

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

IN THE NAME OF ALLAH, THE ALL-MERCIFUL, THE ALL-COMPASSIONATE

# Information and Communication Technologies



**PUNJAB CURRICULUM AND  
TEXTBOOK BOARD, LAHORE**

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# Mastering Microsoft Word and Powerpoint

### Student Learning Outcomes:

**By the end of this chapter, students will be able to:**

- Understand the basic functions of word processing and presentation software, including document and slide formatting, text alignment, font styles, and layout organization.
- Create and format documents and presentations in MS Word and PowerPoint by applying text and visual elements (images, tables, shapes), organizing slides with appropriate layouts and themes, and enhancing presentations with transitions and animations.

Microsoft Word and PowerPoint are essential tools for creating well-structured documents and engaging presentations. Microsoft Word helps in writing, formatting, and organizing text efficiently, making it useful for assignments, reports, and letters. On the other hand, PowerPoint is a dynamic tool for designing visual presentations, allowing users to integrate text, images, charts, animations, and transitions to convey ideas effectively. This chapter provides a step-by-step guide to mastering both applications, covering essential features such as text formatting, inserting tables and images, adjusting layouts, and applying animations.

## 1.1 Getting Started with Microsoft Word

Microsoft Word is a word-processing software that allows users to create, edit, and format documents easily. It is commonly used for writing assignments, reports, letters, and other text-based documents. Unlike handwritten notes, Word provides tools to organize text neatly, check spelling errors, and enhance content with images, tables, and designs. This makes documents look professional and easy to read. Before using Word's features, it is important to know how to open the program and start a new document.

### 1.1.1 Opening Microsoft Word

To open Microsoft Word:

- Click on the Start Menu (Windows logo) at the bottom-left corner of the screen.

- Search for Microsoft Word in the search bar as shown in Figure 1.1.
- Click on the Word application when it appears in the results.
- Wait for the program to load, and you will see a welcome screen with
- different options.

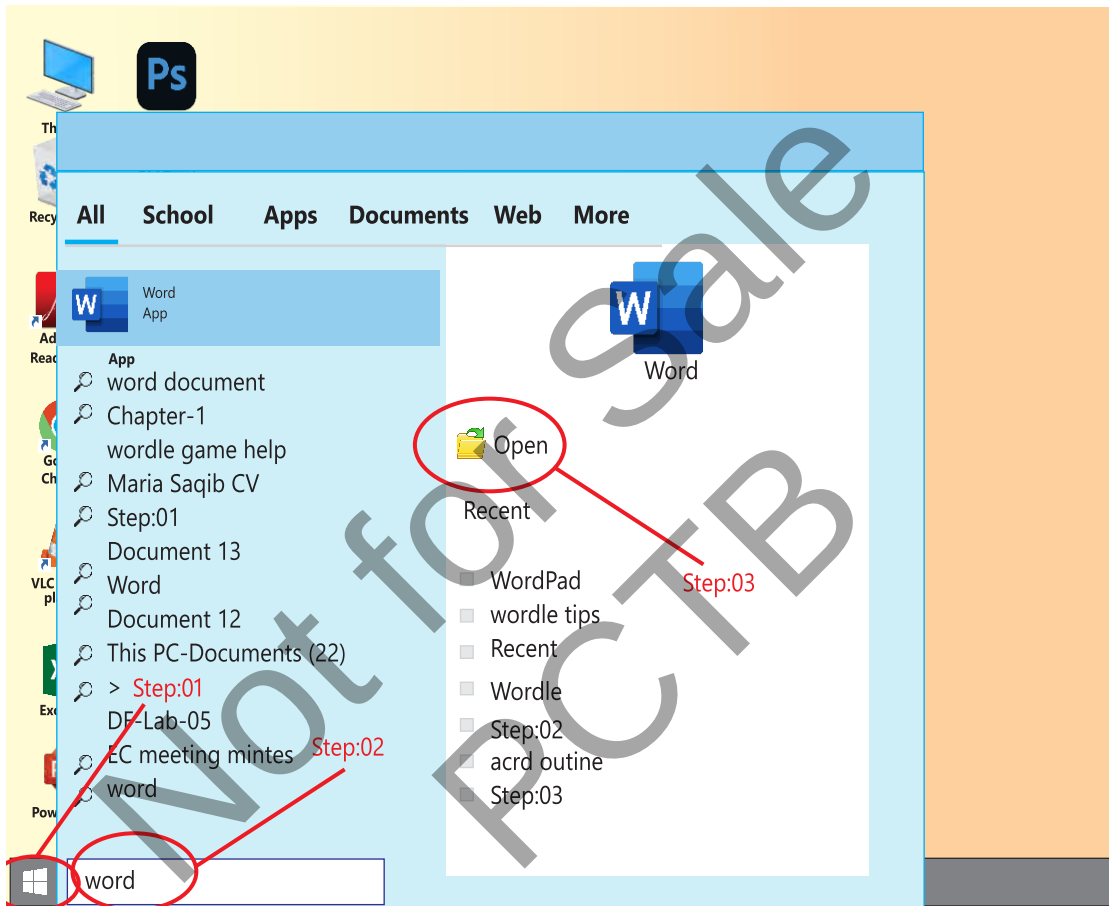


Figure 1.1: Opening Microsoft Word

## 1.2 Creating a New Document

To create a new document:

- Click on Blank Document on the welcome screen.
- A new empty page will appear where you can start typing.
- The blinking cursor on the screen shows where the text will be inserted.
- You are now ready to use Microsoft Word for writing and formatting.

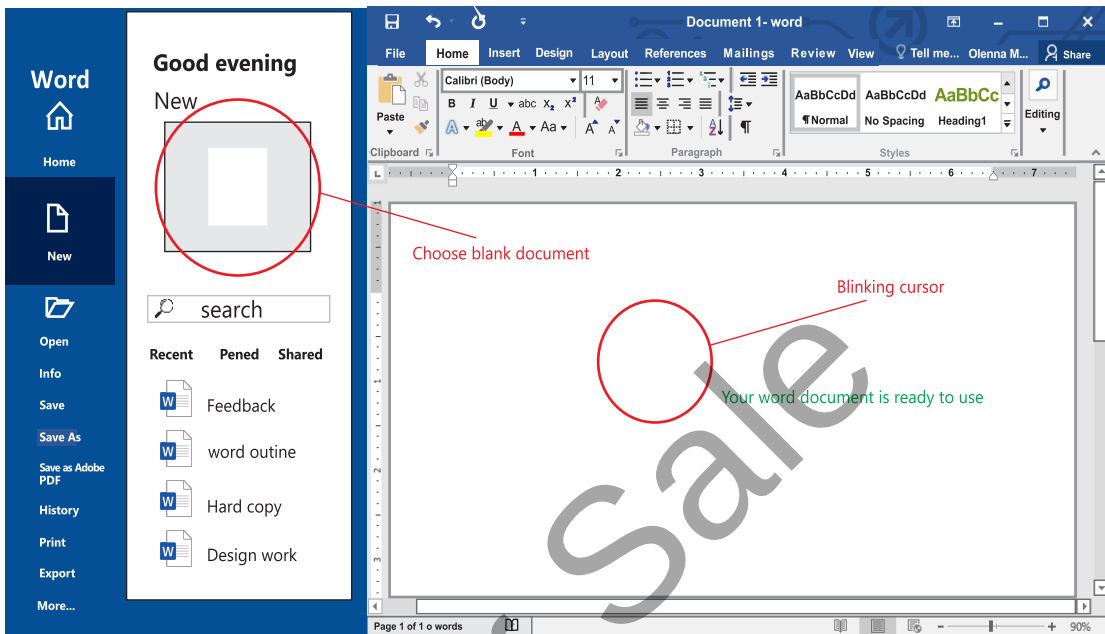


Figure 1.2: Creating WORD document

Every time you work on a document, it is important to save your work regularly to avoid losing progress. You can do this by clicking on the **File menu** > **Save As** and choosing a location on your computer.

## 1.3 Understanding the Word Interface

Microsoft Word has several important components that help in editing and formatting documents. Let's explore them one by one.

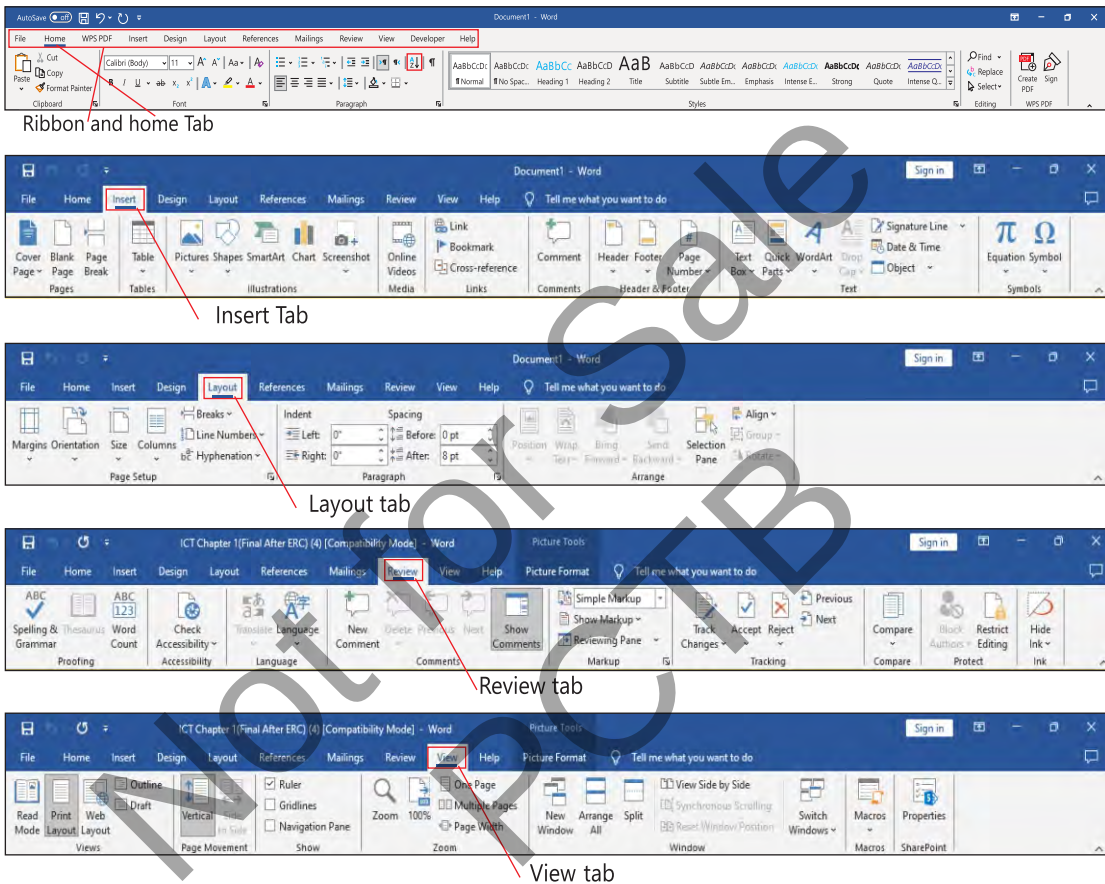
### 1.3.1 Ribbon and Tabs

The **Ribbon** is the top section of the Word window that contains all the tools and commands. It is divided into **Tabs**, with each tab having a specific set of functions as shown in Figure 1.3.

- **Home Tab:** Contains basic text formatting options such as font size, bold, italics, and text alignment.
- **Insert Tab:** Allows users to add images, tables, and shapes to a document.
- **Layout Tab:** Helps in adjusting margins, orientation (portrait or landscape), and page size.
- **Review Tab:** Includes spelling and grammar check, word count, and comment features.

- **View Tab:** This lets users change the way a document appears on the screen.

Each tab contains distinct groups of commands that help users to perform various tasks easily.

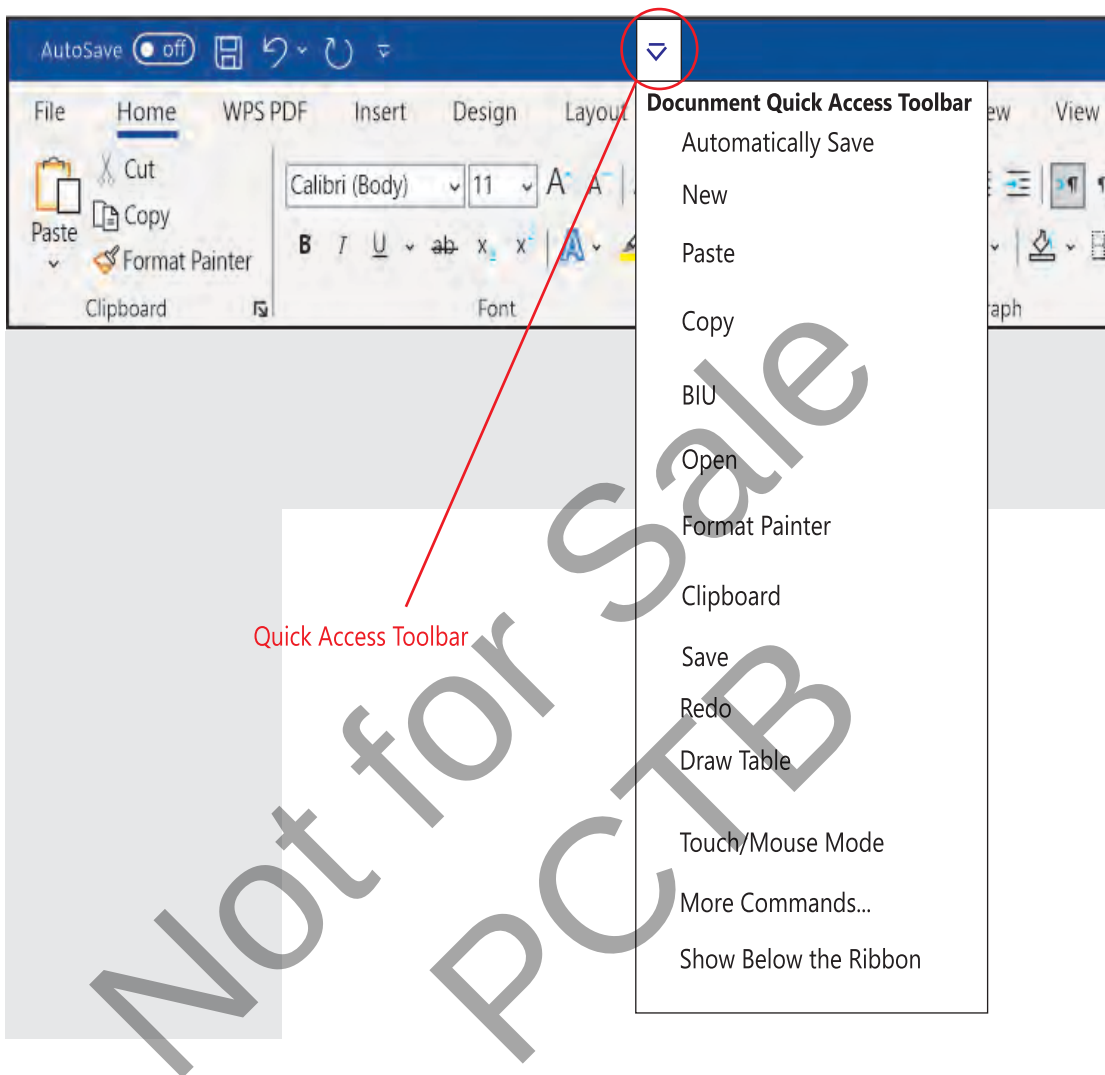


**Figure 1.3: Ribbons and tabs of MS WORD.**

### 1.3.2 Quick Access Toolbar

The Quick Access Toolbar is a small section located at the top-left corner of the window as shown in. It contains frequently used commands like:

- **Save:** Allows users to store their work.
- **Undo:** Reverses the last action if a mistake is made.
- **Redo:** Restores an action that was undone.
- **Print:** Let users prepare a document for printing.



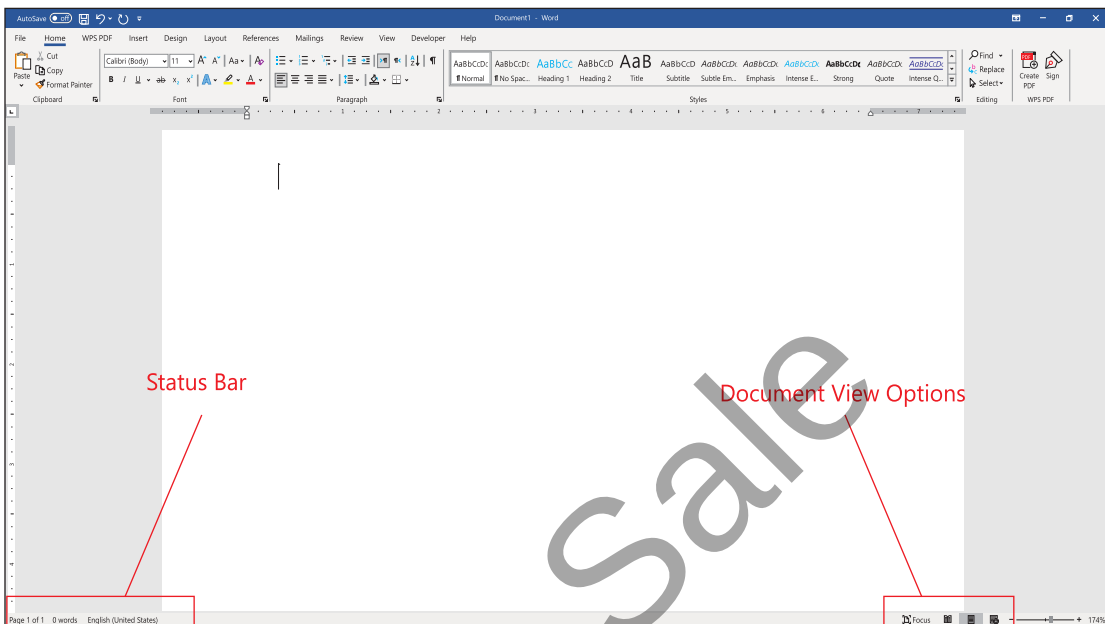
**Figure 1.4:** Opening Quick Access Toolbar

This toolbar helps in quickly performing common tasks without searching through different tabs.

### 1.3.3 Status Bar and Document View Options

At the bottom of the Word window, the Status Bar provides key details about the document, such as:

- **Page Count:** Shows how many pages are in the document.
- **Word Count:** Displays the total number of words typed.
- **Language:** Indicates the selected language for spell check.



**Figure 1.5: Status bar and document view options**

Next to the Status Bar, the Document View Options allow users to change how the document appears on the screen. The common views include as shown in Figure 1.5:

- **Print Layout:** Displays the document as it would appear when printed.
- **Read Mode:** Adjusts the layout for easier reading on a screen.
- **Web Layout:** Shows how the document would look if published online.

## 1.4 Home Tab

The Home Tab is one of the most important sections in Microsoft Word. It contains tools that help in writing, editing, and formatting text. These tools make documents look well-organized, professional, and easy to read. In this section, we will explore three key groups in the **Home Tab**:

- **Font Group** to change the style and appearance of text.
- **Paragraph Group** to organize and align text in a structured way.
- **Styles Group** to apply predefined or custom text formatting styles.

### 1.4.1 Font Group

The **Font Group** helps in making text clear, readable, and attractive. It allows users to change the way the text looks by adjusting the font style and color as shown in Figure 1.6.

## Changing Font Type, Size, and Color

- **Font Type:** A font is the style of the letters in a document. For example, "Arial" and "Times New Roman" are different fonts.
- **Font Size:** This determines how big or small the text appears. Headings are usually written in a bigger size, while normal text is smaller.

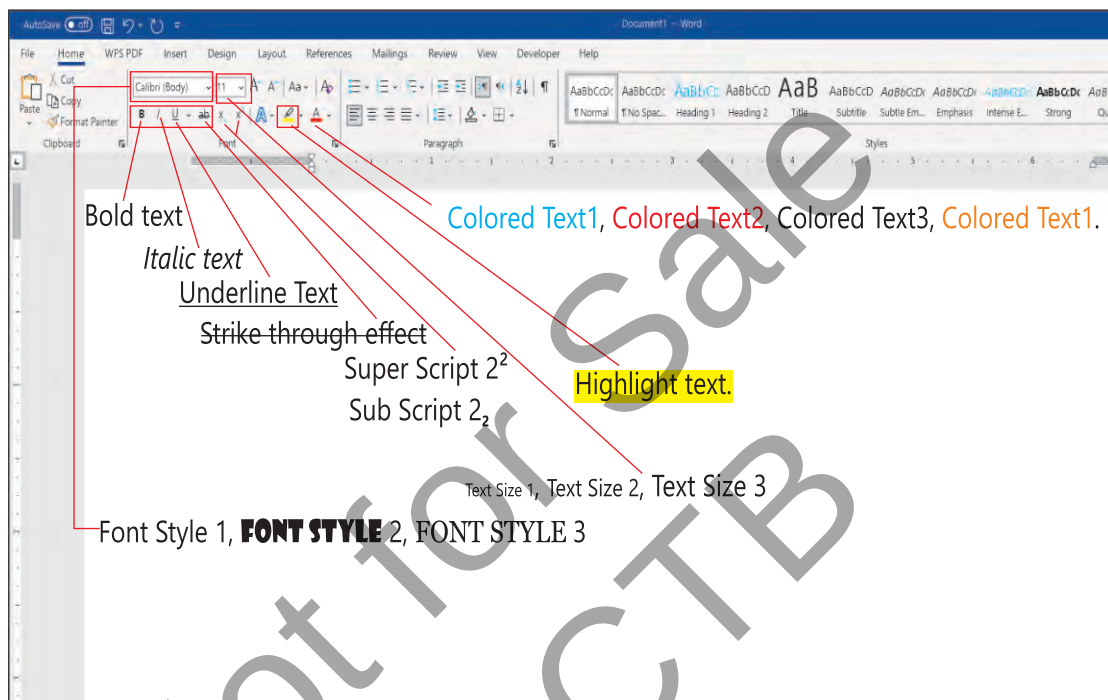


Figure 1.6: Text formatting in MS WORD

- **Font Color:** This allows users to change the color of the text. Different colors can be used to highlight important points.

## Applying Bold, Italics, Underline, and Strikethrough

These tools help in emphasizing important words or sentences:

- **Bold (B):** Makes text darker and thicker for emphasis. Example: **Important Notice**
- **Italics (I):** Slants the text for a stylish effect. Example: *Scientific names of plants*
- **Underline (U):** Adds a line under the text to highlight it. Example: Exam Dates: March 10, 2025
- **Strikethrough (abc):** Draws a line through text to indicate something is removed or no longer needed. Example: ~~Old Prices~~ New Prices



## Highlighting Text and Changing Text Case

- **Highlighting Text:** Adds a background color behind the text, just like using a highlighter in a notebook. This helps important words stand out.
- **Changing Text Case:** Allows users to convert text into UPPERCASE, lowercase, or Capitalized Case without retyping.

### 1.4.2 Text Formatting Using Shortcuts?

Microsoft Word provides keyboard shortcuts for quick and efficient text formatting. Instead of using the ribbon and menus, you can use shortcut keys to apply bold, italics, underline, change font, and adjust text alignment instantly. These shortcuts save time and make document editing faster and easier.

