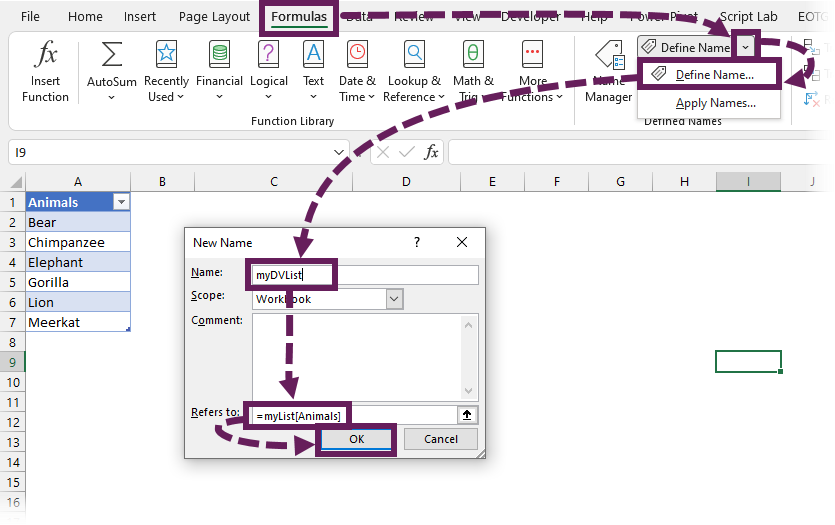
#### ****Part 3: Creating Barcodes and QR Codes****

1. **Barcodes**:
   * Install a barcode add-in or use online barcode generators.
   * Enter data (e.g., product IDs) and convert it to barcodes.
2. **QR Codes**:
   * Use a QR code generator add-in or a tool like Google Sheets QR Code formula.
   * Example for Excel with an add-in: Enter data (e.g., URLs) and generate QR codes linked to them.



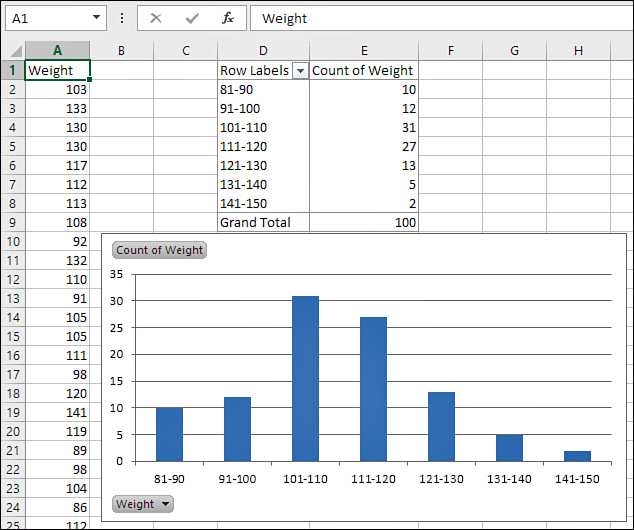
#### ****Part 4: Working with Tables and Data Validation****

1. **Creating Tables**:
   * Select a range of data and go to **Insert > Table**.
   * Customize the table style and use table-specific tools (e.g., filters, sorting).
2. **Data Validation**:
   * Select a cell or range and go to **Data > Data Validation**.
   * Create rules to restrict input (e.g., only numbers between 1 and 100).
   * Add custom error messages for invalid entries.



#### ****Part 5: Frequency Function and Statistical Analysis****

1. **Frequency Function**:
   * Enter a dataset and define bins for grouping.
   * Use the =FREQUENCY(data\_array, bins\_array) function to calculate frequency distribution.
   * Apply it as an array formula (Ctrl + Shift + Enter for older Excel versions).
2. **Statistical Analysis Functions**:
   * =AVERAGE(range) for mean.
   * =MEDIAN(range) for median.
   * =MODE.SNGL(range) for mode.
   * =STDEV.P(range) for standard deviation (population).
   * =VAR.P(range) for variance (population).