Below is a complete list of text formatting shortcuts for Microsoft Word:

#### Basic Text Formatting Shortcuts

Following shortcuts are used to perform basic text formatting.

| Action                                         | Shortcut (Windows) |
|------------------------------------------------|--------------------|
| Bold Text                                      | Ctrl + B           |
| Italic Text                                    | Ctrl + I           |
| Underline Text                                 | Ctrl + U           |
| Strikethrough                                  | Ctrl + Shift + X   |
| Subscript (small text below line)              | Ctrl + =           |
| Superscript (small text above line)            | Ctrl + Shift + =   |
| Highlight Text                                 | Ctrl + Alt + H     |
| Change Font                                    | Ctrl + Shift + F   |
| Change Font Size                               | Ctrl + Shift + P   |
| Increase Font Size                             | Ctrl + }           |
| Decrease Font Size                             | Ctrl + {           |
| Change Case (Uppercase, Lowercase, Title Case) | Shift + F3         |

**Table 1.1:** Shortcuts for basic text formatting

**Example:** If you type hello world and press Shift + F3, it will toggle between:

- ✓ hello world (lowercase)
- ✓ HELLO WORLD (UPPERCASE)
- ✓ Hello World (Title Case)

## Undo, Redo, and Copy-Paste Shortcuts

Following shortcuts are used to perform basic copy, paste, undo, redo and cut operations on text.

| Action           | Shortcut (Windows) |
|------------------|--------------------|
| Undo Last Action | Ctrl + Z           |
| Redo Last Action | Ctrl + Y           |
| Copy Text        | Ctrl + C           |
| Cut Text         | Ctrl + X           |
| Paste Text       | Ctrl + V           |

**Table 1.2: Copy, paste, undo, redo, and cut operations shortcuts**

### Activity 1: Speed Formatting Challenge (Text Formatting & Styles)

**Objective:** Improve text formatting skills using the Home Tab features.

**Instructions:**

Provide students with a plain text paragraph (no formatting applied).

**Ask them to:**

- Change the font type, size, and color.
- Apply bold, italics, and underline to important words.
- Adjust text alignment (left, center, right, justify).
- Use predefined styles for headings and subheadings.

## 1.4.3 Paragraph Group

The Paragraph Group contains tools that help in arranging and organizing text properly. A well-structured paragraph makes reading easier and improves document presentation as shown in Figure 1.7.

### Aligning Text (Left, Center, Right, Justify)

Alignment refers to how text is positioned on the page:

- **Left Align:** Text starts from the left margin of the page (Used for most documents).
- **Center Align:** Text is placed in the middle of page (Used for titles and headings).
- **Right Align:** Text is placed towards the right margin of the page (Used for writing dates and signatures).
- **Justify:** Text is spread evenly across the page, giving a neat and professional look (Used in newspapers and magazines).

## Adjusting Line Spacing

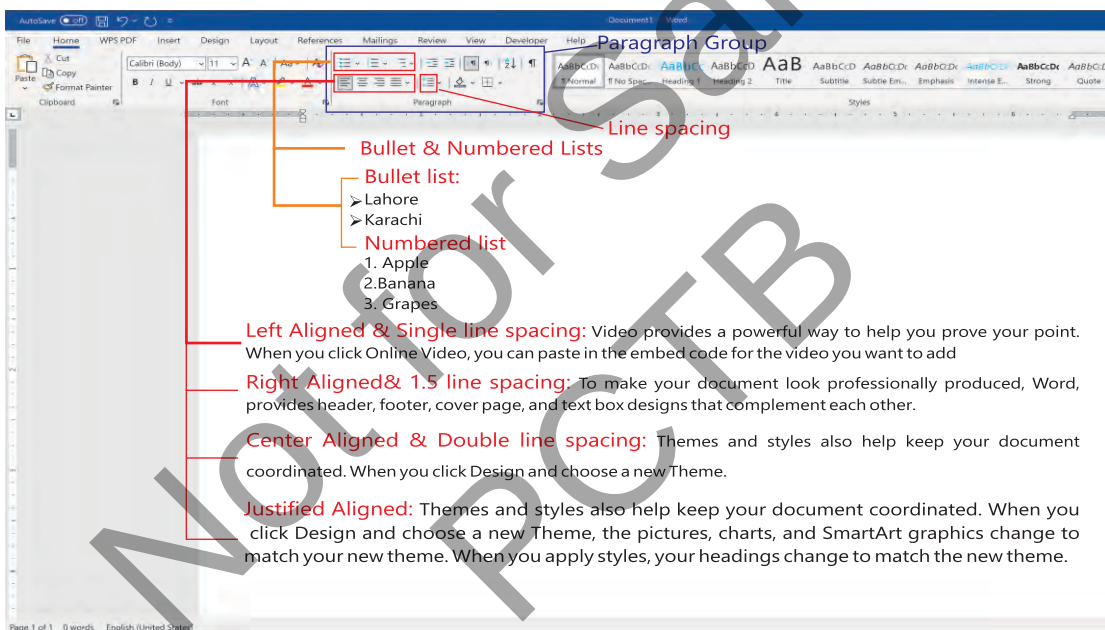
Line spacing determines the amount of space between lines of text.

- **Single spacing:** Keeps lines close together.
- **1.5 spacing:** Provides a little more space, making text easier to read.
- **Double spacing:** Leaves extra space between lines, commonly used in reports and assignments.

## Adding Bullets and Numbered Lists

Lists help in organizing information clearly:

- **Bullets** (•, ■, ✓) used for unordered lists, like shopping lists or key points.
- **Numbered Lists** (1, 2, 3) used when writing steps or instructions.



**Figure 1.7:** Creating numbered or bullet lists

### Do you Know?

Microsoft Word has a hidden Clipboard feature that allows you to store multiple copied items at once! Instead of copying and pasting one item at a time. **How to access it?**

Press Ctrl + C twice OR go to the Home Tab → Clipboard Group → Click the small arrow.

The Clipboard Pane will appear on the left, showing up to 24 copied items.

Click any item to paste it instantly!

### 1.4.4 Paragraph Group Using Shortcuts

Microsoft Word allows users to quickly structure text and format paragraphs using keyboard shortcuts. Using these shortcuts makes editing documents faster and more efficient.

#### Text Alignment Shortcuts

Following shortcuts are used to align text using keyboard shortcuts.

| Alignment Type | Shortcut (Windows) |
|----------------|--------------------|
| Align Left     | Ctrl + L           |
| Align Center   | Ctrl + E           |
| Align Right    | Ctrl + R           |
| Justify Text   | Ctrl + J           |

Table 1.3: Text alignment shortcuts

#### Paragraph Formatting Shortcuts

Following shortcuts are used to perform paragraph shortcuts.

| Alignment Type        | Shortcut (Windows)      |
|-----------------------|-------------------------|
| Increase Line Spacing | Ctrl + 2 (Double Space) |
| Single Line Spacing   | Ctrl + 1                |
| 1.5 Line Spacing      | Ctrl + 5                |
| Add Bullet Points     | Ctrl + Shift + L        |
| Add Numbered List     | Ctrl + Shift + N        |

Table 1.4: Paragraph formatting shortcuts

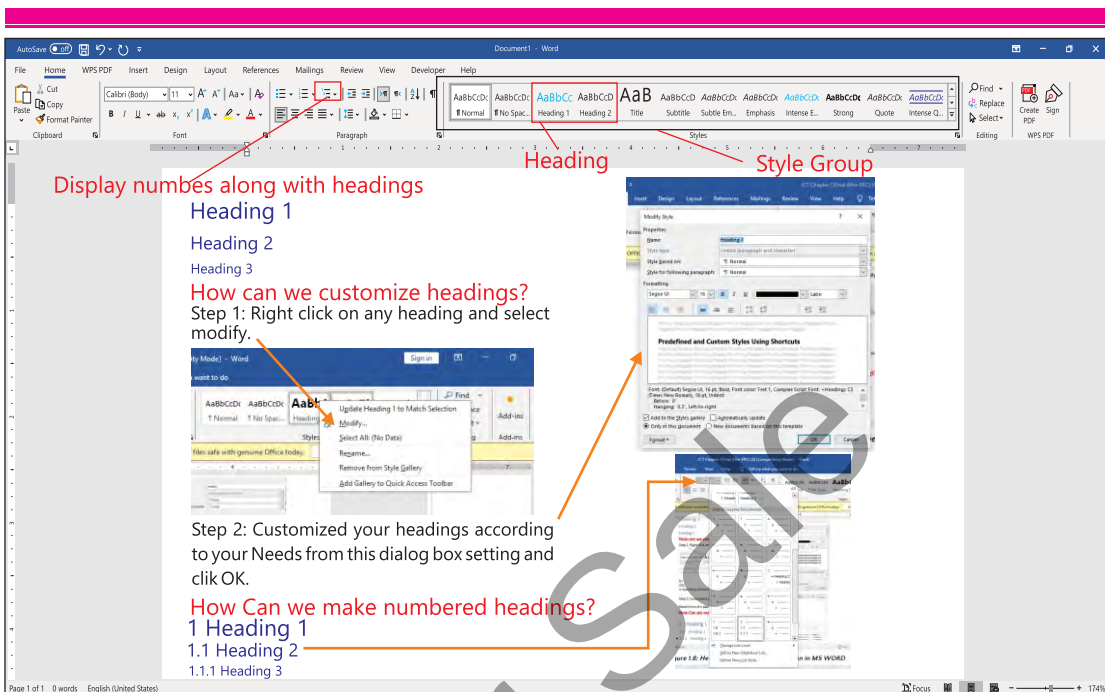
### 1.4.5 Styles Group (Using Predefined and Custom Styles)

The Styles Group allows users to apply predefined formatting to text quickly. Instead of manually changing font size, color, and bold settings, users can apply styles with a single click as shown in Figure 1.8.

#### Using Predefined Styles for Headings and Subheadings

Microsoft Word provides ready-made styles, such as:

- **Title Style** used for main document titles.
- **Heading 1, Heading 2, etc.** used for subheadings and sections.
- **Normal Style** used for regular text.



**Figure 1.8: Headings and their customization in MS WORD**

## 1.4.6 Predefined and Custom Styles Using Shortcuts

Microsoft Word provides shortcut keys to apply and modify predefined styles (like Title, Heading 1, Heading 2) and even create custom styles quickly. These shortcuts help maintain consistent formatting in documents, especially for school assignments, reports, and presentations.

### Shortcut Keys for Applying Predefined Styles

Microsoft Word has built-in **styles** that allow users to format headings and text instantly.

| Alignment Type              | Shortcut (Windows) |
|-----------------------------|--------------------|
| Normal (Default text style) | Ctrl + Shift + N   |
| Heading 1                   | Ctrl + Alt + 1     |
| Heading 2                   | Ctrl + Alt + 2     |
| Heading 3                   | Ctrl + Alt + 3     |

**Table 1.5: Styles shortcuts**

## 1.4.7 Generating a Table of Contents in Microsoft Word

A Table of Contents is used in long documents to help readers navigate sections easily. Microsoft Word can generate a Table of Contents automatically if heading styles are applied properly.

---

## Steps to Create a Table of Contents:

### Use Heading Styles:

- Choose suitable headings for each section of your Word document (e.g., 'Introduction,' 'Literature Review,' etc.) .

### Insert Table of Contents:

- Place the cursor where you want the Table of Contents.
- Click on the References Tab → Select Table of Contents.
- Choose an automatic style.

### Update the ToC (if needed):

- If new headings are added, right-click on the ToC and select Update Table.

## 1.5 Insert Tab

The Insert Tab in Microsoft Word is one of the most important tools for making documents more visually appealing and well-organized. This tab allows users to add different elements such as pages, tables, images, shapes, and headers to enhance the overall presentation of a document.

### 1.5.1 Pages Group

The Pages Group allows users to manage pages within a document by inserting blank pages, cover pages, or page breaks.

#### Inserting a Blank Page

A blank page is an empty page added anywhere in a document. This is useful when starting a new section or chapter in a long document.

To Insert a Blank Page:

- Click on the Insert Tab.
- Select Blank Page from the Pages Group.
- A new page appears where the cursor is placed.

#### Inserting a Cover Page

A cover page is the first page of a document that usually contains a title, subtitle, author name, and date. It makes the document look more formal and well-structured.

To Insert a Cover Page:

- Click on the Insert Tab.
- Select Cover Page from the Pages Group.
- Choose a design template from the available options.
- Click on the text fields to edit and enter your details.

---

## Inserting a Page Break

A page break moves the text after the cursor to the next page without needing to press “Enter” multiple times. This helps in organizing content properly.

To Insert a Page Break:

- Click on the Insert Tab.
- Select Page Break from the Pages Group.
- The cursor will jump to a new page, leaving the previous content unchanged.

### 1.5.2 Tables Group

Tables help in organizing information in rows and columns, making data easy to read and understand. Figure 1.9 explains how you can create and format your own tables in MS Word.

#### Creating a Table

Tables are used to display data in a structured format.

To insert a Table

- Click on the Insert Tab.
- Select Table from the Tables Group.
- Choose the number of rows and columns by dragging the cursor over the grid.

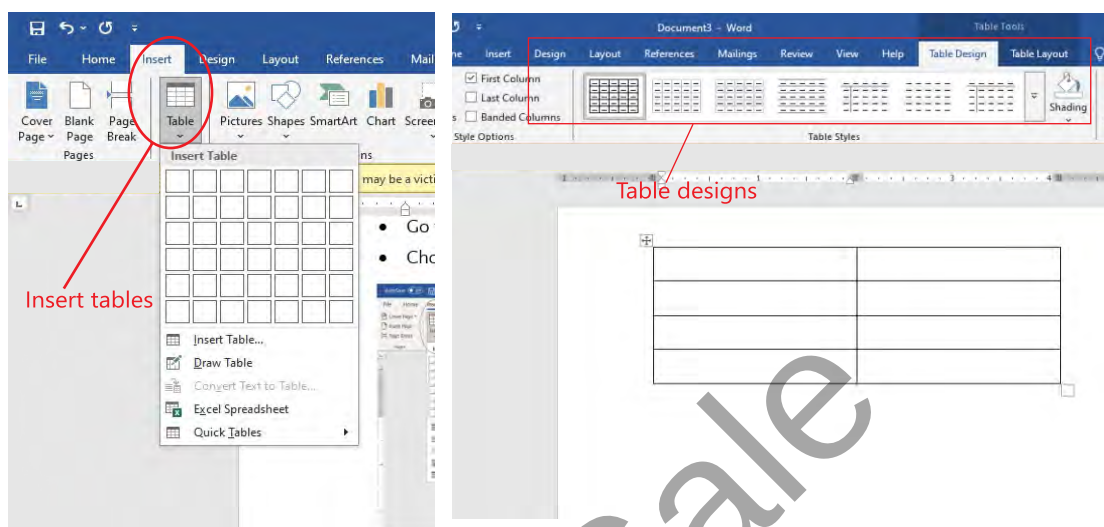
#### Formatting Tables (Borders, Shading, Table Styles)

After inserting a table, formatting improves its appearance.

- **Borders:** Adds lines to define table edges.
- **Shading:** Fills color in selected cells for better visibility.
- **Table Styles:** Provides pre-designed layouts for tables.

To format a Table:

- Double Click inside the table.
- Go to the Table Design Tab.
- Choose Borders, Shading, or a Table Style to apply.



**Figure 1.9:** Tables and their formatting in MS WORD.

### **Activity : Create a Well-Structured Table (Tables Group)**

**Objective:** Develop structured tables using the **Insert Tab**.

**Instructions:**

Ask students to create a **Class Attendance Sheet** with:

- **Columns:** Student Name, Roll Number, Present/Absent Status
- **Rows:** At least five sample student entries

Format the table by:

- Applying table borders and shading.
- Using bold text for column headers.
- Aligning text properly in each cell.

## **1.5.3 Illustrations Group**

The Illustrations Group allows users to insert images, shapes, and SmartArt to make documents more engaging.

### **Inserting Images**

Adding images makes a document more interesting and informative.

To insert Image

- Click on the Insert Tab.
- Select Pictures from the Illustrations Group.
- Choose This Device (for saved images) or Online Pictures (for internet images).
- Select an image and click Insert.



### **Do You Know? - Speak Feature for Reading Text Aloud**

Microsoft Word can read text aloud using the Speak feature, which helps with proofreading, accessibility, and listening to content instead of reading it.

#### **How to Enable it?**

Click on File → Options → Quick Access Toolbar.

In the list, select "All Commands" and find "Speak".

Click "Add", then press OK.

Select any text in your document and click the Speak Button to hear it!

### Resizing and Positioning Images

After inserting an image, adjusting its size and position ensures it fits the document properly.

- **Resize:** Click on the image corners and drag to adjust size.
- **Position:** Click on the Layout Options button and choose placement style.

### **Adding Captions to Images and Tables in Word**

Captions help readers understand images and tables by providing descriptive text below them. Microsoft Word allows users to insert captions automatically for consistency.

To add a Caption to an Image or Table:

- Click on the Image or Table you want to add a caption to.
- Go to the References Tab → Click "Insert Caption".
- Choose a Label:
  - For images, use "Figure 1: Description".
  - For tables, use "Table 1: Description".
- Type the Caption in the box.
- Click OK, and the caption will appear below the image or above the table.

### **Adding Shapes and SmartArt**

Shapes and SmartArt help in explaining concepts visually.

To insert Shapes:

- Click on the Insert Tab.
- Select Shapes from the Illustrations Group.
- Choose a shape and draw it in the document.

### Activity: Design a School Event Poster (Images & Shapes)

**Objective:** Use images and shapes to create an engaging document.

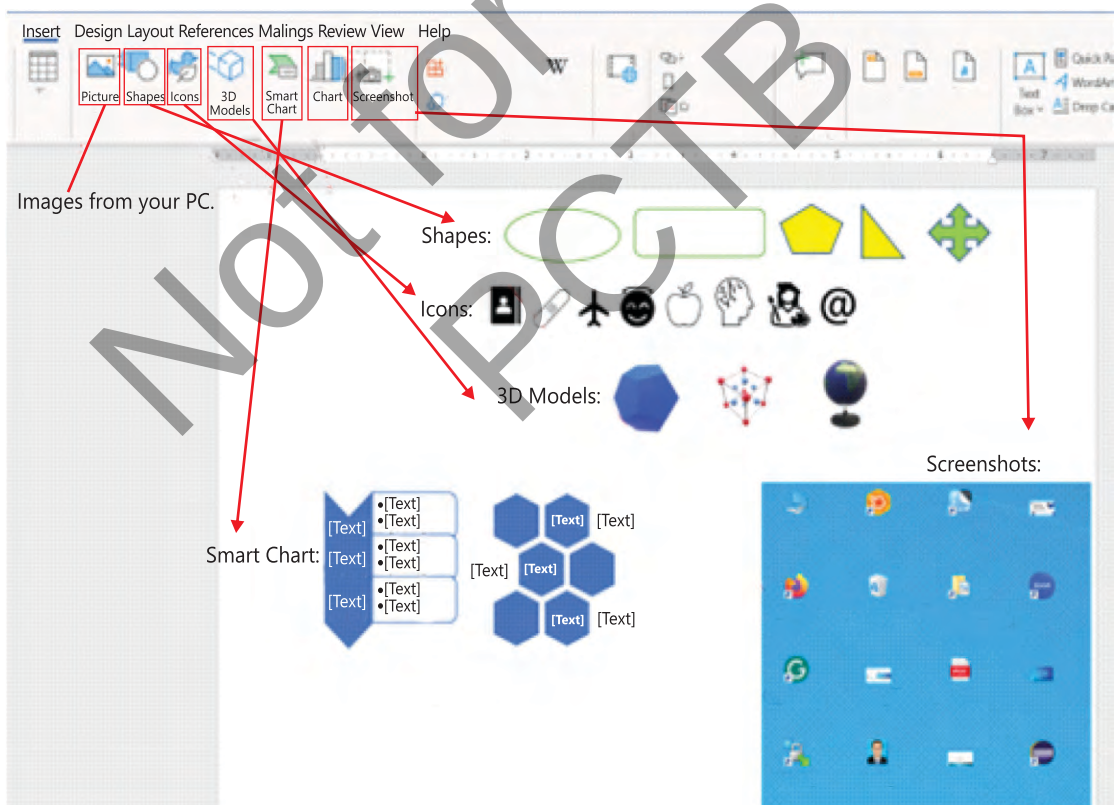
**Instructions:**

Ask students to design a School Sports Day Poster with:

- A title (bold & large font).
- At least one image related to sports.
- Shapes or SmartArt to highlight event details.
- A border or background color for better presentation.
- Ensure the design looks visually appealing and professional.

## 1.5.4 Formatting of Tables Using Shortcuts

We can also format our tables using shortcuts please find the below list of attached shortcuts to format tables in MS WORD.



**Figure 1.10:** Insert Images, Shapes, Icons, 3D models, SmartArt,

| Action                    | Shortcut               |
|---------------------------|------------------------|
| Insert a Table            | Alt + N, T             |
| Move to the Next Cell     | Tab                    |
| Move to the Previous Cell | Shift + Tab            |
| Add a New Row at the End  | Tab (in the last cell) |
| Delete a Row              | Alt + J, L, D, R       |
| Delete a Column           | Alt + J, L, D, C       |
| Merge Selected Cells      | Alt + J, L, M          |
| Split Cells               | Alt + J, L, P          |

**Table 1.6 :** Shortcuts for table formatting.

### 1.5.5 Header & Footer Group

Headers and footers provide consistent information on every page.

#### Adding Headers and Footers

Headers appear at the top of every page, while footers appear at the bottom. They often contain titles, dates, or author names. In MS word these are present in insert tab as shown in Figure 1.11.

To add Header and Footer

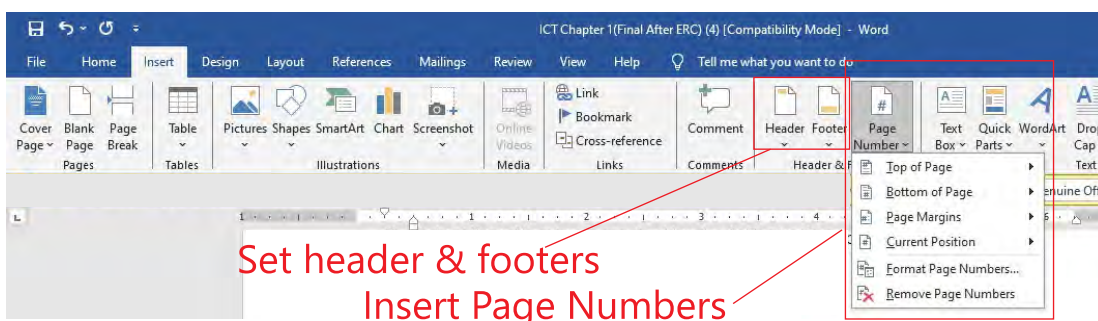
- Click on the Insert Tab.
- Select Header or Footer from the Header & Footer Group.
- Choose a design template and enter information.

#### Inserting Page Numbers

Page numbers help in organizing multi-page documents.

To add Page Numbers

1. Click on the Insert Tab.
2. Select Page Number from the Header & Footer Group.
3. Choose the placement (Top, Bottom, or Side).



**Figure 1.11:** Inserting Page Numbers

---

## 1.6 Layout Tab

The Layout Tab in Microsoft Word helps in structuring and designing documents. It allows users to adjust page size and margins. It makes documents look organized and professional. These settings are useful when preparing assignments, reports, or formal documents that require a neat appearance.

### 1.6.1 Page Setup Group

The page setup section helps in adjusting how a document looks when printed or viewed on a screen.

#### Adjusting Margins

Margins are the empty spaces around the edges of a page. They help in keeping text neat and prevent words from touching the edges.

To change margins:

- Click on the Layout Tab.
- Click on Margins in the Page Setup group.
- Select a margin style (e.g., Normal, Narrow, Wide, or Custom Margins).

#### Changing Page Orientation

Page orientation refers to the direction in which the page is displayed. There are two types:

- **Portrait (Vertical):** The default setting, best for essays and letters.
- **Landscape (Horizontal):** Used for tables, posters, and wide-format documents.

To change orientation:

- Click on the Layout Tab.
- Select Orientation and choose either Portrait or Landscape.

#### Selecting Paper Size

Different documents require different paper sizes. For schoolwork, the standard size is **A4 (8.5 x 11 inches)**, but some documents like posters may need larger paper.