### ****Observations****

|  |  |  |
| --- | --- | --- |
| **Feature** | **Functionality** | **Observations** |
| Bar, Line, Pie Charts | Visualizes data in various formats. | Helps in analyzing trends and distributions. |
| Conditional Formatting | Highlights data based on rules. | Improves data readability and focus. |
| Barcodes and QR Codes | Generates scannable codes from data. | Useful for product tracking and linking. |
| Tables | Organizes data with built-in filters and formatting. | Enhances data management and sorting. |
| Data Validation | Ensures accurate and restricted data input. | Prevents errors in large datasets. |
| Frequency Analysis | Groups data into intervals. | Simplifies distribution analysis. |
| Statistical Functions | Calculates key metrics like mean, median, and variance. | Crucial for detailed data analysis. |

### ****Conclusion****

Excel provides powerful tools for data visualization and analysis. Features like charts, conditional formatting, and statistical functions simplify complex data handling, while tools like barcodes, QR codes, and data validation enhance functionality and accuracy.

## **LAB 10**

## Advanced Tools and Final Project (Introduction to Pivot Tables, Using VLOOKUP and HLOOKUP, Introduction to Macros, Final Project: Analyze and Visualize Data Set Using Skills Learned Throughout the Course)

### ****Objective****

1. To understand and apply advanced Excel tools, including Pivot Tables, VLOOKUP, HLOOKUP, and Macros.
2. To analyze and visualize a dataset using the skills learned throughout the course.
3. To create a comprehensive final project that integrates all learned techniques for effective data analysis and visualization.

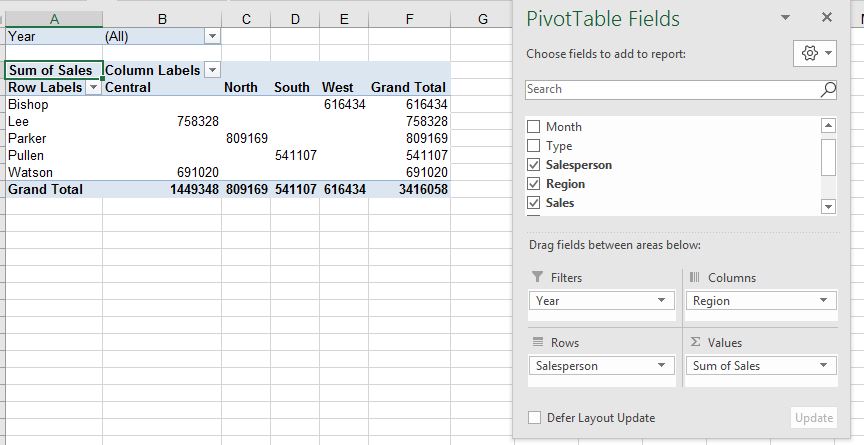
### ****Materials Required****

* A computer system with Microsoft Excel (Office 2016 or later) installed.
* Sample dataset for analysis.
* Access to online resources for learning Excel functions.

### ****Procedure****

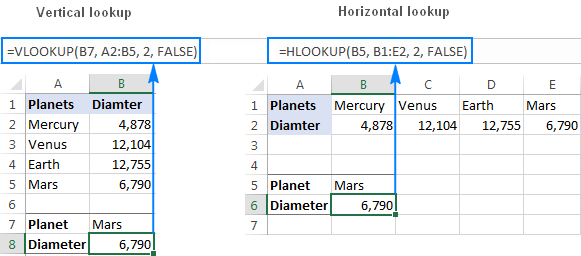
#### ****Part 1: Introduction to Pivot Tables****

1. **Create a Pivot Table**:
   * Open Excel and load a sample dataset (e.g., sales data).
   * Select the data range and go to **Insert > Pivot Table**.
   * Choose where to place the Pivot Table (either in a new sheet or existing sheet).
2. **Configure Pivot Table**:
   * Drag fields into Rows, Columns, and Values to summarize data.
   * For example, place "Region" in Rows and "Sales" in Values to analyze sales by region.
3. **Apply Filters and Sorting**:
   * Use the **Filter** option to narrow down the data (e.g., filter by date or category).
   * Sort the results to view data in ascending or descending order.
4. **Pivot Chart**:
   * Convert the Pivot Table into a Pivot Chart to visually represent the data.
   * Choose a suitable chart type like a bar or line chart to display trends.