To change paper size:

- Click on the Layout Tab.
- Select Size and choose from options like A4, Letter, or Legal.

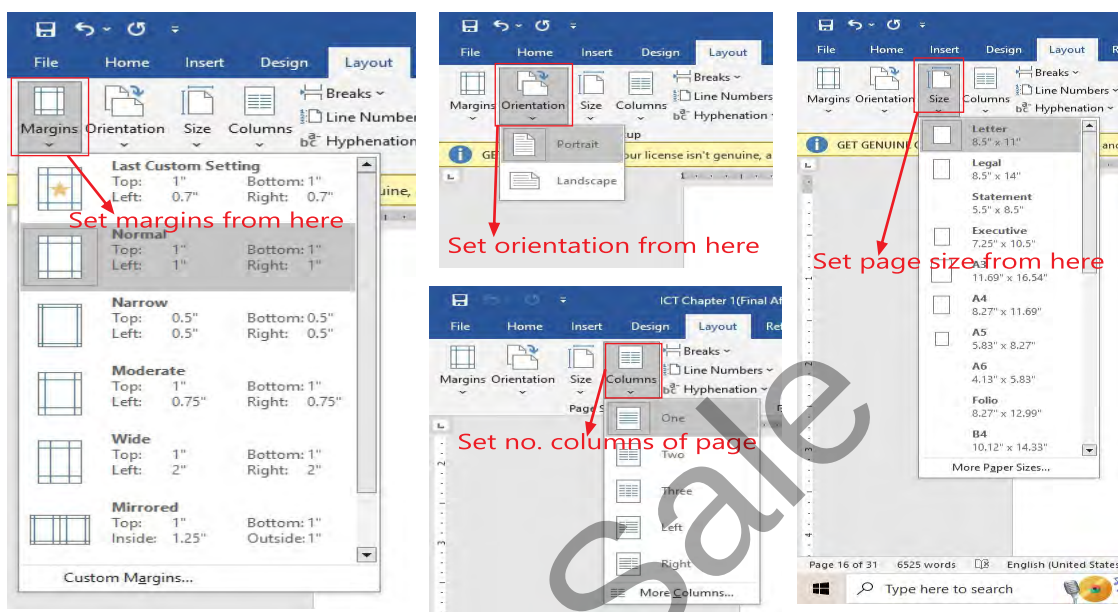


Figure 1.12: Page layouts in MS WORD.

### Do You Know?

Microsoft Word has a built-in Dictation feature that lets you speak instead of typing! Simply go to **Home Tab** → Click on the **Dictate** button, start speaking, and Word will convert your voice into text instantly. This is especially useful for taking quick notes, hands-free writing, or assisting students with writing difficulties.

## 1.7 View Tab

The View Tab allows users to change how they see the document for easier reading and editing.

### 1.7.1 Document Views Group

#### Activity: Insert & Format a Header/Footer (Headers & Footers)

**Objective:** Apply **headers & footers** for professional document structuring.

#### Instructions:

Ask students to insert a **header and footer** in a given document.

The **header** must include:

- **Document Title** (e.g., "History Assignment – Grade 9")
- **Student Name & Roll Number**
- The **footer** must include:
- **Page Numbers** (aligned to the right)
- **Date & Time**

- **Print Layout:** Shows how the document will look when printed.
- **Read Mode:** Removes distractions for easier reading.
- **Web Layout:** Shows how the document appears online.

## Getting Started with Microsoft PowerPoint

Microsoft PowerPoint is a presentation software developed by Microsoft. It is part of the Microsoft Office suite and is widely used by students, teachers, and professionals to create and deliver presentations

PowerPoint makes it easy to:

- Present information clearly using slides.
- Use images, videos, and animations to make learning fun.
- Organize ideas visually with bullet points and SmartArt.
- Enhance communication skills by delivering presentations confidently.

## 1.8 Getting Started with PowerPoint

Before creating a presentation, it is important to know how to open PowerPoint and create a new presentation.

### 1.8.1 Starting Microsoft PowerPoint

To start using PowerPoint:

- Click on the Start Menu (Windows logo) at the bottom-left corner of the screen.
- Type "PowerPoint" in the search bar.
- Click on Microsoft PowerPoint from the search results.
- PowerPoint will open, and a welcome screen will appear.

### 1.8.2 Creating a New Presentation

To create a new presentation:

- Click on "Blank Presentation" to start fresh.
- A new slide will appear with a Title Box and a Subtitle Box where you can type text.
- You are now ready to add more slides, images, and animations to create your presentation.

## 1.9 Understanding the PowerPoint Interface

To use PowerPoint effectively, it is important to understand its main parts. Below are the key components of the PowerPoint interface:

### 1.9.1 Ribbon and Tabs

The Ribbon is the top section of the PowerPoint window that contains different tabs. Each tab has tools for designing, formatting, and presenting



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slides.

- **Home** tab Contains options to add slides, change fonts, and format text.
- **Insert** tab allows users to add images, tables, charts, and SmartArt.
- **Design** tab helps in applying themes and slide backgrounds.
- **Transitions** tab used to add smooth slide changes.
- **Animations** tab adds movement to text and objects.
- **Slideshow** tab helps in running the presentation.

### 1.9.2 Slide Pane and Slide Area

The Slide Pane and Slide Area help in organizing and designing slides.

- **Slide Pane** shows a list of all slides in the presentation. You can rearrange, delete, or duplicate slides from here.
- **Slide Area** displays the current slide where text, images, and objects can be added.

### 1.9.3 Notes Section and Status Bar

- Notes Section (Bottom of the Screen) Allows users to write speaker notes. These notes help presenters remember key points while presenting.
- Status Bar (Bottom of the Window) Shows important details like:

#### **Activity: Identifying the Interface**

**Objective:** Learn to recognize different parts of the PowerPoint interface.

**Instructions:**

- Open Microsoft PowerPoint on your computer.
- Look at the Ribbon, Slide Pane, Slide Area, Notes Section, and Status Bar.
- Label a screenshot of the PowerPoint interface by marking these components.
  - Slide Number (e.g., Slide 3 of 5)
  - Zoom Control (to adjust slide view)
  - View Options (Normal View, Slide Sorter View, Reading View)

## 1.10 Home Tab

Microsoft PowerPoint provides a structured way to create visually engaging slides. The Home Tab in PowerPoint includes essential tools for adding, formatting, and organizing text to make presentations clear and professional. Since many of these tools function the same way as they do in Microsoft Word. This section will focus on how these features apply specifically in PowerPoint and their differences from Word.

---

### 1.10.1 Adding and Formatting Text in PowerPoint

In PowerPoint, text is not typed directly onto a blank page like in Word. Instead, it is placed inside text boxes that are part of slide layouts. Each slide typically has a title and content area where text can be entered.

#### Adding Text in PowerPoint

Text can be added in two ways:

##### 1. Using an existing text box

- Click inside a pre-made text box (usually labeled “Click to add text”).
- Type the content, and it will automatically fit within the box.

##### 2. Inserting a new text box

- Click on the **Insert Tab** and select **Text Box**.
- Click anywhere on the slide to place the text box.
- Type the text and adjust the size of the box as needed.

### 1.10.2 Text Formatting in PowerPoint

PowerPoint provides the same basic text formatting options as Word. Refer to Section 1.4.1 for details on changing font style, size, and color 2.1.1.

### 1.10.3 PowerPoint-Specific Differences

- Text formatting applies only to individual text boxes instead of a continuous document.
- Font sizes are usually larger because slides are meant for viewing from a distance. A slide title should typically be 36 or 44pt, while body text should be 18 or 24pt.
- Font styles, colors, and bold effects can be adjusted using the Font Group in the Home Tab.

## 1.11 Using Bullet Points and Numbering in PowerPoint

Bullet points help in presenting information in a structured way. The process for adding bullet points in PowerPoint is similar to Word as we see in Section 1.4.3 but there are some key differences

### 1.11.1 PowerPoint-Specific Differences

- In Title and Content Slides, bullet points appear automatically when text is typed.
- Users can remove automatic bullets by selecting the text box and clicking the bullet icon in the Home Tab.
- PowerPoint allows custom bullet points using symbols, images, or icons.



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## 1.12 Aligning and Structuring Text in PowerPoint

Text alignment in PowerPoint follows the same principles as we done in Word . However, the way alignment works in slides is slightly different.

### 1.12.1 PowerPoint Specific Differences

- In Word, alignment is applied to paragraphs inside a document.
- In PowerPoint, alignment applies to individual text boxes, so each must be adjusted separately.
- PowerPoint offers an Align Tool (under the Format Tab) that helps position text boxes evenly across the slide.

## 1.13 Applying Layouts, Themes, and Backgrounds

The Design Tab in Microsoft PowerPoint helps in making a presentation look organized, visually appealing, and professional. A good design improves the way information is presented and makes it easier for the audience to understand. This section explains how to use Slide Layouts, Themes, and Backgrounds to improve the look of your slides.

### 1.13.1 Slide Layouts

When creating a PowerPoint presentation, each slide has a different purpose. Some slides are used for titles, some for lists, and others for images or charts. Instead of adding text and pictures anywhere, Slide Layouts help in organizing content neatly.

A slide layout is a pre-designed format that arranges text, images, and other content in a structured way. PowerPoint provides built-in layouts that help in placing content properly.

#### Common Types of Slide Layouts

There are five fundamental types of layouts:

1. **Title Slide:** Used for the first slide of a presentation. It usually has a space for a title and a subtitle.
2. **Title and Content:** A slide with a title at the top and space to add text, bullet points, or images.
3. **Two Content:** This layout allows placing two different types of content side by side, such as text and an image.
4. **Comparison Slide:** Similar to the Content layout but also includes headings for easy comparison.
5. **Picture with Caption:** A layout with an image and a small description below it.

## Applying Slide Layout

- Click on the **Home Tab**.
- Select **Layout** from the Slides group.
- Choose a layout that matches your content.

### 1.13.2 Applying Themes and Colors

A theme in PowerPoint is a set of pre-designed colors, fonts, and effects that make all slides look uniform and professional. Using themes ensures that slides have a consistent design, rather than each slide looking different.

#### Using Themes

- Makes the presentation look professional and organized.
- Ensures consistent colors and fonts throughout the slides.
- Saves time instead of designing each slide manually.

#### To apply a theme:

- Click on the **Design Tab**.
- Select a theme from the available options.
- Click on a theme to **apply it to all slides**.

#### Activity: Apply a Theme to a Presentation

##### Task:

Create a **3-slide presentation** on “**My Favorite Hobby**”.  
Apply a **theme** to make all slides look consistent.  
Use **different slide layouts** to present the information.  
Customize the **background** for at least one slide.

## 1.14 Insert Tab

Insert Tab in Microsoft PowerPoint helps in making presentations more interesting and visually appealing. Instead of using only text, we can add images, icons, SmartArt, tables, and charts to make the information clearer and more engaging.

### 1.14.1 Insert Images and Icons

Images and icons help the audience understand the topic easily and keep their attention focused on the slides.

---

## Inserting Image in PowerPoint

To add an image:

- Click on the Insert Tab in the Ribbon.
- Click on Pictures.
- Choose This Device (to insert an image from your computer) or Online Pictures (to search for images from the internet).
- Select an image and click Insert.
- Resize and move the image as needed.

## Inserting Icon in PowerPoint

Icons are small, simple symbols used to represent ideas (e.g., a light bulb for "innovation" or a book for "education"). They make slides look neat and professional.

To insert an icon:

- Click on the Insert Tab.
- Select Icons.
- Search for an icon (e.g., "computer" or "science").
- Click Insert, then resize or move it.

## 1.15 Using SmartArt

SmartArt is a tool in PowerPoint that allows you to create diagrams and flowcharts easily.

### Insert SmartArt in PowerPoint

- Click on the Insert Tab.
- Select SmartArt.
- Choose a category (e.g., List, Process, Cycle, Hierarchy).
- Click on the design that fits your topic.
- Type your text into the SmartArt diagram.

## 1.16 Inserting Tables and Charts

A table organizes information into rows and columns, making it easier to compare and analyze.

### Inserting Table in PowerPoint

- Click on the **Insert Tab**.
- Select **Table**.
- Choose the number of **rows and columns**.
- Enter the data inside the table.
- Adjust the table size and style for better presentation.

## Insert Chart in PowerPoint

- Click on the **Insert Tab**.
- Select **Chart**.
- Choose a chart type (Bar, Pie, Line, etc.).
- Enter data in the table that appears.
- Click outside the table to see the chart on your slide.

## 1.17 Transitions and Animations

Microsoft PowerPoint is not just about adding text and images; it also helps in making presentations more attractive and engaging. One way to do this is by using transitions and animations. These tools bring movement to slides, making them more dynamic and helping to grab the audience's attention. In this section, we will learn about slide transitions, animations, and how to control their timing and sequence.

### Activity: Create an Informative Slide

#### **Task:**

Insert one image, one SmartArt diagram, and one table into a slide.  
Use the table to organize information neatly.  
Arrange all elements properly for a clear and engaging slide.

### 1.17.1 Creating Smooth Transitions Between Slides

A slide transition is the effect that occurs when you move from one slide to another during a presentation. It controls how the next slide appears on the screen. Transitions help make the slideshow flow smoothly rather than jumping abruptly from one slide to another.

#### Common Types of Transitions

PowerPoint provides many transition effects, but they can be grouped into three categories:

- **Subtle Transitions:** provide simple and professional effects, such as Fade, Push, and Wipe.
- **Example:** The Fade transition makes one slide gradually disappear while the next slide appears smoothly.
- **Exciting Transitions:** add dramatic effects like Flip, Gallery, and Curtains.
- **Example:** The Flip transition makes slides rotate as if they are flipping a page in a book.

- **Dynamic Content Transitions:** keep some elements on the screen while changing others, such as Pan and Uncover.  
**Example:** The Pan transition moves slides from one side to another, like a moving camera.

### Applying Transition to a Slide

To apply a Transition:

- Open your PowerPoint presentation.
- Click on the Transitions Tab in the ribbon.
- Select the slide where you want to apply the transition.
- Choose a transition effect from the list.
- Click on Preview to see how it looks.
- Adjust the Duration if needed to make it faster or slower.
- Click Apply to All if you want the same transition on every slide.

### 1.17.2 Animations

Animations bring life to individual text, images, shapes, and other objects on a slide. While transitions affect entire slides, animations control how objects appear, move, or disappear on a slide.

#### Types of Animations in PowerPoint

Animations in PowerPoint are divided into four types:

- Entrance animations make an object appear on the slide.  
**Example:** The Fly In animation makes text move into the slide from the side.
- Emphasis animations add effects to already existing objects, like color changes, shaking, or spinning.  
**Example:** The Spin animation makes a shape rotate in place.
- Exit animations make an object disappear from the slide.  
**Example:** The Fade Out animation makes text slowly disappear.
- Motion Paths move objects along a specific path like a circle, line, or wave.  
**Example:** The Curve motion path makes an object move in a curved direction.

### Applying Animation

To apply Animations:

- Click on the object (text, image, or shape) that you want to animate.
- Go to the Animations Tab in the ribbon.
- Choose an animation from the list.

- Click Preview to see how the animation works.
- Adjust the Duration and Delay for better control.
- Click on Animation Pane (on the right side) to manage multiple animations.

**Tip:** Avoid using too many animations in one slide. Simple and smooth animations make presentations look more professional and easier to follow.

### Activity: Animate a Slide

**Objective:** Learn how to add and control slide transitions and animations.

**Steps:**

Open a new PowerPoint presentation.

Create **three slides** with a title, text, and at least one image.

Apply a **different transition** to each slide.

On Slide 2, animate the **title and image** using entrance animations.

Use the **Animation Pane** to adjust the sequence and timing.

Play the slideshow to check the effects.

## EXERCISE

### Multiple Choice Questions

1. What is the default file extension for Microsoft Word documents?
 

|           |           |
|-----------|-----------|
| (a) .txt  | (b) .pdf  |
| (c) .docx | (d) .pptx |
2. What is the function of the page break feature in Word?
 

|                                |                                 |
|--------------------------------|---------------------------------|
| (a) Deletes the current page   | (b) Moves text to the next page |
| (c) Copies formatting settings | (d) Aligns the document text    |
3. Which tab in PowerPoint allows users to insert images and tables?
 

|            |                 |
|------------|-----------------|
| (a) Home   | (b) Insert      |
| (c) Design | (d) Transitions |
4. What is the primary purpose of slide master in PowerPoint?
 

|                                            |                                             |
|--------------------------------------------|---------------------------------------------|
| (a) To change the background of all slides | (b) To create consistent layouts and themes |
| (c) To add animations                      | (d) To modify the slideshow speed           |
5. In PowerPoint, which key starts the slideshow from the beginning?
 

|               |                   |
|---------------|-------------------|
| (a) F5        | (b) Ctrl + S      |
| (c) Alt + Tab | (d) Shift + Enter |

- 
6. Which file format is used to export a PowerPoint presentation as a video?
    - (a) .docx
    - (b) .mp4
    - (c) .pptx
    - (d) .xlsx
  7. What is the default slide layout when creating a new PowerPoint presentation?
    - (a) Title Slide
    - (b) Blank Slide
    - (c) Comparison Slide
    - (d) Two-Column Slide
  8. The spelling & grammar tool is found in which tab of Word?
    - (a) Insert
    - (b) Home
    - (c) Review
    - (d) View
  9. Ctrl + Z in Word and PowerPoint is used for:
    - (a) Saving a file
    - (b) Undoing an action
    - (c) Copying text
    - (d) Pasting an item
  10. Which tab in Word allows you to add headers and footers?
    - (a) Insert
    - (b) Layout
    - (c) Home
    - (d) View

### Short Questions

1. Define a header and a footer in Word.
2. Differentiate between various types of text alignments in Word?
3. How can you insert an image into a PowerPoint slide?
4. Explain the difference between transitions and animations in PowerPoint.
5. How do you add bullet points to a PowerPoint slide?
6. Define two ways to save a PowerPoint presentation.
7. Explain the purpose of a Slide Master in PowerPoint.
8. Illustrate the purpose of a table in Microsoft Word.

### Long Questions

1. Explain the difference between Microsoft Word and Microsoft PowerPoint and their best use cases.
2. Describe the step-by-step process of formatting a document in Word.
3. How do SmartArt and Charts improve a PowerPoint presentation?
4. Explain how to apply and customize slide transitions and animations.
5. Discuss the importance of using consistent themes and layouts in PowerPoint presentations.

# Exploring Arduino Basics-Circuits, Code and Projects

### Student Learning Outcomes:

**By the end of this chapter, you will be able to:**

- Design and explain basic circuits using an Arduino microcontroller, identifying and understanding components such as LEDs, buzzers, and sensors.
- Write and test simple programs to control electronic components, incorporating LEDs, buzzers, and basic sensors.
- Build and troubleshoot projects, including LED blinking, distance measurement with an ultrasonic sensor, and traffic light control simulation.

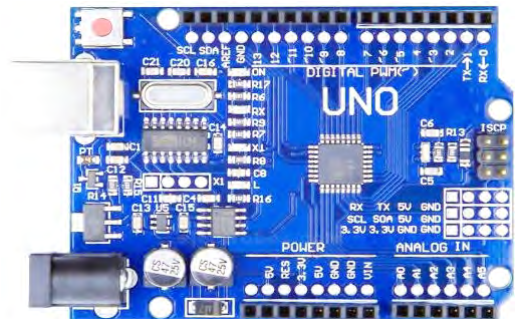
Imagine being able to control lights, make sounds, and even measure distances using a small electronic board and a few simple components. This is exactly what Arduino allows us to do. Arduino is a powerful yet easy-to-use microcontroller that helps beginners and experts create exciting electronic projects. It is widely used in robotics, home automation, and smart devices.

## 2.1 Designing and Explaining Basic Circuits with Arduino

Arduino projects begin with understanding how to connect electronic components to create functional circuits. This section introduces the Arduino microcontroller and key components—LEDs, buzzers, and sensors—while explaining how to design simple circuits.

### 2.1.1 The Arduino Microcontroller

The Arduino (e.g., Arduino Uno) is a small circuit board with a microcontroller at its core, capable of reading inputs (like sensor data) and controlling outputs (like lights or sounds) as shown in Figure 2.1: The Arduino Microcontroller. It features digital and analog pins, power pins (5V, 3.3V, GND), and a USB port for programming.



**Figure 2.1:** The Arduino Microcontroller



### Do You Know?

Arduino started as a **student project** and became one of the most influential **microcontroller platforms** ever. Whether it's **DIY projects, robotics, IoT, or even space technology**, Arduino remains an essential tool for innovators worldwide.

## 2.2 Key Components

The Arduino Microcontroller has several important components that help it work properly. Let's take a look at them in a simple way.

### 2.2.1 LEDs (Light-Emitting Diodes)

An LED is a small light that glows when current flows through it. It has two legs: the anode (longer, positive) and cathode (shorter, negative) as shown in Figure 2.2.



Figure 2.2: LED

To protect it, always connect a resistor (e.g., 220 ohms) in series to limit current. Example: Connect the anode to Arduino pin 13 and the cathode to GND via a resistor.

LEDs, or Light Emitting Diodes, come in different sizes, and their diameter is an important factor to consider when using them in electronic projects. The size of an LED is measured in millimeters (mm), with the most common diameters being 3mm, 5mm, 8mm, and 10mm.

When choosing an LED, it is important to consider not just the size, but also the brightness, power consumption, and beam angle.

### 2.2.2 Buzzers

A **buzzer** is an electronic device that produces sound when an electric current is applied to it. Buzzers are commonly used in alarms, timers, notifications, and electronic circuits to give audible feedback. They are widely used in projects with Arduino and microcontrollers for producing sound alerts.



Figure 2.3: Buzzer

There are two main types of buzzers:

1. **Active Buzzer** – This type has a built-in oscillator and produces sound when powered with a **simple HIGH signal** from a microcontroller or battery.

- 2. Passive Buzzer** – This type does not have a built-in oscillator and requires a **changing frequency signal (PWM)** from a microcontroller like Arduino to produce different tones.

A typical buzzer looks like the one shown in Figure 2.3.

Buzzers are used in many applications, including security alarms, doorbells, microwave ovens, game controllers, and electronic toys. They are simple yet powerful components that help in providing audible alerts and notifications in various electronic devices.

### 2.2.3 Sensors

Sensors are electronic devices that detect and measure physical changes in the environment and convert them into electrical signals. They are widely used in robotics, automation, security systems, and smart devices. Sensors can detect various physical parameters such as temperature, light, sound, distance, and motion.

One popular example is the HC-SR04 Ultrasonic Sensor shown in Figure 2.4 , which is commonly used for distance measurement. This sensor works by emitting ultrasonic sound waves and calculating the time it takes for the waves to bounce back after hitting an object. The HC-SR04 is widely used in robotics for obstacle detection, automatic parking systems, and proximity sensing in various smart devices.



**Figure 2.1:** HC-SR04 Ultrasonic Sensor

### 2.2.4 Resistor

A resistor is a small electronic component that limits the flow of electric current in a circuit. It prevents too much current from flowing through a device, which could damage it. The resistance is measured in Ohms ( $\Omega$ ) and is represented by colored bands on its body, which indicate its value.

**Example:** Resistors are commonly used to protect LEDs from burning out by reducing the current passing through them.



**Figure 02.2:** Resistor

Figure 2.5 illustrates the cylindrical body of a resistor, along with its metal leads and color bands.

**Do You Know?**

Color bands of a resistor represent its resistance value.

The colored bands painted on them, tell us their resistance value and sometimes their tolerance (how accurate the resistance is). Table 0.1 shows the resistor color codes. Most resistors have four, five, or six bands. The most common is the **four-band resistor**, so we'll start there. Each band has its own meaning.

- First Band: First digit of the resistance value.
- Second Band: Second digit of the resistance value.
- Third Band: Multiplier (how many zeros to add or a power of 10).
- Fourth Band: Tolerance (how precise the resistor is).

Here's what each color means:

| Number | color  | Number | color  | Number | color |
|--------|--------|--------|--------|--------|-------|
| 0      | Black  | 4      | Yellow | 8      | Grey  |
| 1      | Brown  | 5      | Green  | 9      | White |
| 2      | Red    | 6      | Blue   |        |       |
| 3      | Orange | 7      | Violet |        |       |

**Table 2.1: Colour Codes**

**Gold** (multiplier = divide by 10, tolerance =  $\pm 5\%$ )

**Silver** (multiplier = divide by 100, tolerance =  $\pm 10\%$ )

**No color** (tolerance =  $\pm 20\%$ )

### Four-Band Resistor

Imagine a resistor with these colors: **Brown, Black, Red, Gold**.

1. **Brown = 1** (first digit).
2. **Black = 0** (second digit).
3. **Red = 2** (multiplier, means  $10^2$  or add 2 zeros).
4. **Gold =  $\pm 5\%$**  (tolerance).

Put it together:

- First two digits = 10.
- Multiplier =  $10^2$  (which is 100), so  $10 \times 100 = 1,000$  ohms (or 1 k $\Omega$ ).
- Tolerance =  $\pm 5\%$ , meaning the real value could be between 950  $\Omega$  and 1,050  $\Omega$ .

So, this resistor is **1,000 ohms (1 k $\Omega$ ) with a tolerance of  $\pm 5\%$ .**

### Do You Know?

If you are unsure which resistor to use, start with 220  $\Omega$  or 1 k $\Omega$  for small projects. Then adjust based on what your circuit needs (e.g., brighter LED = lower resistance,).

## 2.2.5 Jumper Wires

**Jumper wires** are flexible wires used to connect different components on a breadboard or circuit as shown in Figure 2.6 They come in different types, including:

Here are the main types:

### 1. Male-to-Male (M-M) Jumper Wires

- **Description:** Both ends have a pin (male) that fits into holes, like Arduino pins or breadboard sockets.
- **Use:** Connecting Arduino pins to a breadboard or linking two breadboard points.

### 2. Male-to-Female (M-F) Jumper Wires

- **Description:** One end has a pin (male), the other has a socket (female) that fits over pins.
- **Use:** Connecting Arduino pins to components with male headers (e.g., sensors with pins sticking out).

### 3. Female-to-Female (F-F) Jumper Wires

- **Description:** Both ends have sockets (female) to connect male pins together.
- **Use:** Linking two components with pins, like joining two sensors.

### 4. Solid-Core vs. Stranded Jumper Wires

- **Solid-Core:** Single, stiff wire inside. Great for breadboards because they stay in place.
- **Stranded:** Many thin wires twisted together. More flexible but harder to push into breadboard holes.
- **Use:** Solid-core is more common for Arduino beginners.

## Breadboard

A breadboard is a plastic board with tiny holes where electronic components can be connected without soldering as shown in Figure 2.6: Breadboard. Inside, it has metal strips that allow electricity to flow between inserted components. It is mainly used for building and testing circuits before making a permanent version.

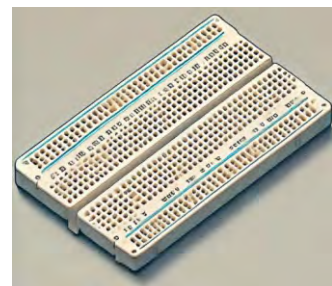


Figure 2.6: Breadboard

## 2.3 Building a Basic Circuit

In this section, we will learn how to build a simple circuit using an **Arduino Uno**, an **LED**, a **220-ohm resistor**, a **breadboard**, and **jumper wires**. This will help you understand how electricity flows and how we can control an LED using Arduino.

### 2.3.1 Understanding the Circuit

In this project, we will connect an LED to the **Arduino Uno** so that it turns on and off. The **Arduino will send electricity to the LED** through a digital pin. A **220-ohm resistor** will be placed in the circuit to prevent the LED from burning out.

#### How It Works:

- The **Arduino pin (digital output)** will send power to the LED.
- The **resistor** controls the current so the LED gets the right amount of electricity.
- The **ground (GND) connection** completes the circuit, allowing electricity to flow.

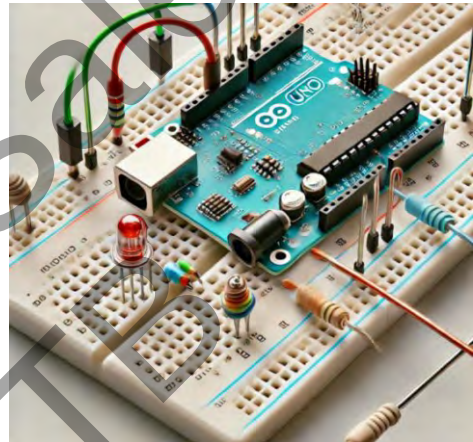


Figure 2.7: A sample Electronic Circuit

Before we start, look at the Figure 2.7.

### 2.3.2 Step-by-Step Guide to Build the Circuit

#### Step 1: Place the LED on the Breadboard

- Insert the **long leg (anode, +)** of the LED into one hole of the breadboard.
- Insert the **short leg (cathode, -)** into a different hole.

#### Step 2: Connect the Resistor

- Connect **one end of the 220-ohm resistor** to the short leg (-) of the LED.
- Connect the **other end of the resistor to the ground (GND) row** of the breadboard.

#### Step 3: Connect the Jumper Wires

- Use a jumper wire to connect **the long leg (+) of the LED to Arduino digital pin 13**.

- Use another jumper wire to connect the **GND row of the breadboard** to **GND on the Arduino**.

**Check Your Connections:** Make sure all wires are firmly placed in the right spots!

## 2.4 Installing the Arduino IDE

The Arduino IDE is like a magic notebook where you write instructions for your Arduino. See **Error! Reference source not found..** Here's how to get it on your computer:

### 2.4.1 Get the Software

- Open your web browser (like Chrome or Edge).
- Go to this website: [www.arduino.cc](http://www.arduino.cc).
- Look for a button that says "Software" at the top and click it.
- Find "Downloads" and click it. You'll see options for Windows, Mac, or Linux.
- Install the IDE and open it just like other software.

### 2.4.2 Connecting Arduino to the Computer

- Take your Arduino Uno (or whichever Arduino you have) and a USB cable (it's usually a flat-to-square plug).
- Plug one end into the Arduino's USB port and the other into your computer.
- You might see a little light on the Arduino turn on, that means it is connected.

### 2.4.3 Tell the IDE About Your Board

- In the IDE, click "Tools" at the top.
- Hover over "Board" and pick "Arduino Uno" (or your board's name).
- Now click "Tools" again, then "Port". Pick the one that says "COM" followed by a number (e.g., COM3) on Windows, or something like "/dev/ttyUSB0" on Mac/Linux. If you're not sure, ask a teacher!

## 2.5 Writing a Simple Program to Blink an LED

Let's make an LED blink—it's like saying "Hello" with light. . We will use the board discussed in Section 0.

- In the Arduino IDE, type the following code into the blank box

```
2. // This tells the Arduino which pin the LED is on
3. int ledPin = 13;
4.
```

```
5. // This runs once when the Arduino starts
6. void setup() {
7.   pinMode(ledPin, OUTPUT); // Says pin 13 is for sending signals out
8. }
9.
10. // This keeps running over and over
11. void loop() {
12.   digitalWrite(ledPin, HIGH); // Turns the LED on
13.   delay(1000); // Waits 1 second (1000 milliseconds)
14.   digitalWrite(ledPin, LOW); // Turns the LED off
15.   delay(1000); // Waits 1 second again
16. }
```

- Each line has a job: `int ledPin = 13` names the pin, `pinMode` sets it up, `digitalWrite` switches the LED on or off, and `delay` makes it wait.

### Check Your Code

- Click the tick button ( ✓ ) at the top left. This checks for mistakes. If it says “Done compiling” at the bottom, you’re good.

### Running Your Program

Time to send your code to the Arduino and watch it work!

#### 1. Upload the Code

- Click the arrow button ( ➡ ) next to the tick. This sends your program to the Arduino.
- Wait a moment—you’ll see “Done uploading” at the bottom if it works. The LED should start blinking: on for 1 second, off for 1 second, over and over!

### What If It Doesn’t Work?

- **No blinking?** Check your wires—make sure the LED’s long leg is at pin 13 and the short leg goes through the resistor to GND.
- **Error message?** Double-check you picked the right board and port in “Tools”. If it says “not found”, unplug and replug the USB, then try again.
- Ask a friend or teacher if you’re stuck!

#### Activity: Animate a Slide

Try making the LED blink faster by changing `delay(1000)` to `delay(500)` (half a second). Upload it again and see what happens.



## 2.6 Activating a Buzzer Using Arduino

Now that you have successfully made an LED blink using Arduino, let's move on to another exciting project – activating a buzzer! This project will help you understand how to control sound with Arduino.

### 2.6.1 What You Will Need

Before we start, gather these components:

- **Arduino Uno** – The brain of our project
- **Buzzer (Piezo or Active Buzzer)** – To generate sound
- **Jumper wires** – To connect everything
- **Breadboard** – For easy connections

### 2.6.2 Understanding the Circuit

In this project, we will connect a buzzer to an Arduino so that it turns on and off just like the blinking LED, but this time it will produce a beep sound instead of light. The Arduino will send electrical signals to the buzzer, making it vibrate and create sound.

#### How It Works:

- The **buzzer receives power from an Arduino digital pin**.
- It **produces sound** when electricity flows through it.
- The **Arduino code** will turn the buzzer **ON and OFF at set intervals**, just like we did with the blinking LED.

Before we start, look at the circuit diagram shown in Figure 0.8: Buzzer Setup.

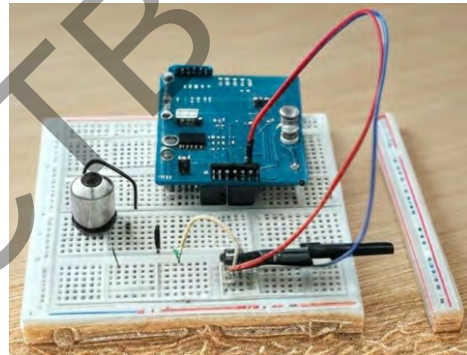


Figure 2.8: Buzzer Setup

Here is the step-by-step guide to build the circuit

#### Step 1: Place the Buzzer on the Breadboard

- Insert the **positive leg (longer leg, +)** of the buzzer into one hole of the breadboard.
- Insert the **negative leg (shorter leg, -)** into another hole.

#### Step 2: Connect the Jumper Wires

- Use a jumper wire to connect the **positive leg (+) of the buzzer** to **Arduino digital pin 9**.
- Use another jumper wire to connect the **negative leg (-) of the buzzer** to **GND on the Arduino**.



## 2.6.3 Writing the Code

Now, let's write a simple program to make the buzzer beep on and off, just like the LED blinked, we discussed in Section 0.

Open the **Arduino IDE** on your computer, and type the following code

```
1. // This tells the Arduino which pin the LED is on
2. void setup() {
3.   pinMode(9, OUTPUT); // Set pin 9 as an output
4. }
5.
6. void loop() {
7.   digitalWrite(9, HIGH); // Turn the buzzer ON
8.   delay(1000); // Wait for 1 second
9.   digitalWrite(9, LOW); // Turn the buzzer OFF
10.  delay(1000); // Wait for 1 second
11. }
```

### Do You Know?

Buzzers are used in **alarms, doorbells, and timers!**

The **first buzzers** were used in **early telephones** to signal incoming calls.

With a little more coding, you can **play simple tunes** on a buzzer!

## 2.7 Reading a Sensor (HC-SR04)

Now that you have learned how to blink an LED and activate a buzzer using Arduino, it's time to take the next step—reading a sensor. In this section, we will use the HC-SR04 Ultrasonic Sensor to measure distance and display the results.

### 2.7.1 What is the HC-SR04 Ultrasonic Sensor?

The **HC-SR04** is a sensor that measures distance by sending **ultrasonic sound waves** and detecting their reflection from an object. It is shown in Figure 0. and it has the following four pins.

**Trigger Pin** – Sends sound waves

**Echo Pin** – Receives the reflected waves

**VCC Pin** – Power supply (5V)

**GND Pin** – Ground connection



Figure 2.9: HC-SR04 Ultrasonic Sensor

### How It Works:

- The **Trigger Pin** sends a short ultrasonic pulse.
- The pulse travels, hits an object, and bounces back.
- The **Echo Pin** records the time taken for the pulse to return.
- The **Arduino calculates the distance** using the speed of sound.

### 2.7.2 Components You Need

**Arduino Uno** – The microcontroller

**HC-SR04 Ultrasonic Sensor** – To measure distance

**Breadboard** – To make connections easy

**Jumper Wires** – To connect everything together

### 2.7.3 Circuit Connections

Connect the HC-SR04 sensor to the Arduino Uno as follows:

| HC-SR04 Pin | Arduino Pin |
|-------------|-------------|
| VCC         | 5V          |
| GND         | GND         |
| Trig        | Pin 9       |
| Echo        | Pin 10      |

### 2.7.4 Writing the Code

Now, let's write an Arduino program to measure distance using the HC-SR04 sensor and display the readings in the **Serial Monitor**.

```
const int trigPin = 9; // Trigger pin connected to Pin 9
const int echoPin = 10; // Echo pin connected to Pin 10

void setup() {
  Serial.begin(9600); // Start serial communication
  pinMode(trigPin, OUTPUT); // Set trigPin as an output
  pinMode(echoPin, INPUT); // Set echoPin as an input
}

void loop() {
  long duration;
  int distance;

  // Send a short pulse
  digitalWrite(trigPin, LOW);
```

```
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);

// Read the echo time
duration = pulseIn(echoPin, HIGH);

// Calculate distance in centimeters
distance = duration * 0.034 / 2;

// Display distance in Serial Monitor
Serial.print("Distance: ");
Serial.print(distance);
Serial.println(" cm");

delay(500); // Wait before next reading
}
```

Now you can transfer code and execute like we did in the above mentioned experiments.

#### Activity

- Change the **delay(500);** to **delay(100);** and observe what happens.
- Try placing different objects at various distances and note the readings.
- Can you use the sensor to detect when someone is near and turn on an LED or buzzer?

#### Do You Know?

- The HC-SR04 sensor is used in **robotics, automation, and security systems**.
- Similar ultrasonic technology is used in **car parking sensors**!
- Bats use **echolocation**, just like the HC-SR04 sensor, to detect objects in the dark.

## 2.8 Simulating Traffic Lights

This project will teach you how to use LEDs, resistors, and basic Arduino programming to mimic a real traffic light sequence (Red → Green → Yellow → Red).

We will see:

- How to connect LEDs to an Arduino?
- How to use resistors to protect LEDs?
- How to write a simple Arduino programmed to control timing and lights.

You need the following items for this project.

1. **Arduino Board** (e.g., Arduino Uno).
2. **3 LEDs:** Red, Yellow, Green (one for each traffic light color).
3. **3 Resistors:** 220 ohms or 330 ohms (to limit current to the LEDs).
4. **Breadboard:** To connect everything easily.
5. **Jumper Wires:** To link the Arduino, LEDs, and breadboard.
6. **USB Cable:** To connect the Arduino to your computer.
7. **Computer** with the Arduino IDE installed (free software from [arduino.cc](http://arduino.cc)).

## Step 1: Understand the Traffic Light Sequence

A traffic light follows this pattern:

1. **Red:** Stop (on for 5 seconds).
2. **Green:** Go (on for 5 seconds).
3. **Yellow:** Get ready to stop (on for 2 seconds).
4. Back to Red, and repeat.

We'll use three LEDs to copy this sequence.

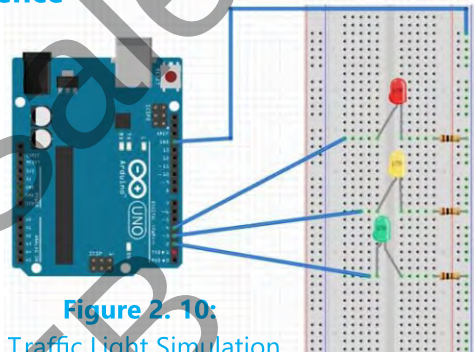


Figure 2.10:  
Traffic Light Simulation.

## Step 2: Set Up the Circuit as shown in Error! Reference source not found.

### 1. Place the LEDs on the Breadboard

- Each LED has two legs: the longer one is positive (anode), the shorter one is negative (cathode).
- Put the Red LED in one row, Yellow in another, and Green in a third row.

### 2. Add Resistors

- Connect a 220-ohm resistor from the negative leg (cathode) of each LED to the breadboard's ground rail (a long row marked "-").

### 3. Connect to Arduino

- Red LED positive leg → Arduino Pin 13 (via a jumper wire).
- Yellow LED positive leg → Arduino Pin 12.
- Green LED positive leg → Arduino Pin 11.
- Connect the breadboard's ground rail to the Arduino's **GND** pin.

### 4. Double-Check

- Positive legs go to Arduino pins through wires.
- Negative legs go through resistors to GND.

### Circuit Diagram (Simple Description)

- Red LED: Pin 13 → Resistor → GND
- Yellow LED: Pin 12 → Resistor → GND
- Green LED: Pin 11 → Resistor → GND

### Step 3: Write the Arduino Code

1. Open the Arduino IDE on your computer.
2. Copy the following code into a new sketch.

```
// Define the pins for each LED
int redPin = 13;
int yellowPin = 12;
int greenPin = 11;

void setup() {
  // Set the LED pins as outputs
  pinMode(redPin, OUTPUT);
  pinMode(yellowPin, OUTPUT);
  pinMode(greenPin, OUTPUT);
}

void loop() {
  // Red light on for 5 seconds
  digitalWrite(redPin, HIGH); // Turn Red ON
  digitalWrite(yellowPin, LOW); // Turn Yellow OFF
  digitalWrite(greenPin, LOW); // Turn Green OFF
  delay(5000); // Wait 5 seconds

  // Green light on for 5 seconds
  digitalWrite(redPin, LOW); // Turn Red OFF
  digitalWrite(yellowPin, LOW); // Turn Yellow OFF
  digitalWrite(greenPin, HIGH); // Turn Green ON
  delay(5000); // Wait 5 seconds

  // Yellow light on for 2 seconds
  digitalWrite(redPin, LOW); // Turn Red OFF
  digitalWrite(yellowPin, HIGH); // Turn Yellow ON
  digitalWrite(greenPin, LOW); // Turn Green OFF
  delay(2000); // Wait 2 seconds
}
```

## Explanation of the Code

- `int redPin = 13;` assigns pin numbers to each LED.
- `setup()` tells the Arduino which pins are outputs (for LEDs).
- `loop()` runs forever, turning LEDs on (HIGH) or off (LOW) in the traffic light order.
- `delay(5000)` pauses for 5,000 milliseconds (5 seconds).

## Step 4: Upload and Test

- Connect your Arduino to the computer with the USB cable.
- In the Arduino IDE, click **Tools > Board** and pick your Arduino (e.g., "Arduino Uno").
- Click **Tools > Port** and select the port your Arduino is on (e.g., "COM3" on Windows).
- Click the **Upload** button (right arrow) to send the code to the Arduino.
- Watch your LEDs! They should follow the sequence: Red (5s) → Green (5s) → Yellow (2s).

### Activity

In the above project:

- **Change Timing:** Edit the `delay()` values (e.g., `delay(3000)` for 3 seconds).
- **Add a Buzzer:** Connect a buzzer to Pin 10 and use `tone(10, 1000, 500)` to beep when Yellow turns on.
- **Two-Way Traffic:** Add three more LEDs for a second traffic light (e.g., Red on one side, Green on the other).

## 2.9 Troubleshooting Projects

Sometimes, things don't work as expected when you build electronic projects with Arduino. Maybe your LED doesn't blink, your buzzer stays silent, or your sensor shows wrong readings. Don't worry! Troubleshooting is a normal part of learning, and even expert engineers face these challenges.

In this section, we will learn how to find and fix common problems when working with Arduino circuits.

### Do You Know?

**Even NASA engineers troubleshoot their projects!** The Mars Rover had a software bug, and they fixed it remotely—millions of kilometers away!

---

## 2.9.1 Check Your Circuit Connections

Many problems happen because of **loose or incorrect connections**. Ask yourself:

- Are all jumper wires plugged in properly?
- Did I connect components to the right Arduino pins?
- Is the breadboard being used correctly?

## 2.9.2 Is Your Arduino Getting Power?

If nothing is working at all, the **Arduino may not be receiving power**. Check these:

- Is the USB cable properly connected to the computer?
- If using an external power source, is it plugged in correctly?
- Is the Arduino's power LED (small green light) ON?

If the power light is **OFF**, try using another USB cable or connecting to a different port on your computer.

## 2.9.3 Test Individual Components

Sometimes, a single component might be **damaged or faulty**. Try these:

- **LED Not Blinking?** Replace it with another LED.
- **Buzzer Not Beeping?** Try connecting it directly to 5V to see if it works.
- **Sensor Not Responding?** Use the **Serial Monitor** to check if it's sending any data.

## 2.9.4 Check Your Code

Even small mistakes in coding can stop your project from working. Ask yourself:

- Did I select the correct Arduino board (Uno, Mega, Nano) in the Arduino IDE?
- Are there any spelling mistakes in the code? (e.g., `pinMode(13, OUTPUT);` instead of `pinmode(13, OUTPUT);`)
- Did I upload the code after making changes?

**Tip:** Use the **Verify** button in the Arduino IDE to check for errors before uploading your code!

## 2.9.5 Use the Serial Monitor

The **Serial Monitor** is your best friend for finding errors! You can use it to **see what the Arduino is doing** in real-time.

For example, if your **HC-SR04 sensor** isn't working, add this line in your code: `Serial.println("Sensor is running...");`



Then open the **Serial Monitor (Tools > Serial Monitor)** and see if the message appears. If it does, your Arduino is working, but the sensor may not be connected properly.

### 2.9.6 Check for Short Circuits and Burnt Components

If something smells **burnt** or gets **too hot**, **disconnect everything immediately!** Short circuits can happen if:

- Wires touch **each other accidentally**
- A component gets **too much voltage**

**Tip:** Always **double-check resistor values** before connecting LEDs or sensors. Using a **multimeter** can also help check voltage and current.

### 2.9.7 Restart and Try Again

Sometimes, the simplest solution is to:

- Unplug the Arduino
- Close the Arduino IDE
- Restart your computer
- Reconnect and try again

This can fix unexpected software issues!

## 2.10 Common Problems and Their Fixes

Here are some common issues you may face and **how to fix them**:

| Problem                            | Possible Cause                      | Solution                                              |
|------------------------------------|-------------------------------------|-------------------------------------------------------|
| LED is not blinking                | Wrong pin number in code            | Check and correct the pin number                      |
| Buzzer is silent                   | Not enough voltage                  | Try connecting it directly to 5V                      |
| Sensor gives wrong distance        | Objects too far or too close        | Place an object <b>10–50 cm</b> away for best results |
| Nothing happens at all             | Arduino not getting power           | Check USB cable or external power                     |
| "Error uploading to board" message | Wrong board selected in Arduino IDE | Select <b>Arduino Uno</b> in <b>Tools &gt; Board</b>  |
| Arduino keeps resetting            | Loose wires                         | Secure connections properly                           |

#### Activity

**Step 1: Make a mistake on purpose!** (e.g., connect an LED backward)

**Step 2:** Try to **find and fix the problem** by following the steps above.

**Step 3:** Discuss with a friend: **What mistake did you make? How did you fix it?**

**Challenge:** Swap circuits with a classmate and troubleshoot **each other's mistakes!**

### Do You Know?

**Most electronic failures happen due to simple wiring mistakes.** Checking your connections carefully **can save hours of work!**

**Your brain learns better when you fix mistakes.** Troubleshooting makes you a better problem-solver in all areas of life!