#### ****Part 2: Using VLOOKUP and HLOOKUP****

1. **VLOOKUP (Vertical Lookup)**:
   * In a new sheet, create a reference table with two columns (e.g., Product ID and Product Name).
   * Use the formula =VLOOKUP(lookup\_value, table\_array, col\_index\_num, [range\_lookup]).
   * Example: =VLOOKUP(A2, B1:C10, 2, FALSE) to retrieve the product name based on a Product ID.
2. **HLOOKUP (Horizontal Lookup)**:
   * Similar to VLOOKUP, but used for horizontal data ranges.
   * Example: =HLOOKUP(A2, B1:F5, 2, FALSE) to retrieve information from a row in a horizontal range.



#### ****Part 3: Introduction to Macros****

1. **Recording a Macro**:
   * Go to the **View Tab** and click **Macros > Record Macro**.
   * Assign a name, description, and shortcut key for the macro.
   * Perform a repetitive task (e.g., formatting cells, inserting data) while recording the macro.
2. **Running a Macro**:
   * Stop the macro recording.
   * Run the macro by using the shortcut key or through **View > Macros > View Macros**.
3. **Editing a Macro**:
   * Open the Visual Basic for Applications (VBA) editor via **Developer Tab > Visual Basic**.
   * Edit the macro code to modify or extend its functionality.
4. **Automating Tasks**:
   * Use the recorded macros to automate tasks like generating reports or formatting data consistently.

#### ****Part 4: Final Project: Analyze and Visualize Data Set****

1. **Dataset Selection**:
   * Choose a real-world dataset for analysis (e.g., sales data, financial data, customer data).
   * Import the dataset into Excel.
2. **Data Preparation**:
   * Clean and organize the dataset (e.g., remove duplicates, fix errors, and ensure consistency).
3. **Applying Pivot Tables**:
   * Create a Pivot Table to summarize key metrics (e.g., total sales, average revenue, customer count).
4. **Using VLOOKUP and HLOOKUP**:
   * Use VLOOKUP to link and retrieve data from related tables.
   * Apply HLOOKUP for analyzing horizontal data arrangements.
5. **Conditional Formatting and Charts**:
   * Use conditional formatting to highlight key trends and outliers in the data.
   * Create charts (e.g., bar, line, pie) to visualize the dataset effectively.
6. **Macros for Automation**:
   * Automate repetitive tasks such as formatting, data entry, or report generation using macros.
7. **Analysis and Insights**:
   * Use statistical functions (e.g., AVERAGE, COUNT, MIN, MAX) to analyze the data.
   * Draw conclusions and insights based on the analysis, such as trends, anomalies, or areas for improvement.
8. **Final Report**:
   * Compile a report summarizing the data analysis process, key findings, and visualizations.

### ****Observations****

|  |  |  |
| --- | --- | --- |
| **Feature/Function** | **Functionality** | **Observations** |
| Pivot Tables | Summarizes large datasets and groups data dynamically. | Efficient for aggregating and analyzing data. |
| VLOOKUP and HLOOKUP | Retrieves data from tables based on specific criteria. | Useful for linking multiple data sources. |
| Macros | Automates repetitive tasks in Excel. | Saves time and ensures consistency. |
| Data Analysis and Charts | Visualizes and analyzes data effectively. | Enhances data understanding and decision-making. |
| Conditional Formatting | Highlights data based on criteria for better visibility. | Focuses attention on key data points. |

### ****Conclusion****

This lab explored advanced Excel features that enhance data analysis and automation. Pivot Tables, VLOOKUP, HLOOKUP, and Macros provide powerful tools for analyzing and visualizing datasets. The final project demonstrated the application of these tools in real-world scenarios, providing a comprehensive understanding of Excel’s capabilities for data management and decision-making.