## EXERCISE

### Multiple Choice Questions

1. What is the main function of an Arduino microcontroller?
  - (a) Store files like a USB drive
  - (b) Control electronic components based on programming
  - (c) Act as a battery for circuits
  - (d) Replace a computer processor
2. The buzzer in an Arduino project produces sound when:
  - (a) It receives an analog input
  - (b) It is connected to GND only
  - (c) A high signal (5V) is sent to its pin
  - (d) It is placed directly on a breadboard
3. What is the purpose of using a 220-ohm resistor in an LED circuit?
  - (a) Increase brightness
  - (b) Protect the LED from excessive current
  - (c) Change the LED color
  - (d) Make the circuit faster
4. In an Arduino sketch, which function runs only once when the program starts?
  - (a) setup()
  - (b) loop()
  - (c) run()
  - (d) start()
5. Which tool in the Arduino IDE is used to monitor sensor data in real-time?
  - (a) Serial Plotter
  - (b) Serial Monitor
  - (c) Code Debugger
  - (d) Pin Analyzer
6. What happens if an LED is connected backward in a circuit?
  - (a) It will blink twice as fast
  - (b) It will not turn on
  - (c) It will burn immediately
  - (d) It will work normally but at half brightness
7. What does the color "Red" mean as the third band on a four-band resistor?
  - (a) 2 ohms
  - (b) Multiply by 100 ( $10^2$ )
  - (c) Multiply by 1,000 ( $10^3$ )
  - (d)  $\pm 5\%$  tolerance
8. A resistor has the colors Yellow, Violet, Orange, Gold. What is its resistance?
  - (a) 47 ohms
  - (b) 470 ohms
  - (c) 47,000 ohms (47 k $\Omega$ )
  - (d) 470,000 ohms (470 k $\Omega$ )

9. Which color represents a tolerance of  $\pm 10\%$ ?

- (a) Gold                      (b) Silver                      (c) Black                      (d) Brown

10. What is the multiplier for the color "Green" in the third band?

- (a)  $10^1$  (10)                      (b)  $10^2$  (100)  
(c)  $10^5$  (100,000)                      (d)  $10^6$  (1,000,000)

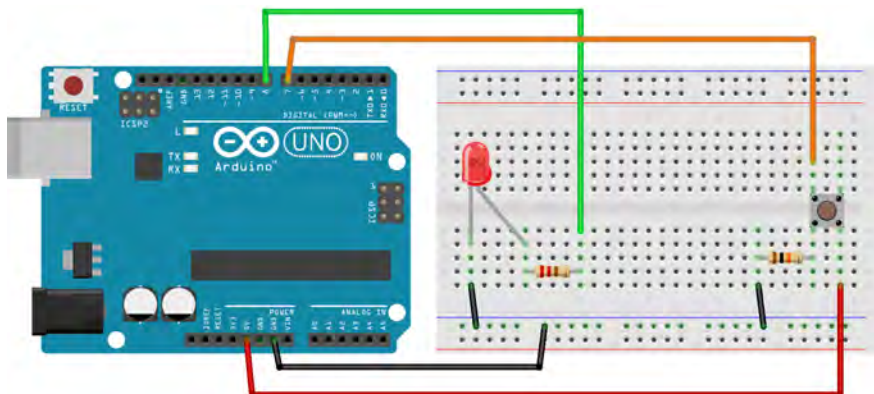
### Short Questions

1. What is an Arduino Uno, and why is it commonly used in electronics projects?
2. What is the function of a resistor in an Arduino circuit?
3. Explain the difference between digital and analog pins on an Arduino board.
4. Decode a resistor having the following colour bands.  
Orange, White, Black, Silver.
5. How does the HC-SR04 Ultrasonic Sensor measure distance?
6. What does the function `pinMode(13, OUTPUT);` do in an Arduino program?
7. Why do we use a breadboard instead of directly connecting components to the Arduino?
8. What is the purpose of the Serial Monitor, and how can it help in debugging?

### Long Questions

#### A. Labeling an Arduino Circuit Diagram

- Below is a diagram of an Arduino Uno with an LED circuit. Label the following parts:
  - Arduino board
  - Breadboard
  - Resistor
  - LED
  - Jumper wires
  - Digital pin
  - Power (5V and GND connections)



## B. Debugging Arduino Code (Find and Fix Errors)

Below is an Arduino program that is supposed to blink an LED connected to pin 9, but it contains **three errors**. Identify and correct the mistakes.

```
void setup() {  
  pinMode(9, OUTPUT);  
}  
  
void loop() {  
  digitalWrite(9, HIGH); // Turn LED on  
  delay(1000); // Wait for 1 second  
  digitalWrite(9, LOW); // Turn LED off  
  delay(1000) // Missing semicolon  
}
```

### Questions

1. Find and correct all mistakes in the code.
2. Explain why each correction was necessary.
3. What would happen if we removed the `delay(1000);` lines?

## C. Troubleshooting a Faulty Circuit

Your classmate built an Arduino buzzer alarm circuit with an HC-SR04 sensor. However, the circuit is not working!

### 1. The problem

- The buzzer does not sound when an object is detected nearby.
- The Serial Monitor shows incorrect distance values.

### 2. Observations

- The buzzer is connected to GND and digital pin 7.
- The sensor is connected to 5V, GND, Trig (pin 9), and Echo (pin 10).
- The buzzer code is correct, but the sensor data seems incorrect.

### 3. Your Task

- Identify three possible mistakes that could be causing this issue.
- Suggest step-by-step solutions to fix the circuit.
- Draw a corrected circuit diagram.

# Graphic Designing and Multimedia

### Student Learning Outcomes:

By the end of this chapter, students will be able to:

- Understand the basics of graphic design and publishing.
- Utilize basic design tools (like Canva and CapCut) to create posters, flyers, and brochures for school events, demonstrating practical skills in digital and print media design.
- Apply documentation systems to manage digital and print media, including generating QR codes and barcodes for project access and inventory management.

This chapter is your gateway to creating eye-catching posters, fun videos, and useful brochures, all while learning skills that are used in real-world jobs like advertising, filmmaking, and event planning. Whether you're designing a flyer for a school fair or organizing digital files for a project, you'll discover how to shape your ideas with creativity and technology.

By the end of this unit, you'll have the know-how to design, create, and manage multimedia projects like a pro ready to impress your friends, teachers, and maybe even a future boss.

## 3.1 Getting Started with Graphic Design and Publishing

Welcome to the world of graphic design and publishing. This section will help you learn the basics of creating cool pictures and sharing them with others. Whether it's making a poster for a school event or sharing a flyer online, you'll discover how to turn your ideas into amazing designs.

### What Is Graphic Design?

Graphic design is the art of making things look good using pictures, colours, and text. It's everywhere, on book covers, adverts, and even school event posters.

**Example:** A bright poster for a school sports day or a logo for your class team.

### Understanding Publishing

Publishing is how you share your designs with the world. It can be digital (on a computer or phone) or print (on paper).

1. **Digital Publishing:** Sharing a poster online, like on a school website or social media. You can send it to friends with a click.
2. **Print Publishing:** Making physical copies, like printing flyers for a school event to hand out.

Your design needs to work for where it's shared. Usually, we use big text for posters, small text for brochures, or videos for online fun.

### Key Design Basics

To make great designs, you need to know a few simple rules. These are like the building blocks of graphic design, such as:

- **Colours:** Use bright colours to grab attention, but don't mix too many. Two or three colours are best (e.g., red and yellow for a fun event).
- **Shapes:** Circles, squares, or lines can make your design look tidy or exciting.
- **Text** Pick easy-to-read fonts and make important words (like the event date) bigger.
- **Balance and Contrast:** Spread things out so it's not too crowded, and use dark text on a light background (or the other way around) to make it attention grabbing.

#### Activity

Grab some paper and crayons. Draw a poster for a school sports festival using one colour, a circle shape, and big text for "Sports Festival".

## 3.2 Using Basic Design Tools

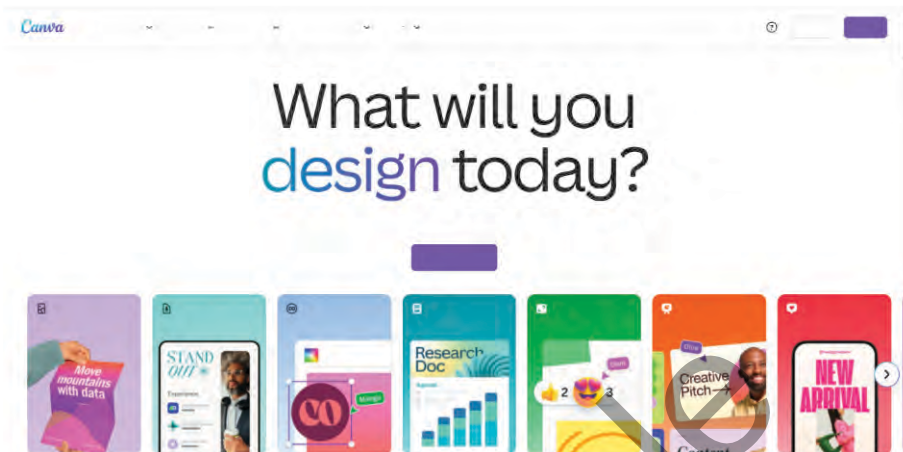
Now that you know the basics of graphic design, it's time to have some fun with tools that make creating easy. In this section, you'll learn how to use beginner-friendly software like Canva and CapCut to design posters, flyers, and brochures. These tools will help you turn your ideas into real projects for both digital screens and printed pages.

#### Do You Know?

You can ask your parents to help you create accounts on websites like **Fiverr** or **Upwork** to offer online services in **graphic design**. Also, you can look for businesses near your home and make **promotional videos** for them to post on **Instagram, Facebook, and TikTok**.

### 3.2.1 Exploring Canva

Canva is a free (basic version), simple tool you can use on a computer or phone to create amazing designs.



**Figure 3. 1:** Home Screen of [www.canva.com](https://www.canva.com).

**Canva** is a website ([canva.com](https://canva.com)) where you drag and drop pictures, text, and colours to make posters or flyers as shown in Figure 3. 1. A sample home screen is shown in Figure 3. 1, which can be changed from time to time. Canva has over 250,000 templates to help you start. You can also download it as a desktop application but it requires continuous Internet support.

- **Example:** Make a poster for “Pakistan Day Celebrations” at your school. Add a photo of the Pakistan flag and Minar-e-Pakistan, write Pakistan’s National Day – 23 March in bold letters, and use green and white colors to match the national theme.

#### Do You Know?

A beginner's guide for Canva with video tutorial is available at <https://www.canva.com/learn/how-to-canva-beginners-guide/>.

#### Activity

Open Canva, pick a template, and change the text to advertise a school bake sale. Save it as a PDF to print later.

## **Step-by-Step Guide Creating a Design Using Canva**

Let’s plan a poster for a “Pakistan Day 23 March”.

### **Step 1: Log In and Start a New Design**

Open your web browser, go to [canva.com](https://canva.com), and log in with your email or Google account. You will find the Canva homepage with options like “Create a design” at the top. Click “Create a design” and choose “Poster” from the dropdown menu. (You can pick any size, but “Poster” works for events).



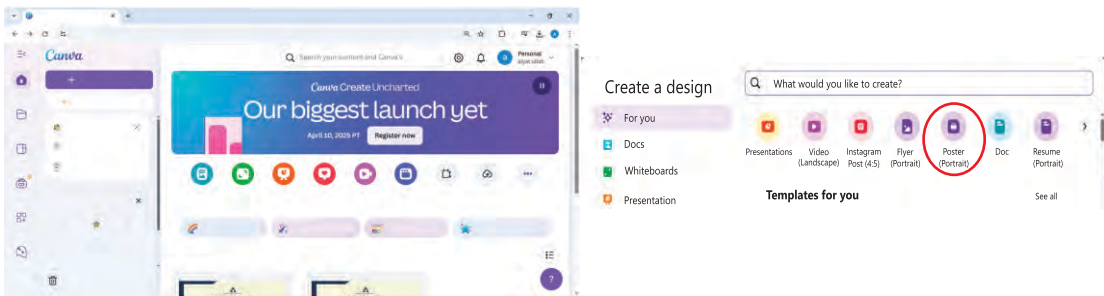


Figure 3.2 creating design and choosing poster in Canva

## Step 2: Set Up Your Canvas

Once the poster opens, you'll see a blank space. Click the "Customise" tab or leave it as the default poster size (e.g., 8.3 x 11.7 inches). You will find a white rectangle with a sidebar on the left full of options like "Elements", "Text", and "Uploads".

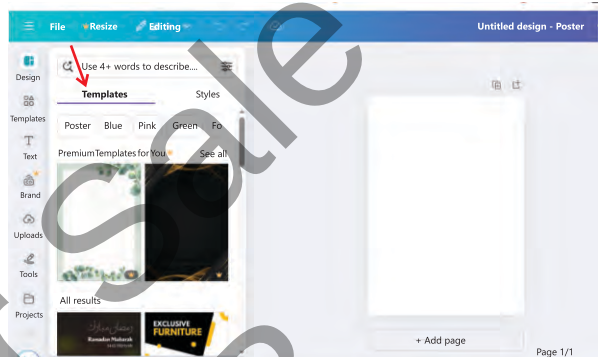


Figure 3.3: Selecting Background

Let's add a background. Click "Background" in the sidebar, pick a bright colour (e.g., light green w.r.t. Pakistan's national colour), and click it to fill the canvas.

## Step 3: Add a Title

Go to the "Text" tab in the sidebar and click "Add a heading". You will find a text box appears on the canvas with "Your Text Here". Click inside, type "Pakistan Day 23 March", and choose a bold font (e.g., "Impact" or "Arial Black") from the top toolbar. Make the text big (e.g., 60 pt) and change the colour to white.

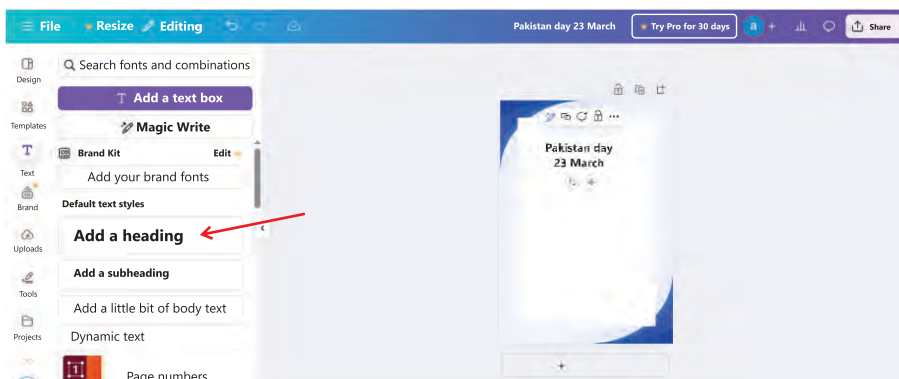


Figure 3.4: Adding a Title and Selecting Font style



#### Step 4: Insert Shapes or Images

Go to the "Elements" tab, click "Shapes", and choose a circle. Drag it to the centre of the canvas. Change its colour to red by clicking it and selecting a red shade from the top.

You will find a red circle appears, which you can resize by dragging the corners. You may also try "Uploads", for the relevant photos already there in your phone/computer. **Example:** Photos of Minar-e-Pakistan, Quaid-e-Azam etc.

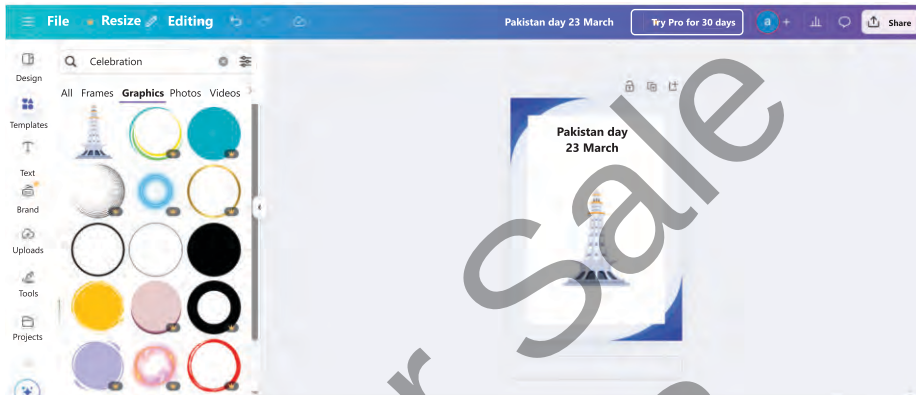


Figure 3.5: Adding Shapes

#### Step 5: Add Details

Click "Text" again, choose "Add a little text", and type "Date: 23 March" and "Time: 10 AM - 2 PM" in two separate boxes. You will find two small text boxes appear. Move them below the title. You can change the font to something simple (e.g., "Roboto") and the colour to black. Adjust the size (e.g., 20 pt) so it's easy to read.

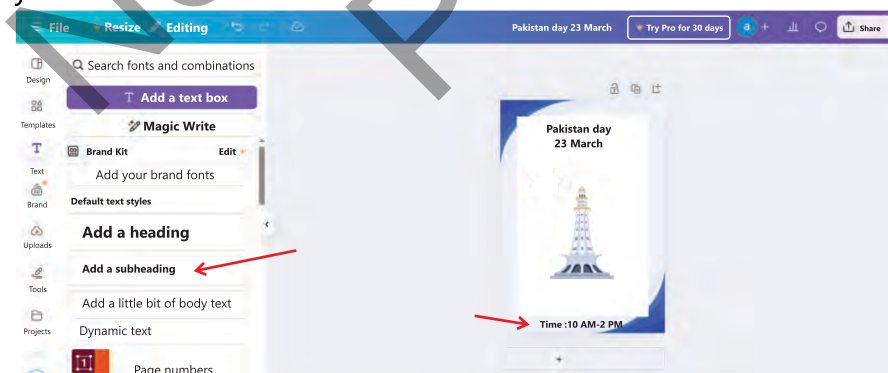


Figure 3.6: adding subheading

#### Step 6: Decorate with Elements

Go to "Elements", click "Graphics", and search for "confetti" or "stars". Pick one and drag it to a corner of the canvas. You will find a small confetti or star

shapes appear, which you can resize or move. Add a few more in different corners for a festive look.

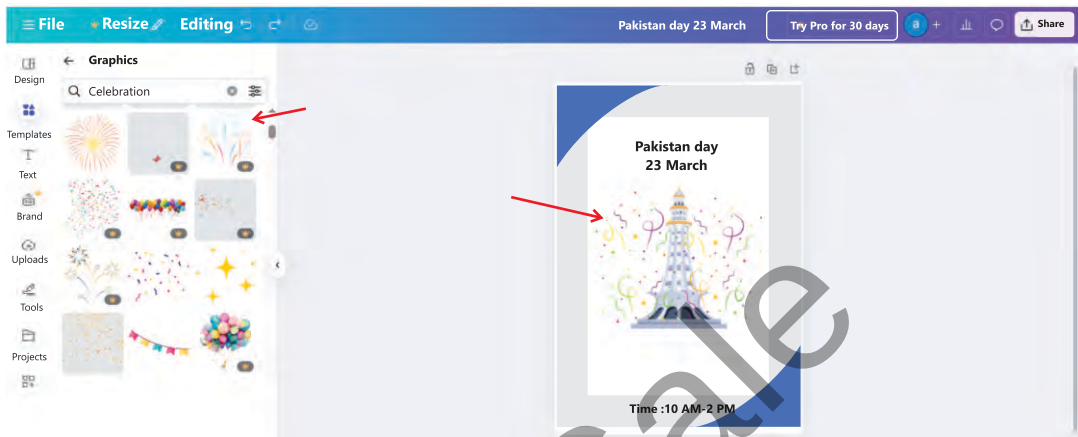


Figure 3.7: adding Elements

### Step 7: Save and Download

Click "Share" (top right) as shown in figure 3.7, then "Download". Choose "PDF Print" for printing or "PNG" for digital use. You will find a pop-up where you pick the file type and click "Download". Save it to your computer or phone with a suitable name like "Pakistan\_Zindabad".

### Types of Designs You Can Create with Canva

Canva is a versatile free online graphic design tool that empowers users to create a wide range of designs, from whiteboards to websites and beyond. Each type of design in Canva is given below.

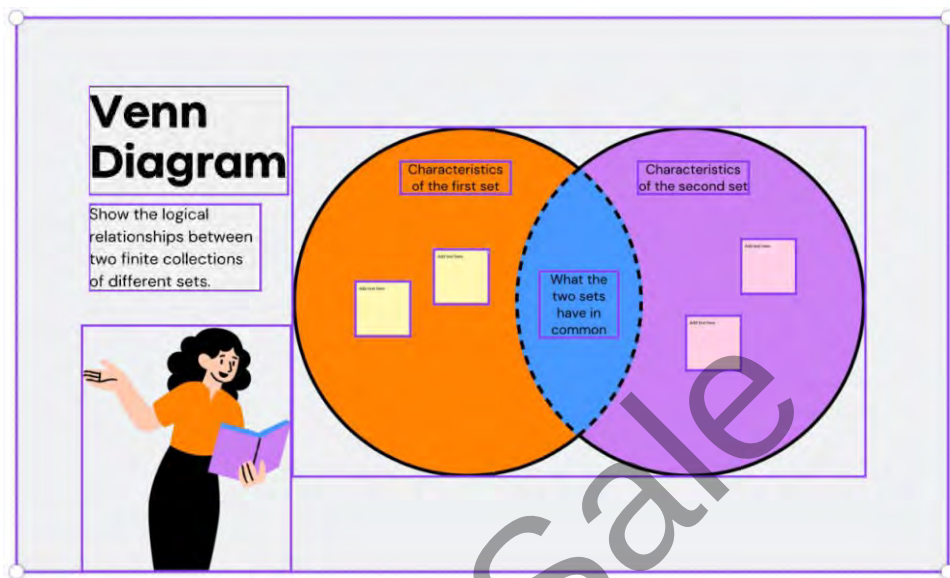
#### Whiteboard

Whiteboard is a digital space where you can brainstorm ideas, draw diagrams, or plan projects with others in real-time. It's interactive and perfect for group projects or creative thinking.

To use it, open Canva, select "Whiteboard" from the design options, and start with a blank canvas or a template (e.g., mind maps or SWOT analysis). A sample whiteboard is shown in Figure 3.8. We can add text, shapes, images, or sticky notes, and share it with friends or classmates to collaborate.

#### Activity

Plan a school event by sketching a timeline with colourful sticky notes.



**Figure 3.8:** A Whiteboard Showing the Concepts of Sets.

## Doc

Doc is a digital document where you can combine text, images, and graphics to create reports, notes, or guides. It's like a smart Word document but with design flair, ideal for school assignments.

To use it, choose "Doc" from Canva's design menu, pick a template (e.g., a report or letter), and add headings, paragraphs, photos, or charts as shown in Figure 3.9. Edit it online and share it easily.

### Activity

Make a study guide with pictures and bullet points for a history lesson.



**Welcome to the 9<sup>th</sup> class**

**Figure 3.9:** A Sample Doc.

---

## Presentation

Slides you can use to share ideas or teach a topic, similar to PowerPoint but easier to customize. It makes learning fun and helps you impress your class or teacher.

To use it, select "Presentation", choose a template (e.g., for a school project), add slides with text, images, or videos, and use animations. Present live or record it.

### Activity

Create a presentation about your favorite book with pictures and fun transitions.

## Social Media

Graphics or short videos designed for platforms like Instagram, Facebook, or Twitter. It helps you share your ideas with friends or promote school events online.

To use it, Pick "Social Media" and select a size (e.g., Instagram Post or Story), then customize with templates, photos, text, or stickers. Download or schedule posts directly.

### Activity

Design an Instagram post to announce a school club meeting with a bright photo and hashtag.

## Video

Short clips or animations you can make with music, text, and visuals. It's a fun way to tell stories or create ads without needing fancy equipment.

To use it, choose "Video" or "Animated Social Media", upload clips or photos, add transitions, text, and audio from Canva's library, then export as MP4.

### Activity

Make a 15-second video inviting classmates to a sports day with music and text.

You can also find other AI (Artificial Intelligence) based tools which make video w.r.t. your guidelines. For example, [www.invideo.io](http://www.invideo.io)

## Website

A simple one-page *website* you can build to share information or showcase a project. It's an easy way to go online without learning complex coding.

To use it, select "Website", pick a template, add sections for text, images, or links, and customize colours. Publish it with a Canva link or connect a domain.

### Activity

Create a website for your school's debating club with photos and event dates.

## Poster

A poster is a large, eye-catching design for printing or sharing digitally, like for events or announcements. It is perfect for decorating classrooms or spreading the word about school activities.

To use it, choose “Poster”, select a size (e.g., A4), add a background, text, and images using templates or from scratch, then download as PDF or PNG.

### Activity

Design a poster for a school science fair with bold text and a beaker graphic.

## Flyer

A **flyer** is a small, single-page design to hand out or post, similar to a poster but more compact, easy to share with friends or pin up around school. A sample flyer for food is shown in Figure 3.10.

To use it, pick “Flyer”, choose a template, add event details, colours, and photos, and download for printing.

### Activity

Make a flyer for a bake sale with a cake image and price list.



Figure 3.10: A Sample Flyer

## Brochure

A brochure is a folded document with multiple sections, great for detailed information. It looks professional and holds lots of info in a small space.

To use it, select “Brochure”, pick a tri-fold template, add text and images for each panel (e.g., event info, photos), and export as PDF.

### Activity

Create a brochure for a school trip with maps, schedules, and pictures.

## Logo

A logo is a unique symbol or design to represent a person, team, or club. It gives your projects or teams a special identity as shown in Figure 3.11.

To use it, choose “Logo”, start with a template or blank canvas, add shapes, text, and colours, then download as PNG or SVG.



Figure 3. 11: A Sample Logo

### Activity

Design a logo for your football team with a ball and your initials.

## Business Card

It is a small card with your name, contact info, or club details for sharing. It is a useful way of networking or showing off your work!

To use it select "Business Card", pick a template, add your name, phone number, and a photo, then download for printing.

### Activity

Make a card for your school project group with everyone's names.

## Invitation

An invitation is a design to invite people to an event, like a party or meeting. It makes any event feel special and exciting!

To use it, choose "Invitation," select a template (e.g., birthday or event), add text (date, time, place), and decorate with images, then download.

### Activity

Create an invitation for a school talent show with confetti graphics.

## Infographic

An *infographic* is a visual way to show facts or data with charts and pictures. It turns boring numbers into something fun and easy to understand. See Figure 3.12, where an infographic about the auditing process is shown.

To use it, pick "Infographic", choose a template, add stats (e.g., school attendance), and use icons or graphs, then export.

### Activity

Make an infographic about your class's favorite sports.

## Resume

A resume is a document to show your skills and experience, like for a job or school application. It helps you stand out when applying for opportunities.

### Auditing Process



Figure 3.12 Sample Infographic



To use it, select “Resume”, pick a template, add your education, skills, and a photo, then download as PDF.!

#### **Activity**

Create a resume for a school leadership role with your achievements.

### **Card**

A card is a custom greeting card for occasions like birthdays or Eid. It is your personal touch for special moments.

To use it choose “Card”, select a template (e.g., birthday), add a message and images, and download or print.

#### **Activity**

Design a thank-you card for your teacher with a flower graphic.

### **T-Shirt**

You can also design a print for T-shirts, perfect for teams or events. It is a fun way to show team spirit or celebrate.

To use it choose Pick “T-Shirt”, choose a template, add text or logos, and download as PNG for printing.

#### **Activity**

Make a T-shirt design for your school sports day with the date.

### **Menu**

A menu is a list of food or items, great for events or pretend restaurants. It is useful for planning or selling at school fairs!

To use it, select “Menu”, pick a template, add dish names and prices, and decorate with food images, then download.

#### **Activity**

Create a menu for a school bake sale with cake and cookie options.

### **Letterhead**

A letterhead is a customized letter template with your name or club logo. It makes your letters look official and smart.

To use it, choose “Letterhead”, pick a template, add your name and design, and download as a Word or PDF file.

#### **Activity**

Make a letterhead for your school club’s official letters.

## **3.3 Getting Start with CapCut**

CapCut is a free, all-in-one video editing app that also offers graphic design features, making it a great tool for creating vibrant designs for social media, videos, or even static images. In this section, we’ll create a design from scratch using CapCut. Download it for free on iOS, Android, or use the desktop version at [www.capcut.com](http://www.capcut.com).



### 3.3.1 Step-by-Step Guide to Create Design Using CapCut

CapCut lets you create dynamic, eye-catching designs that move, perfect for social media or school events. It's a great way to learn video editing while designing, giving you skills for both static and animated projects. Let's learn this tool by making a new project.

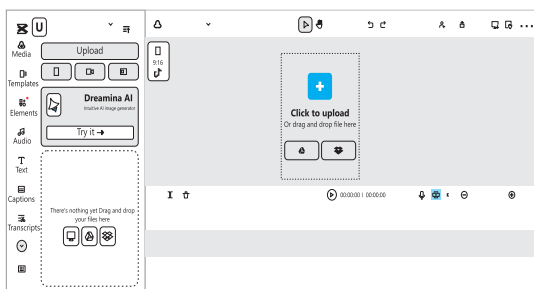


Figure 3.13: Blank Project in CapCut

#### Step 1: Open CapCut and Start a New Project

The CapCut homepage with options like "New Project" (on mobile, it's a "+" button; on desktop, it's "Create New"). Tap "New Project". If asked, allow access to your photos and media. Choose a canvas size (e.g., 9:16 for a vertical social media post or 16:9 for a wider graphic).

You will see a blank canvas with a timeline at the bottom and a toolbar with options like "Text", "Stickers", and "Effects" as shown in Error! Reference source not found..

#### Step 2: Add a Background

Start with a colorful background. Tap "Background" (or "Canvas" on desktop) in the toolbar, then pick a solid colour to make your design according to your choice. It is just like setting the mood for your design. You can also add a filter for texture using "Effects", then "Video Effects", and search for "Grain" or "Sparkle" to add a subtle overlay.

#### Step 3: Add a Main Title

Tap the "Text" icon in the toolbar, then select "Add Text". You will find a text box appears on the canvas with placeholder text like "Tap to Edit". Type "Happy 14 August" in the box as shown in. You can use the font and colour of your choice. Add an animation by tapping "Animation" and selecting "Fade In".

#### Step 4: Insert a Sticker or Graphic

Tap "Stickers" in the toolbar, search for "music note" or "star", and pick one to add to your design. You will find a small music note sticker appears on the canvas, which you can drag and resize. You can place the sticker below the title, resize it to be medium-sized, and change its colour (some stickers allow colour changes in CapCut).

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### Step 5: Add Event Details

Tap "Text" again, choose "Add Text", and type "Date: 14 August | Time: 2 PM - 5 PM". You will find a new text box appears. Drag it to the center of the canvas. You can customize the colour, font and background.

### Step 6: Add a Dynamic Effect

Tap "Effects", then "Video Effects", and search for "Glitch" or "Confetti". Apply the effect to the entire canvas. You will find a confetti effect plays across the screen, adding movement to your design. You can adjust the duration of the effect on the timeline (drag the effect bar to last 5 seconds). If you're making a static image, skip the effect or export it as a still frame.

### Step 7: Review and Adjust

Tap the play button to preview your design. Check if everything looks balanced and readable. You will find the title fades in, the music note sits nicely, the details are clear, and confetti adds fun. You can also adjust positions if needed by dragging elements to avoid overlap. Use the timeline to tweak the timing of animations.

### Step 8: Export Your Design

Tap the export button (top right, usually an arrow pointing up). Choose "Export" as a video (MP4) for a dynamic design, or "Save as Image" (PNG) for a static graphic. You will find the export options like resolution (e.g., 1080p) and format. CapCut may add a watermark unless you're using the Pro version or exporting to TikTok. Name your file "Pakistan" and save it to your device. Share it directly to social media if you'd like.

## 3.3.2 How CapCut Differs from Canva

While both CapCut and Canva are fantastic for creating designs, they cater to slightly different needs:

- **Focus on Video vs. Static Design:** CapCut is primarily a video editing app with graphic design features, so it excels at creating dynamic designs with animations, transitions, and effects (like the confetti in our example). Canva, however, focuses on static designs like posters and flyers, with limited video features unless you use its presentation or video tools.
- **Features and Tools:** CapCut offers video-specific tools like speed adjustments, keyframe animations, and chroma key (green screen), plus audio editing (music, voiceovers). It also has graphic design capabilities like stickers, text animations, and effects, but its library of static elements

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(e.g., icons, illustrations) is smaller. Canva has a massive library of static graphics, templates, and print-ready features, plus more advanced text and layout options.

- **Ease of Use:** CapCut's interface is timeline-based, ideal for video editing, but it can feel less intuitive for static designs compared to Canva's drag-and-drop canvas. Canva is simpler for beginners creating posters or flyers, with more focus on layout precision.
- **Output and Sharing:** CapCut is built for video output (e.g., MP4) and social media sharing (especially TikTok, as it's owned by ByteDance, TikTok's parent company). It can export static images, but it's not its strength. Canva excels at both digital and print outputs, offering high-quality PDFs and eco-friendly printing options.
- **Cost and Access:** Both tools have free versions. CapCut's free version includes most features but may add a watermark on exports unless you upgrade to Pro (\$7.99/month) or share directly to TikTok. Canva's free version is robust for static designs, with a Pro option (\$12.99/month) for extra templates and features.

#### **Activity**

Create a 10-second video flyer for a sports day. Add a photo of a football, text like "Sports Day – Join Us!" and a fun song. Set it to loop for 5 seconds on and 5 seconds off.

#### **Do You Know?**

CapCut lets you speed up or slow down videos. Try making a slow-motion clip of a goal kick.

#### **Activity**

Use CapCut to make a video with two school photos and text about a class trip. Share it with a friend to see their reaction.

### **3.4 Managing Digital and Print Media**

Now that you've learned how to create posters, flyers, and videos, it's time to keep everything organized. In this section, you'll discover how to manage your digital (on the computer) and print (on paper) projects so you can find them easily. You'll also learn to use fun tools like QR codes and barcodes to make your work more professional and easier to access.

### 3.4.1 Documentation Systems

Keeping your work organized is super important. A documentation system is just a way to sort and store your files, so you don't lose them. Imagine if you made a great poster for a school event but couldn't find it when you needed to print more copies that would be a mess!

- **How to Organize**

- o Name Your Files Clearly: Use names like "SchoolFairPoster\_2025" or "BakeSaleVideo\_Final" so you know what's what.
- o Make Folders: Create a folder on your computer called "School Projects" and put all your designs in there. You can even make smaller folders inside, like "Posters" and "Videos".
- o Back Up: Save copies on a USB stick or cloud storage (like Google Drive) in case your computer breaks.

### 3.4.2 Creating QR Codes

A QR code is a square with black-and-white patterns that you can scan with your phone to open a website, video, or file as shown in Figure 3. It's a cool way to share your digital projects without printing lots of links.

- **Why Use QR Codes?**

- o Add a QR code to your poster so people can scan it and watch your event video online.

- o It saves space and looks modern!

- **How to Make a QR Code (Step-by-Step)**

- o Go to a free QR code website like QRCodeMonkey.com or QRStuff.com.
- o If your video or digital poster is online (e.g., on Google Drive), copy its link.
- o Paste the link into the QR code website.
- o Click "Generate" to make your QR code.
- o Download the QR code as an image and add it to your poster or flyer using Canva.



**Figure 3.14:** QR Code to download Pakistan's National Adaptation Plan

The following QR code for the "National Adaptation Plan" by the Pakistan's Ministry of Climate Change and Environmental Coordination.

### **Activity**

Make a QR code that links to a short video you created with CapCut. Add the QR code to a printed flyer and ask a friend to scan it—does it work?

### **Do You Know?**

In 2019, MoFA (Ministry of Foreign Affairs) introduced a digital QR code system for document attestation. This system allows individuals to verify the authenticity of their attested documents by scanning the QR code, streamlining the verification process and reducing the risk of forgery.

### **3.4.3 Using Barcodes for Inventory**

A barcode is a set of lines that you can scan to keep track of things, like how many printed posters you have. It's like a label for your stuff as shown in Figure 3.15.



**Figure 3.15:** Bar Code Reader

- **Why Use Barcodes?**
  - o Barcodes are used to identify products in stores. They provide information to a computer system, which is used to track inventory, pricing, and other data.
  - o If you print 50 flyers for a school club, barcodes help you count how many you've given out.
  - o It makes managing big projects easier.
- **How to Make a Barcode (Step-by-Step)**
  - o Use a free barcode generator like Online-Barcode-Generator.net.
  - o Type in a number or name for your project (e.g., "ClubFlyer\_001").
  - o Choose a barcode type (like Code 128—it's common and easy).
  - o Generate the barcode and download it.
  - o Print the barcode on a sticker and put it on your stack of flyers.

### **Activity**

Pretend you printed 20 brochures for a school event. Make a barcode for them, stick it on the pile, and write down how many you give out each day. It's like being a shop manager.

### **Putting It All Together**

Now let's combine everything to manage your projects like a pro.

- **For Digital Media**
  - o Save your final poster or video with a clear name (e.g.,

"TalentShowPoster\_Final.pdf").

- o Upload it to Google Drive and create a QR code for the link.
- o Add the QR code to your printed poster so people can scan it and see more details online.

- **For Print Media**

- o Print your posters or brochures and stack them neatly.
- o Add a barcode to the stack to track how many you have left.
- o Write a list of who you gave them to (e.g., "10 to Class 5, 5 to Teachers").

**Activity**

Organize your latest project (like a poster and video for a school event). Save the files in a folder, make a QR code for the video, and print a barcode for your stack of posters. Show your teacher how you've kept everything tidy!

**EXERCISE**

**Multiple-Choice Questions**

1. What is graphic design?
  - (a) Writing stories for movies
  - (b) Building websites only
  - (c) Making things look good using pictures, colours, and text
  - (d) Recording videos for school
2. What is the main difference between digital and print publishing?
  - (a) Digital is on paper, print is online
  - (b) Digital is on a screen, print is on paper
  - (c) Digital uses text, print uses videos
  - (d) Digital is for posters, print is for videos
3. Which tool is best for creating a poster in Canva?
  - (a) Whiteboard
  - (b) Video
  - (c) Poster
  - (d) Website
4. What does a QR code do when added to a poster?
  - (a) It prints the poster faster
  - (b) It links to a website, video, or file when scanned
  - (c) It changes the poster's colour
  - (d) It tracks how many posters are printed

- 
5. How does CapCut differ from Canva, as per the chapter?
- (a) CapCut is only for printing, Canva is for videos
  - (b) CapCut focuses on video editing, Canva is better for static designs
  - (c) CapCut is for posters, Canva is for barcodes
  - (d) CapCut has no animations, Canva does
6. Which of the following is NOT a feature of Canva?
- (a) Creating presentations
  - (b) Editing videos
  - (c) Writing programming code
  - (d) Designing social media posts
7. What is the main purpose of the "Elements" tool in Canva?
- (a) To add text to designs
  - (b) To insert shapes, icons, and illustrations
  - (c) To export designs as PDFs
  - (d) To adjust image brightness
8. Which of the following features is available in CapCut?
- (a) Code debugging
  - (b) 3-D animation modeling
  - (c) Video trimming and transitions
  - (d) Web hosting
9. What is the main difference between Canva and CapCut?
- (a) Canva is for video editing, while CapCut is for graphic design
  - (b) Canva is used for graphic design, while CapCut is used for video editing
  - (c) Both are used for the same purpose
  - (d) Canva is a mobile app, but CapCut is only for desktops
10. Which of the following is true about Canva and CapCut?
- (a) Both tools allow advanced coding features
  - (b) Canva is best for video transitions, while CapCut is best for posters
  - (c) Canva is mainly for designing images and presentations, while CapCut specializes in editing videos
  - (d) CapCut can create animations, but Canva cannot



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## Short Questions

1. What is the difference between digital publishing and print publishing? Give one example of each.
2. Name two key design basics you should follow when making a poster.
3. List three types of designs you can create with Canva.
4. Why is CapCut good for creating a video flyer for a school event?
5. What is a documentation system, and why is it important for managing your designs?

## Long Questions

1. Explain the steps to create a poster for a school event using Canva. Include at least five steps in your answer.
2. Describe how to make a QR code for a school project and add it to a poster. Why is this useful?
3. Compare Canva and CapCut as design tools. Give two differences and explain how you would use each for a school talent show project.
4. What are barcodes, and how can you use them to manage printed flyers for a school event? Describe the steps to create a barcode.
5. Why is it important to organize your digital and print media? Describe how you would manage a project with a poster and video for a school fair, including QR codes and barcodes.

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## Chapter-4

# Fundamentals of Web Development and e-Commerce

### Student Learning Outcomes:

By the end of this chapter, students will be able to:

- develop, test, and debug static websites using HTML and CSS at the intermediate level and an interactive website using JavaScript at beginner level.
- Understand the fundamentals of e-Commerce, and its impact on modern businesses, and explore common e-Commerce platforms (such as Shopify, eBay, and Daraz).

## Introduction

The Internet has changed how people learn, communicate, and do business. From online stores to social media platforms, websites are everywhere. But have you ever wondered how these websites are created? Web development is the process of creating websites and involves using various programming languages and tools. In this chapter, we will explore the basics of Web Development. You will learn how to create simple websites using HTML and CSS and add interactivity using JavaScript. By the end of this chapter, you will be able to develop, test, and debug a simple website using these technologies.

In addition to building websites, we will also explore the basics of e-Commerce, and how businesses sell products and services online. You will learn about the impact of e-Commerce on modern businesses and explore popular platforms such as Shopify, eBay, and Daraz. This journey into web development will open up many opportunities. Whether you want to start a blog, create an online portfolio, design a website for a school project, or explore how an online business works, learning web development will help you turn your ideas into reality. Let's start by understanding the basics of web development and why it is important.

## 4.1 Introduction to Web Development

Web development is the process of creating websites and web applications. It includes everything from designing a simple webpage to building complex

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online platforms. A website is a collection of web pages that are linked together and displayed in a web browser.

To develop a website, we will explore the following three fundamental web development technologies:

1. **HyperText Markup Language (HTML):** HTML provides the foundation and organizes the content, such as headings, forms, images, tables, paragraphs, and links.
2. **Cascading Style Sheets (CSS):** CSS makes the website attractive, colorful, and visually appealing.
3. **JavaScript:** JavaScript adds interactivity and smart features to a website.

**Example:** When you move your mouse over a button and it changes color, or when you press a button, and a hidden message appears, these interactive effects are created using JavaScript.

## 4.2 Motivation Behind Learning Web Development

Learning web development is exciting because it allows you to build real projects that can be shared with the world. Here are some reasons why you want to learn web development:

- **Creativity:** You can design and develop your own unique website.
- **Problem-Solving Skills:** Writing code and debugging teaches logical thinking.
- **Future Career Opportunities:** Many jobs today require web development skills.
- **Self-Expression:** You can create personal blogs, portfolios, or school websites.

## 4.3 Essential Tools and Environment Setup

Before starting web development, we need the right tools. Setting up the correct environment makes coding easier and more efficient. Below are the essential tools you need to begin:

### 4.3.1 Code Editors

To write HTML, CSS, and JavaScript, we need a text editor (for example Notepad) or an Integrated Development Environment (IDE). Some popular editors include:

1. **Visual Studio Code (VS Code):** A free and powerful code editor with many useful features.
2. **Sublime Text:** A lightweight editor for quick coding.

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### 4.3.2 Installing a Code Editor

To set up Visual Studio Code (VS Code):

1. Download from <https://code.visualstudio.com/>.
2. Install it on your computer.
3. Open VS Code and start a new project. Setting Up a Simple Web Development Project

To create your first web page:

1. Open your code editor.
2. Create a new folder and name it MyFirstWebsite.
3. Inside the folder, create a new file and name it index.html.
4. Write the HTML code.

Save the file and open it in your web browser to view the webpage.

#### Activity

Guide students through setting up a web development environment on their computers or using online development platforms.

To set up Visual Studio Code (VS Code):

1. Download from <https://code.visualstudio.com/>.
2. Install it on your computer.
3. Open VS Code and start a new project. Setting Up a Simple Web Development Project

To create your first web page:

1. Open your code editor.
2. Create a new folder and name it MyFirstWebsite.
3. Inside the folder, create a new file and name it index.html.
4. Write the HTML code.

Save the file and open it in your web browser to view the webpage.

### 4.3.3 Build Your First Web Page with HTML

Following HTML code creates a webpage with a title, a heading, and a paragraph, forming the foundation of any HTML document. Here's a basic HTML structure to create your first webpage:

```
<!DOCTYPE html>  
<html>
```

```
<head>
  <title>My First Web Page</title>
</head>
<body>
  <h1>Welcome to My First Website</h1>
  <p>This is a simple webpage created using HTML.</p>
</body>
</html>
```

#### 4.3.4 Understanding Your First HTML Web Page

The HTML code is written in a file named `index.html` in a text editor. It defines a webpage with a title, heading, and paragraph. When opened in a browser, the file displays a heading ("Welcome to My First Website") and a paragraph ("This is a simple webpage created using HTML"). Figure 4. 1, shows how to run a simple web page using HTML.

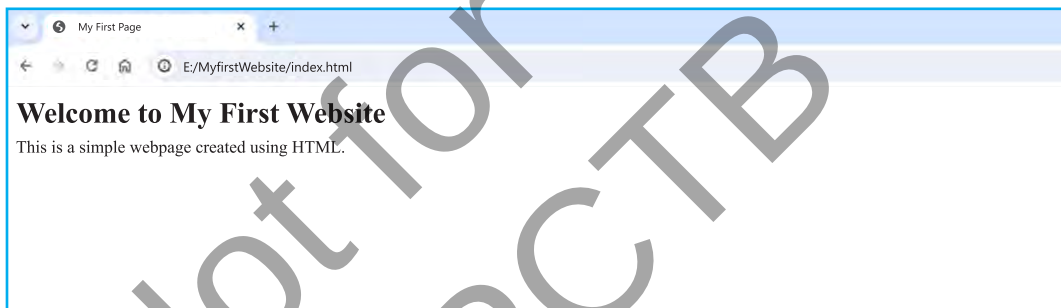


Figure 4. 1: Viewing the output in a web browser.

#### 4.3.5 HTML Explained with a Real-World Analogy

This simple HTML structure forms the foundation of a webpage, just like a book's structure helps readers navigate its content.

1. **<!DOCTYPE html> Setting the Rule**

It tells the browser this is an HTML5 document.

2. **<html> The Main Container**

It holds all webpage content inside.

3. **<head> The Information Section**

It stores metadata, styles, and scripts.

4. **<title> Naming the Page**

It sets the name shown on the browser tab.

## 5. <body> The Page Content

It holds text, images, and links.

## 6. <h1> Creating a Heading

It highlights the main heading.

## 7. <p> Adding Paragraphs

Like paragraphs in a book, it organizes text for easy reading.

### Do You Know?

First website ever created is still online? It was developed by Tim Berners-Lee in 1991 and is accessible at <https://info.cern.ch/> It was a simple text-based page explaining the World Wide Web!

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## 4.4 Creating Web Pages with HTML

In this section, we will learn about HTML tags that help in structuring text, displaying images, adding links, creating lists, tables, and forms.

### 4.4.1 Adding Text to a Web Page

We use different HTML tags to format and organize text in a way that makes it easy to read.

#### Paragraphs

A paragraph is a block of text that helps in organizing content clearly.

#### HTML Code:

```
<p>This is the first paragraph on my website.</p>  
<p>HTML makes it easy to add and format text.</p>
```

#### Headings

Headings define titles and subtitles on a webpage. There are six levels of headings, from <h1> (largest) to <h6> (smallest).

#### HTML Code:

```
<h1>Main Heading (Biggest)</h1>  
<h2>Subheading</h2>  
<h3>Smaller Heading</h3>
```

## Formatting Text

HTML also allows us to style text in different ways.

**Example:** Think of these like using a marker to bold important notes, slanting words for emphasis, or underlining key points in your school book.

### HTML Code:

```
<b>This text is bold</b> <br>  
<i>This text is italic</i> <br>  
<u>This text is underlined</u>
```

## 4.4.2 Adding Images to a Web Page

Images enhance the visual appeal of a webpage and improve user experience by conveying information more effectively. The `<img>` tag in HTML allows you to embed images directly into your webpage.

### Syntax of Image Tag

The `<img>` tag is a self-closing tag, meaning it does not require a closing tag. It requires at least the `src` attribute to specify the image file.

Example: Embeds an image (nature.jpg) with a width of 300 pixels and displays "Beautiful Nature" as alternative text if the image fails to load.

### HTML Code:

```

```

### Explanation of Attributes

| Attribute    | Description                                                                                       | Example                             |
|--------------|---------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>src</b>   | Specifies the source (location) of the image file. It can be a local file or an online image URL. | <code>src="nature.jpg"</code>       |
| <b>alt</b>   | Provides alternative text if the image doesn't load.                                              | <code>alt="Beautiful Nature"</code> |
| <b>width</b> | Sets the width of the image in pixels.                                                            | <code>width="300"</code>            |



### Activity

Create a simple webpage using HTML paragraphs, headings, and text formatting to introduce yourself creatively.

Add the following elements to your webpage:

1. Main heading (<h1>) with your name
2. Subheading (<h2>) for a short title (e.g., "Aspiring Web Developer")
3. Paragraphs (<p>) introducing yourself
4. Bold (<b>), Italic (<i>), and Underline (<u>) formatting in your text
5. Add profile picture using <img> tag.

### Do You Know?

The size of images is important in web performance! Using optimized images (such as JPEG, PNG, or WebP) can speed up website loading time by 30-40%.

## 4.4.3 Adding Links to a Web Page

Links (also known as hyperlinks) allow users to navigate between different web pages, and sections of the same page. It also permits downloading files and sending emails.

### Basic Syntax of the Tag

The <a> tag (short for "anchor") is used to create hyperlinks. The href (Hypertext Reference) attribute specifies the destination of the link.

Example: Creates a link that directs users to the NADRA website when clicked.

### HTML Code:

```
<a href="https://www.nadra.gov.pk">Visit NADRA</a>
```

### Explanation

- href="https://www.nadra.gov.pk" → This specifies where the link will take the user when clicked.
- Visit NADRA → This is the visible clickable text for the user.
- <a> and </a> → These tags wrap around the text or element that acts as the hyperlink.

## 4.4.4 Creating Lists in HTML

Lists in HTML help in structuring and organizing content effectively. They are commonly used for menus, to-do lists, steps in a process, and various other structured information formats.

## Unordered Lists – Bullet Points

An unordered list (<ul>) is used when the order of items doesn't matter. It displays items with bullet points.

### HTML Code:

| HTML Code                                                                                                                  | Output                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| <pre>&lt;ul&gt;   &lt;li&gt;Apple&lt;/li&gt;   &lt;li&gt;Banana&lt;/li&gt;   &lt;li&gt;Orange&lt;/li&gt; &lt;/ul&gt;</pre> | <ul style="list-style-type: none"><li>• Apple</li><li>• Banana</li><li>• Orange</li></ul> |

## Ordered Lists – Numbered Lists

An ordered list (<ol>) is used when the sequence of items is important. It automatically numbers the list items.

### HTML Code:

| HTML Code                                                                                                                               | Output                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <pre>&lt;ol&gt;   &lt;li&gt;Wake up&lt;/li&gt;   &lt;li&gt;Brush teeth&lt;/li&gt;   &lt;li&gt;Go to school&lt;/li&gt; &lt;/ol&gt;</pre> | <ol style="list-style-type: none"><li>1. Wake up</li><li>2. Brush teeth</li><li>3. Go to school</li></ol> |

### Activity

Create an interactive webpage titled "My Web Navigation" using hyperlinks (<a> tag) and lists (<ul>, <ol>) to structure content effectively.

1. Add hyperlinks:
  - A link to Google (opens in a new tab).
  - A link to jump to a specific section on the same page.
2. Create structured lists:
  - Unordered List: List of favorite fruits.
  - Ordered List: List of daily routine.
  - Nested List: List of subjects with categories.

## 4.4.5 Creating Tables in HTML

Tables are useful for presenting structured information, like a school timetable.

## HTML Code:

| HTML Code                                                                                                                                                                                                                                                                                                                            | Output                                                                                                                                |         |      |      |         |         |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------|------|------|---------|---------|----------|
| <pre>&lt;table border="1"&gt;   &lt;tr&gt;     &lt;th&gt;Subject&lt;/th&gt;     &lt;th&gt;Time&lt;/th&gt;   &lt;/tr&gt;   &lt;tr&gt;     &lt;td&gt;Math&lt;/td&gt;     &lt;td&gt;9:00 AM&lt;/td&gt;   &lt;/tr&gt;   &lt;tr&gt;     &lt;td&gt;English&lt;/td&gt;     &lt;td&gt;10:00 AM&lt;/td&gt;   &lt;/tr&gt; &lt;/table&gt;</pre> | <table><tr><th>Subject</th><th>Time</th></tr><tr><td>Math</td><td>9:00 AM</td></tr><tr><td>English</td><td>10:00 AM</td></tr></table> | Subject | Time | Math | 9:00 AM | English | 10:00 AM |
| Subject                                                                                                                                                                                                                                                                                                                              | Time                                                                                                                                  |         |      |      |         |         |          |
| Math                                                                                                                                                                                                                                                                                                                                 | 9:00 AM                                                                                                                               |         |      |      |         |         |          |
| English                                                                                                                                                                                                                                                                                                                              | 10:00 AM                                                                                                                              |         |      |      |         |         |          |

## Explanation

- (a) `<table>` → Creates a table.
- (b) `<tr>` → Defines a row.
- (c) `<th>` → Creates a header cell (bold text).
- (d) `<td>` → Creates a data cell.

## 4.4.6 Creating Forms in HTML

Forms in HTML allow users to enter and submit data. They are used for login pages, contact forms, search bars, surveys, and many other interactive web applications.

### Basic Structure of an HTML Form

The `<form>` tag defines a section in the HTML document where user input is collected as shown in Figure 4.2.

### User Input Fields

The `<input>` tag is used to collect user input. Common types include:

| Input Type | Description                                       |
|------------|---------------------------------------------------|
| Text       | Standard text input (e.g., Name, Username)        |
| Email      | Only allows valid email formats (abc@example.com) |
| Password   | Hides input (for passwords)                       |
| Number     | Accepts only numeric values                       |
| Checkbox   | Allows multiple selections                        |
| Radio      | Allows selecting one option from a group          |
| Submit     | Sends the form data                               |

---

## Submit Button

Clicking this button sends the form data to the URL specified in the action attribute.

### HTML Code:

```
<input type="submit" value="Register">
```

## Dropdown List

Used to create a dropdown menu.

### HTML Code:

```
<label for="country">Country:</label>
<select id="country" name="country">
  <option value="usa">USA</option>
  <option value="uk">UK</option>
  <option value="canada">Canada</option>
</select>
```

## Multi-line Text Input

Used for larger text input, like comments or messages.

### HTML Code:

```
<label for="message">Message:</label> <br>
<textarea id="message" name="message" rows="4" cols="30"> </textarea>
```

## Form Validation and Required Fields

1. The required attribute makes a field mandatory.
2. The maxlength and minlength attributes define length limits.

## Example: A Complete Form

HTML code below creates a registration form with fields for name, email, password, gender selection, country selection, and a message box.

### HTML Code:

```
<form action="submit.php" method="post">
  <h2>Registration Form</h2>
  <label for="name">Name:</label>
  <input type="text" id="name" name="name" required> <br> <br>
```

```

<label for="email">Email:</label>
<input type="email" id="email" name="email" required> <br> <br>
<label for="password">Password:</label>
  <input type="password" id="password" name="password"
required> <br> <br>
<label for="gender">Gender:</label>
<input type="radio" id="male" name="gender" value="male"> Male
<input type="radio" id="female" name="gender" value="female"> Female
<br> <br>
<label for="country">Country:</label>
<select id="country" name="country">
  <option value="usa">USA</option>
  <option value="pakistan">Pakistan</option>
  <option value="canada">Canada</option>
</select> <br> <br>
<label for="message">Message:</label> <br>
  <textarea id="message" name="message" rows="4" cols="30"> </
textarea> <br> <br>
<input type="submit" value="Submit">
</form>

```

The image shows a web browser window with the title 'My First Web Page'. The address bar displays 'File E:/MyFirstWebsite/index.html'. The main content area contains a form titled 'Registration Form'. The form has the following elements: a text input for 'Name:', a text input for 'Email:', a text input for 'Password:', a 'Gender:' section with 'Male' and 'Female' radio buttons, a 'Country:' dropdown menu with 'USA' selected, a 'Message:' text area, and a 'Submit' button at the bottom.

**Figure 4.2:** Visual look of above registration form.

---

## 4.5 Enhancing Your Web Page with CSS Fundamentals

Cascading Style Sheets(CSS) controls the design, layout, and interactivity of webpages, making them visually appealing and user-friendly.

### 4.5.1 Understanding CSS in Simple Terms

CSS makes websites attractive. CSS allows you to:

- Change colors, fonts, and backgrounds
- Adjust spacing and layout
- Add animations and transitions
- Control the positioning of elements

#### Classes and IDs in CSS

- Classes (.) are reusable styles applied to multiple elements.
- IDs (#) are unique styles applied to a single element.

**Example:** Here, **heading** applies to all elements with this class, while **#main-title** applies only to the element with this specific ID.

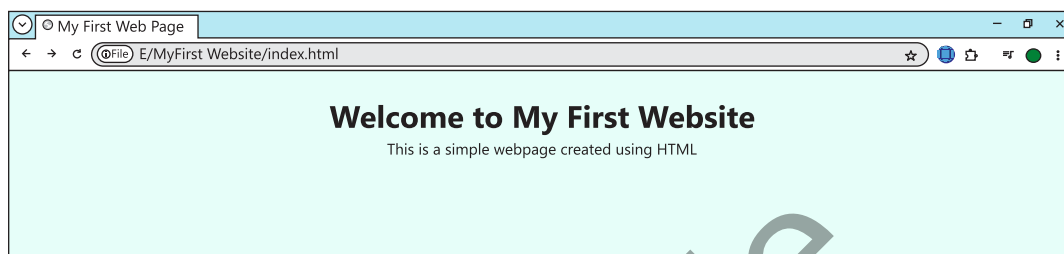
```
.heading {  
    color: blue;  
}  
#main-title {  
    font-size: 24px;  
}
```

### 4.5.2 Relating CSS to Above HTML

In section 4.3.3, we created a basic webpage with a title, heading, and paragraph. Let's now apply CSS to improve its appearance:

```
<style>  
body {  
    font-family: Arial, sans-serif;  
    background-color: #f4f4f4;  
    color: #333;  
    text-align: center;  
}  
</style>
```

This makes the background light gray, applies Arial font, and centers all text as shown in Figure 4.3. In this case, we apply internal CSS by adding a `<style>` tag inside the `<head>` section of the simple webpage code.



**Figure 4.3:** Layout of the simple webpage after applying CSS.

## Applying Styles to Headings and Paragraphs

Previously in section 4.4.1, we used `<h1>` for the main heading and `<p>` for paragraphs. Now, let's add styling:

```
h1 {  
  color: darkblue;  
  text-transform: uppercase;  
  border-bottom: 2px solid black;  
}  
p {  
  font-size: 18px;  
  line-height: 1.6;  
}
```

The heading is now dark blue while paragraphs have better readability.

## Styling Links

In section, we created hyperlinks. Let's style them:

```
a {  
  color: blue;  
  text-decoration: none;  
  font-weight: bold;  
}  
a: hover {  
  color: red;  
  text-decoration: underline;  
}
```



The links on a webpage appear blue, bold, and without an underline. However, when the user moves the mouse pointer over the link (hovers over it), the link changes to red and becomes underlined. This effect helps users easily identify which link they are pointing at before clicking on it.

#### **Do You Know?**

The world's most visited website, Google, uses CSS to create its clean, minimalist look. Even the blue link color was chosen based on extensive research!

### **CSS Animations**

To make the webpage interactive, we can add CSS animations:

```
button {  
  width: 120px;  
  height: 50px;  
  background-color: red;  
  color: white;  
  font-size: 16px;  
  border: none;  
  cursor: pointer;  
  transition: transform 0.5s ease, background-color 0.5s ease;  
}  
button: hover {  
  transform: scale(1.2);  
  background-color: darkred;  
}
```

### **Explanation**

- The button is red by default with white text.
- When the user hovers over it, the button grows in size (scales up) and its color darkens, creating a smooth effect.
- The cursor: pointer; ensures it looks clickable.

#### **Activity**

Students will apply CSS fundamentals to style an HTML page, improving its appearance, layout, and usability.

1. Create a simple HTML page named index.html with:
  - (a) A heading (<h1>)

- (b) A paragraph (<p>)
  - (c) A navigation menu
  - (d) A form (<form>) with fields for name and email
2. Write CSS to:
- (a) Change colors, fonts, and backgrounds
  - (b) Style headings and paragraphs
  - (c) Create hover effects on links

## 4.6 Enhancing Your Web Page with JavaScript Fundamentals

JavaScript (JS) is a programming language that makes web pages dynamic by responding to user interactions, modifying content, and handling events.

### 4.6.1 Understanding JavaScript Syntax and Data Types

JavaScript has a simple and easy-to-understand syntax for working with variables, data types, and operators. Some of the most commonly used data types include:

- **Strings:** Represent text (e.g., "Hello World")
- **Numbers:** Represent numerical values (e.g., 100, 3.14)
- **Booleans:** Represent true/false values

#### Example:

```
var message = "Welcome to JavaScript!"; // String Variable
let number = 42; // Number Variable
const isActive = true; // Boolean Variable
```

These variables are declared using predefined keywords `var`, `let`, and `const`, which control how they behave within the program.

### 4.6.2 Working with Variables, Operators, and Functions in JavaScript

Variables store data, operators perform calculations, and functions execute reusable blocks of code.

#### Example:

```
let a = 10; let b = 5;
let sum = a + b; // Addition
console.log("The sum is: " + sum); // Output function to print results
```

The above JavaScript code defines two variables to store numeric values(10 and 5, respectively), and the sum holds the result of their addition (a + b). Furthermore, console.log( ) is a built-in function which prints the output. Functions allow you to organize and reuse code:

```
function greet(name) {  
    return "Hello, " + name + "!";  
}  
console.log(greet("Ali"));
```

The above JavaScript code defines a function named greet(name), which takes a name as input and returns a greeting message. The function uses the return statement to concatenate "Hello", with the given name. When console.log(greet("Ali")); is executed, it calls the function with "Ali" as the input and prints "Hello, Ali!" to the console.

### 4.6.3 Handling Events and User Input with JavaScript

JavaScript handles user events like clicks, typing, or form submissions.

#### Example:

```
document.getElementById("myButton").addEventListener("click", function() {  
    alert("Button Clicked!");  
});  
<button id="myButton">Click Me</button>
```

The above JavaScript code uses a print alert message when the button is clicked. The document.getElementById("myButton").addEventListener("click", function() { alert("Button Clicked!"); }); listens for a click event on a button with the ID "myButton", and when clicked, it triggers an alert box displaying "Button Clicked!". This demonstrates how JavaScript is used to add interactivity to a webpage.

### 4.6.4 JavaScript in an HTML Document

JavaScript is placed inside the <script> tag within an HTML document:

1. Inside the <head> section
2. In an external file (script.js) linked using <script src="script.js"> </script>

---

**Example:**

```
<script>
  alert("JavaScript is running!");
</script>
```

### 4.6.5 Modifying CSS with JavaScript

JavaScript can change styles dynamically by modifying CSS properties.

**Example:**

```
<p id="p1">This text will turn blue.</p>
<button onclick="document.getElementById('p1').style.color='blue'">
Change Color</button>
```

This code changes the color of a paragraph's text to blue when the button is clicked. The `<p id="p1">This text will turn blue.</p>` defines a paragraph with an `id="p1"`, which allows JavaScript to identify and modify it. The `<button>` has an `onclick` event that triggers JavaScript when clicked. Inside the button, `document.getElementById('p1').style.color='blue';` selects the paragraph by its ID (`p1`) and changes its text color to blue.

### 4.6.6 Using JavaScript to Modify HTML for a Dynamic Website

JavaScript manipulates HTML elements dynamically using the Document Object Model (DOM).

**Example:**

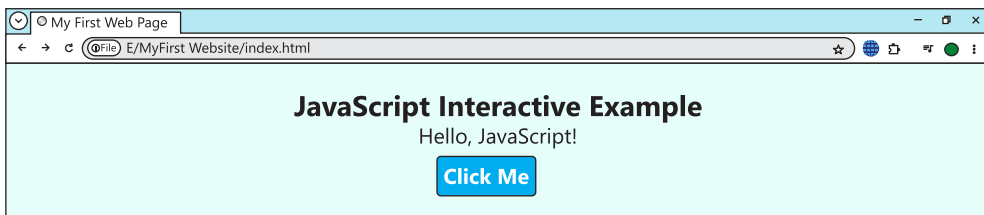
```
<p id="demo">Original Text</p>
<button onclick="document.getElementById('demo').innerHTML='Text
changed!'">Change Text</button>
```

The code changes the text of a paragraph when the button is clicked. The `<p>` element with `id="demo"` initially displays "Original Text". When the button is clicked, JavaScript executes `document.getElementById('demo').innerHTML='Text changed!'`, which updates the paragraph content to "Text changed!", demonstrating dynamic content manipulation.

## Example (Combining HTML, CSS, and JavaScript):

```
<!DOCTYPE html>
<html>
<head>
  <title>Interactive Web Page</title>
  <style>
    body { font-family: Arial, sans-serif; text-align: center; }
    #text { font-size: 20px; }
    /* Styling the button */
    button {
      font-size: 20px; /* Increase text size */
      padding: 15px 30px; /* Increase button size */
      background-color: blue; /* Button background */
      color: white; /* Text color */
      border: none; /* Remove border */
      border-radius: 8px; /* Rounded corners */
      cursor: pointer; /* Show pointer on hover */
    }
    button:hover {
      background-color: darkblue; /* Darker shade on hover */
    }
  </style>
</head>
<body>
  <h1>JavaScript Interactive Example</h1>
  <p id="p1">Click the button to change this text.</p>
  <button onclick="document.getElementById('p1').innerHTML='Hello,
JavaScript!'">Click Me</button>
</body>
</html>
```

Figure 4.4, demonstrates the power of HTML (structure), CSS (styling), and JavaScript (interactivity) working together to create a dynamic webpage.



**Figure 4.4:** Dynamic webpage using JavaScript along with HTML and CSS.

### **Activity**

Students will enhance the previously styled webpage in Activity-4 by adding JavaScript functionality to make it dynamic and interactive.

1. Modify the existing webpage (index.html) to include JavaScript.
2. Create a JavaScript file (script.js) that:
  - Changes the heading text when a button is clicked.
  - Validates the form inputs before submission.
  - Changes the background color when a button is clicked.
3. Link the JavaScript file to the HTML page.

## **4.7 Introduction to e-Commerce**

e-Commerce is all about buying and selling things on the internet. It's like having a shop online where you can sell toys, clothes, or even your old books without needing a real store. People in Pakistan use e-Commerce to shop from home, and it's getting very popular. For example, Daraz.pk is a big e-Commerce platform in Pakistan where you can buy a school bag or sell your handmade friendship bands.

### **4.7.1 Exploring Common e-Commerce Platforms**

Some popular e-Commerce platforms are Shopify, eBay, and Daraz.

- **Shopify:** This is a tool to build your own online shop. You can add pictures of your products and set prices.
- **eBay:** This is a big online market. You can sell used toys, books, or games here. People bid to buy your stuff, or you can set a fixed price.
- **Daraz:** This is very popular in Pakistan. It's like a big online store where you can sell new or old things, like school bags or gadgets.

### **Do You Know?**

You can use a Content Management System (CMS) to set up your own e-Commerce website. A CMS, or Content Management System, is a tool like WordPress or WooCommerce that makes it easy to create a shop online.

#### **4.7.1.1 Setting Up an Online Store**

You can sell things you make or don't need anymore. Let's assume that you want to sell handmade bracelets online. Here's how to start with a platform like Daraz or Shopify.

1. **Sign Up:** Go to the website (like Daraz.pk). Make an account with your email. **Set Up Your Shop:** Click "Sell on Daraz" or "Start a Store" on Shopify. Give your shop a name, like "Kids' Bracelets."

2. Add Products: Upload a photo of your bracelet. Write its name, like “Rainbow Bracelet.” Add a price, like Rs.400.
3. Write a Description: Say something about your bracelet. For example, “Handmade with colorful beads. Perfect for kids!”
4. Choose How to Ship: Pick how you’ll send the bracelet to buyers. You can use a courier like TCS or deliver it yourself if it’s nearby.
5. Publish Your Shop: Click “Save” or “Publish.” Now your shop is live! People can see and buy your bracelets.

#### **Top Tip**

You can market your online shop on Instagram and Facebook. These platforms let you share photos and videos of your products to reach lots of people.

### **4.7.2 Managing Basic Customer Orders and Payments**

When someone buys from your online shop, they place an order. Managing orders means keeping track of what they bought. You also need to handle their payments. Let’s learn how to do this with your shop.

#### **Creating and Maintaining Online Store**

You already set up your shop in the last section. Now, let’s keep it running smoothly.

1. Check for Orders: Look at your shop’s dashboard. It shows if someone bought your bracelet. For example, “Nasir ordered 1 Rainbow Bracelet.”
2. Talk to the Buyer: Send a message to the customer. Say, “Thank you for your order! I’ll send your bracelet soon.”
3. Pack the Item: Put the bracelet in a small packet. Add a thank-you note to make the customer happy.
4. Send the Item: Use a courier like Bykia if the customer lives nearby or use some other service suitable for intercity.
5. Update the Order: Go to your shop. Mark the order as “Shipped.” This tells the customer “Customer Bracelet” is on the way.

#### **Top Tip**

- Reply to buyers quickly if they ask questions.
- Keep your shop tidy—update photos if you add new things.
- Be honest about your products. If a bracelet breaks easily, tell the buyer.

### 4.7.2.2 Online Payments

Payments are the money buyers give you. Managing orders and payments teaches you how to run a shop.

Here's how to manage payments safely:

1. Set Up Payment Options: On Daraz or Shopify, choose how buyers pay. You can pick up bank cards or cash on delivery (they pay when they get the item).
2. Check Payments: After the customer orders, see if the payment is done. On Daraz, it might say "Payment Received: Rs.400."
3. Keep Track: Write down the money you get. For example, "Ayesha paid Rs.400 on 10 March."

## EXERCISE

### Multiple Choice Questions

1. Which language provides the structure for a webpage?  
(a) CSS (b) JavaScript (c) HTML (d) Python
2. Which attribute is used to specify an image source in an `<img>` tag?  
(a) Src (b) href (c) Alt (d) source
3. Choose the purpose of the `<form>` element in HTML  
(a) To structure text content (b) To define a section in a webpage  
(c) To collect user input (d) To create a navigation bar
4. Which tag is used to create a hyperlink in an HTML document?  
(a) `<link>` (b) `<a>` (c) `<href>` (d) `<ur>`
5. What does CSS stand for?  
(a) Computer Styling Sheets (b) Cascading Style Sheets  
(c) Creative Style Syntax (d) Common Styling System
6. Which combination of technologies is commonly used for front-end web development?  
(a) JavaScript, CSS, PHP (b) HTML, CSS, JavaScript  
(c) HTML, Python, SQL (d) CSS, Java, C++
7. Which JavaScript function is used to display messages in a pop-up box?  
(a) `console.log()` (b) `alert()`  
(c) `print()` (d) `messageBox()`
8. Which symbol is used for single-line comments in JavaScript?  
(a) `/* Comment */` (b) `// Comment`  
(c) `<! Comment -->` (d) `# Comment`



**9. What is e-Commerce, as explained in the chapter?**

- (a) Building websites for schools
- (b) Buying and selling things on the internet
- (c) Making videos for shops
- (d) Writing stories online

**10. What is the first step to set up an online store on Daraz?**

- (a) Add a product photo
- (b) Sign up with your email
- (c) Ship the product
- (d) Write a description

**Short Questions**

1. What does the `<p>` HTML tag do on a webpage?
2. Write an HTML tag to display an image from a file named "photo.jpg".
3. What does `<a>` tag do on a webpage?
4. Write a simple CSS rule to change the background color of a webpage to green.
5. How can CSS classes be used to style multiple elements at once?
6. What does the JavaScript function `getElementById()` do?
7. What is e-Commerce? Give one example of an e-Commerce platform in Pakistan.
8. Why is it important to talk to the buyer after they place an order?

**Long Questions**

1. Write a simple HTML code to create a webpage with a heading that says "My Online Shop" and a paragraph that says "Welcome to my store!" Then, add CSS to make the heading green and the paragraph text blue.
2. Create a JavaScript function that changes the text inside an `<h1>` tag when a button is clicked.
3. Make a simple calculator using JavaScript that allows users to enter two numbers and choose an operation (addition, subtraction, multiplication, or division). Finally display the result.
4. Why is it important to manage payments carefully in an online store? Describe how you would keep track of orders and payments for a shop selling notebooks, including one HTML tag you could use to display the shop's name on a webpage.
5. Explain the steps to set up an online store on Daraz to sell handmade keychains. Include at least four steps.

# System Troubleshooting and Maintenance

### Student Learning Outcomes:

By the end of this chapter, students will be able to:

- Understand the key concepts of computer repair and network configuration, including diagnosing hardware issues, configuring IP addresses, and setting up port forwarding.
- Apply practical skills in diagnosing hardware problems, configuring IP addresses, and setting up port forwarding for remote device access.

## Introduction

Computer maintenance refers to the routine inspection, cleaning, and servicing of hardware components and peripheral devices to ensure their optimal functionality, reliability, and lifespan. Preventive measures such as dusting, brushing, and vacuum cleaning are often overlooked but play a crucial role in preventing system failures and data loss.

When issues arise, troubleshooting is used to identify and resolve the problem. In computing, troubleshooting generally refers to diagnosing hardware and software related issues, while debugging is the term used for resolving software problems. However, troubleshooting can encompass both hardware and software concerns.

Hardware troubleshooting involves diagnosing and fixing malfunctions in devices such as the mouse, monitor, printer, and modem. Software troubleshooting focuses on resolving issues within operating systems and applications, including security threats like viruses, which are among the most common concerns in modern computing.

## 5.1 Computer Maintenance

Just like any other machine, computers need proper care and maintenance. By following the following tips properly, you can increase the life span of your computer and enjoy the smooth experience with your computer system:

- Clean the monitor screen with a dry cotton cloth to remove dust.

- Use a brush or a vacuum cleaner to clean the keyboard.
- Do not place heavy objects like books, files, or papers on the computer.
- You can also clean the screen with a mild soap-water spray.

#### Do You Know?

1. Dust build up inside a computer can cause overheating, which may lead to hardware failure. Cleaning your computer every 3-6 months can prevent this.

The system tools used for computer maintenance are shown in Figure 5.1.

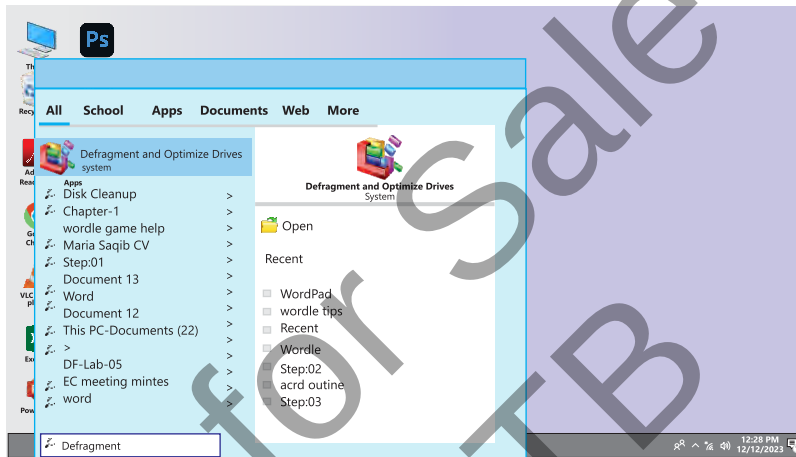


Figure 5.1: System tools for computer maintenance

### 5.1.1 Disk Defragmenter

When we install software or create a file or folder, it is saved on the hard disk. However, sometimes files are not stored in one continuous sequence but are broken into multiple fragments and scattered across different parts of the disk. This happens when there is not enough continuous free space to store the entire file in one place. Disk Defragmenter is a tool that reorganizes these fragmented files, arranging them in a continuous sequence. This improves the efficiency of data retrieval, allowing programs to run faster and enhancing overall system performance.

#### Do You Know?

**Disk Defragmenter** is a system tool used to rearrange the files on the disk so that the programs run faster.

Regularly running the Disk Defragmenter utility improves system performance. A few symptoms of fragmented data on hard drives include slow applications,

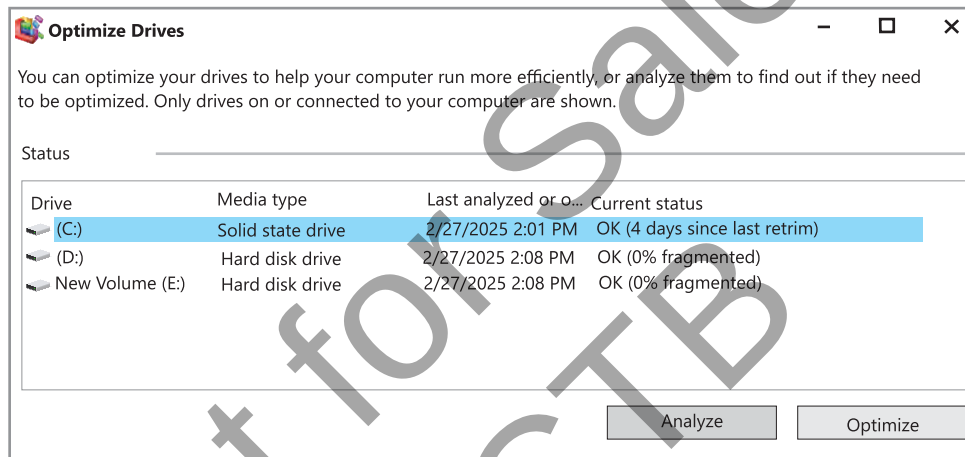
system crashes and stops responding, Slow backup times, reduced data transfer speeds, and slow boot-up times.

### **Remember**

It is not recommended to defragment solid state drives (SSD).

Running Defragmenter on Windows 11 or Windows 10

1. Open the start menu and type "defrag".
2. Click on "Defragment and Optimize Drives".
3. In the window that opens, you will see a list of your computer's drives
4. In the Optimize Drives window, choose a hard drive to defragment (usually C:), and then select Optimize (refer to Figure 5.2).



**Figure 5.2:** Defragmenting a hard drive

5. Click the "Analyze" button to check the fragmentation level
6. If the drive is more than 10% fragmented, click "Optimize" or "click defragment disk" to begin the process
7. Wait for the process to complete. This can take anywhere from a few minutes to several hours, depending on your drive size and fragmentation level
8. After the defragmentation is complete, the current status shows OK.

### **Do You Know?**

The frequency of defragmentation depends on how often you use your computer and how you use it. Here are some general guidelines:

- For regular users: Once a month
- For power users (those who frequently create, delete, or modify large files): Once a week
- For light users: Once every two to three months

## Does Defragmentation Delete Files?

No, defragmentation does not delete files. The process only reorganizes existing data on your hard drive. However, it's always a good idea to back up important files before performing any major system maintenance, including defragmentation. This precaution ensures that your data is safe in the unlikely event of a power failure or system crash during the defragmentation process.

### 5.1.2 Disk Cleanup

The hard disk contains many files that are unnecessary after a certain amount of time, but they still reside on the disk. These need to be deleted manually or using automatic Disk Cleanup program to clean the disk. Figure 5.3 prompts the user to select the drive for disk cleanup.

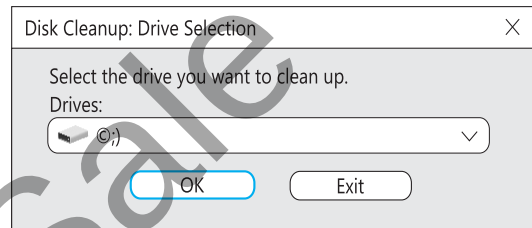


Figure 5.3: Drive Selection for Disk Cleanup

Disk Cleanup system tool deletes all the unused and unwanted files on the hard disk, to free the disk space. It is recommended to perform disk cleanup process on weekly basis.

### 5.1.3 Windows Update

Windows update ensures that your computer is up to date with new features including security. An Internet connection is required to update these features. The system connects to the Microsoft server to download and install the updates on the desired system. As shown in Figure 4, you can click on the Windows Update icon in the start menu and click on the download update to get the updates.

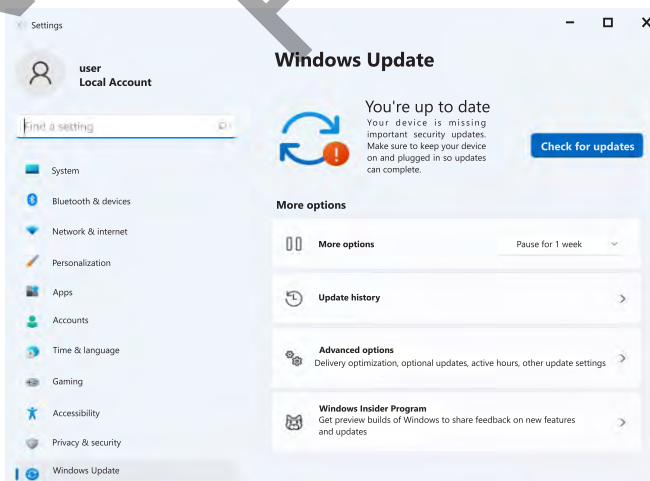


Figure 5.4: Windows update utility

### 5.1.4 Check / Scan disk

Check/Scan disk utility fixes the errors on your computer when you are facing any problems. It is recommended to run this utility every week just to ensure that your computer is error free even if you are not having any problems. You can clean up a drive by clicking on Disk Clean up as shown in Figure 5.5.

#### **Remember**

Scan Disk is a system tool that scans the hard disk and other removable media like Floppy disk to find errors and then fixes it.

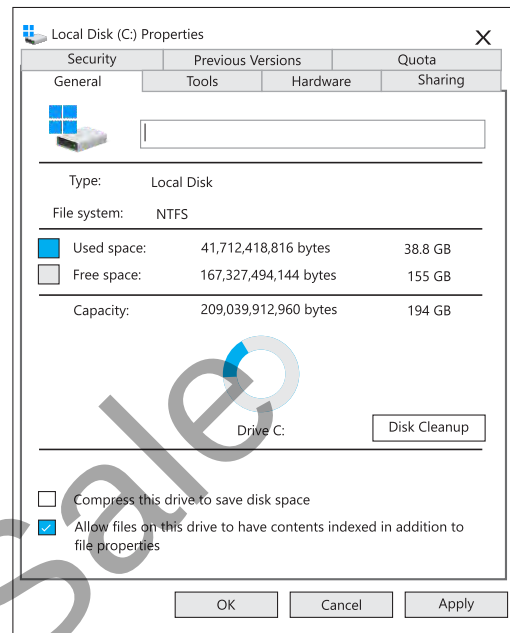


Figure 5.5: Scan Disk Wizard

### 5.1.5 Close / Uninstall Unwanted Programs

Sometimes there are programs that either do not want to run anymore or get halted due to some problem. There are different ways to remove apps and programs.

Uninstall from the Start menu:

- I. Select Start Windows icon and look for the app or program in the list shown.
- II. Press and hold (or right-click) on the app, then select Uninstall.

Uninstall from the Settings page

1. Select Start , then select Settings > Apps > Apps & features.
2. Select the app you want to remove, and then select Uninstall.

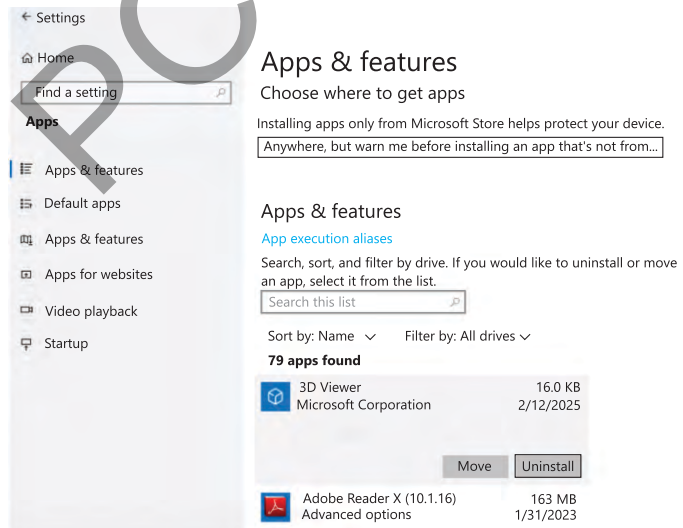


Figure 5.6: Uninstall via Settings

Uninstall from the Control Panel (for programs)

1. In the search box on the taskbar, type Control Panel and select it from the results.
2. Select Programs and Features.
3. Press and hold (or right-click) on the program you want to remove and select Uninstall or Uninstall/Change. Then follow the directions on the screen.

#### **Do You Know?**

Some apps and programs are built into Windows and cannot be uninstalled.

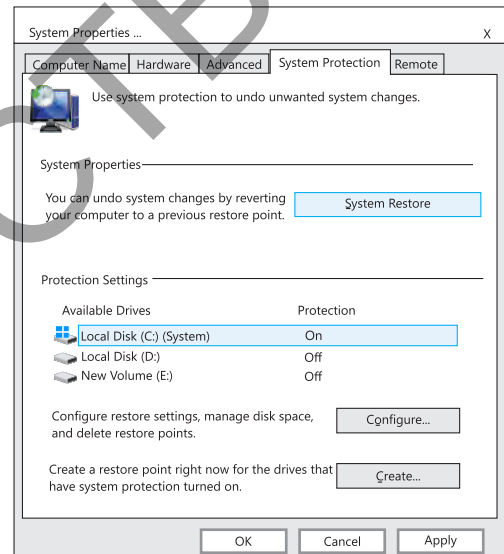
### **5.1.6 System Restore**

System Restore can revert PC's state to a previous point in time. This is particularly useful when troubleshooting issues caused by recent changes, like new software installations, driver updates, or system settings modifications. System Restore utility can undo these changes without affecting personal files and provides a safe way to resolve issues without losing necessary data.

When a restore point is selected, System Restore brings back the system files, registry settings, and installed programs to the state they were in at the time of creation of the restore point. This supports in maintaining the system's stability and can be a useful tool for recovering from unpredicted issues.

To make a restore point today, follow the following steps:

- I. Type "System Restore" in the search on your taskbar.
- II. Click on "Create a restore point" from the search results.
- III. In the System Properties window, click on the "System Protection" tab.
- IV. Click on the "System Restore" button (refer to Figure 5.7).



**Figure 5.7: System Restore Point**

#### **Do You Know?**

NOTE System Restore is a system tool that is used to create a new Restore point or to restore the system to a previous restore point. It makes a secure copy of the system settings when it is functioning normally, which is useful in case system malfunctions.



Table 1 presents a couple of common problems encountered by computer users and their solutions.

| Problem       | Solution                                                                                                                                                                                          |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Slow computer | <ul style="list-style-type: none"> <li>- Disk Cleanup</li> <li>- Disk Defragmentation</li> <li>- Close programs</li> <li>- Run an Antivirus program to overcome possible risk of virus</li> </ul> |
| Frozen screen | <ul style="list-style-type: none"> <li>- Close programs</li> <li>- System restore</li> <li>- Restart your computer</li> <li>- Check disk</li> </ul>                                               |

**Table 5. 1:** Common problems and solutions

When your system does not start, the Operating System (e.g. Windows 10) provides a variety of options:

- **Safe Mode:** Safe Mode option starts the system with minimal necessary drivers and services.
- **Windows Recovery Environment (WinRE):** If Safe Mode fails to resolve the issue, boot into WinRE which is a recovery environment that can repair common causes of unbootable operating systems. Users can access WinRE features through the Advanced startup menu, which enables the users to perform the following actions: (i) Start recovery, troubleshooting, and diagnostic tools, (ii) boot from a device (UEFI only), (iii) access the Firmware menu (UEFI only), and (iv) choose which operating system to boot, if multiple operating systems are installed on the PC.
- You can open command prompt window as an administrator and then run the following command (one option within WinRE): sfc /scannow.
- **Reset or Reinstall Windows 10:** If both safe mode and WinRe fail, then consider reinstalling Windows 10.

#### **Do You Know?**

Unified Extensible Firmware Interface (UEFI) is a modern computer software that starts up devices. It is a newer standard and offers more features and benefits, such as faster boot times, better security, larger disk support, and graphical user interface.



### 5.2.1 Device Driver Problems, Prevention and Recovery Methods

If you add a new device driver which is either outdated and/or incompatible with the operating system, then the same can cause problems.

The following instructions can be followed to prevent problems:

- Always check the Windows Hardware Compatibility List (HCL) before installing new hardware.
- Read your hardware documentation for compatibility and configuration information.
- Download the latest device driver file from the official website of the device's manufacturer.
- Use device manager to update or roll back drivers. Figure 9 shows a command prompt interface and A command namely devmgmt.msc via command prompt (refer to left part of Figure 5.8) opens the Device Manager window (refer to right part of Figure 11) where you can select a driver for update or roll back.

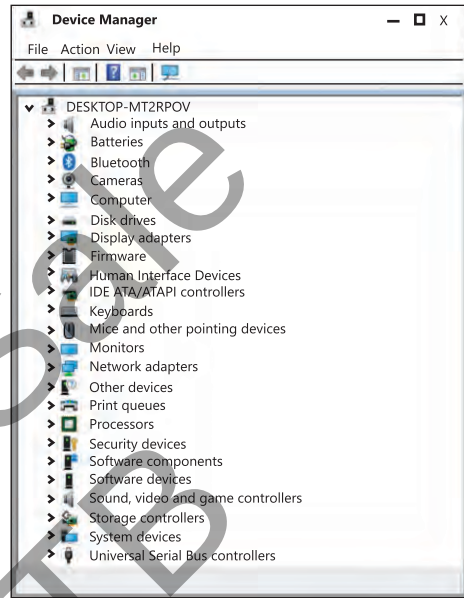


Figure 5.8: Command to open Device Manager

The following are useful recovery methods:

- Boot into Safe Mode and uninstall the problematic driver via Device Manager.
- Use System Restore to revert to a previous working state.
- Check Event Viewer (eventvwr.msc) for error logs (refer to Figure 5.9).

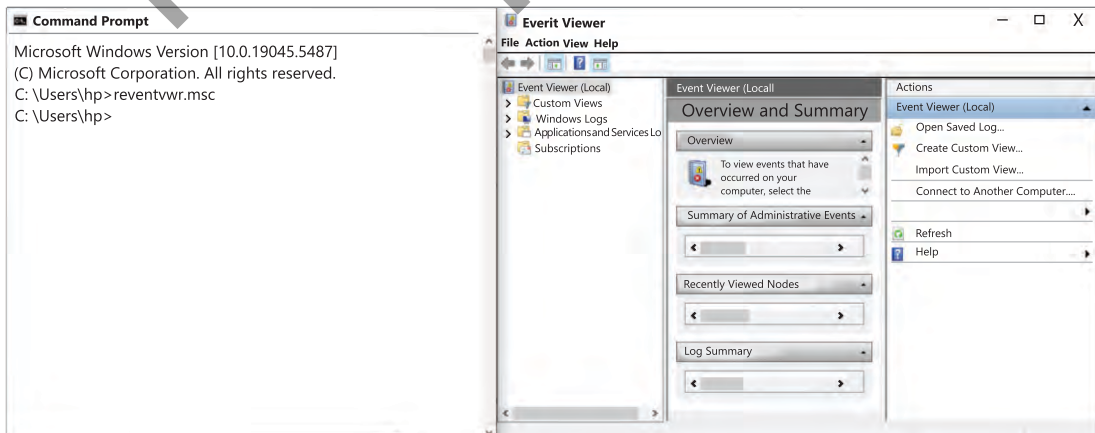


Figure 5.9: Command to open event viewer window

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### 5.2.3 Preventing and Recovering from System File Corruption

If certain types of files are damaged or corrupted, the system can face problems. Such file types include device drivers, windows registry entry files, and system files (e.g., DLL, SYS, EXE files). Preventive measures include:

- Protect the computer against power surges and failures by using an Uninterruptible Power Supply (UPS). Power surges can damage files when they are being written to the hard disk.
- Before installing or implementing unusual device configurations, drivers, or registry settings, obtain detailed information from the device manufacturer.
- Perform regular backups, including System State backups.

### 5.2.4 Virus and Malware Protection

A computer virus is a program that requires a host in order to make copies of itself on computer disks. Viruses may infect (copy to, and spread from), program files, programs in disk sectors etc. The ability to self-replicate distinguishes viruses from programs that do not. All viruses are created by people who know how to write computer programs.

Virus problems can be prevented in the following ways:

- Keep Windows Defender (Microsoft Defender Antivirus) enabled and updated.
- Avoid downloading software from untrusted sources.
- Use email filtering to prevent phishing attacks.
- Make backup copies of essential files on your hard disk. Business records, spreadsheets, manuscripts, and other important files can be lost in an instant.
- Use email filtering to prevent phishing attacks.: Clicking on everything, as some users do, is very unsafe, because an e-mailed virus can send a copy of itself to everyone a user knows, often disguised as something innocent. If you open a file attached to an e-mail, even from someone you know, you are always taking risks; however, the same may be small.

### 5.2.5 Creating an Emergency Recovery Disk

A recovery disk helps restore Windows 10 if the system becomes unbootable.

You can follow the following steps to create a recovery drive.

- Connect a USB drive (minimum 16GB recommended).

- Search for Create a recovery drive in Windows search.
- Follow the wizard and select Back up system files to the recovery drive.
- Complete the process and keep the drive in a safe location.

#### Remember

- Obtain software only from trusted sources.
- Use a safe Web browser and e-mail client.
- Install anti-virus software, and keep it updated.
- Scan all newly obtained disks, programs and files

#### Activity: Software Troubleshooting

**Objective:** Learn how to troubleshoot problems using Safe Mode.

#### **Instructions:**

- Press **Windows + R**, type "**msconfig**", and press Enter.
- Click the **Boot tab** and check **Safe Boot (Minimal)**.
- Click Apply and restart the computer.
- In Safe Mode, check if the issue persists.
- Uninstall recent software if needed from **Control Panel**.
- Open **msconfig**, uncheck **Safe Boot**, and restart normally.

## 5.3 Hardware Troubleshooting

### 5.3.1 Troubleshooting Monitor

A typical monitor is shown in Figure 5.10. Most of the time the problems are with the cabling, or interference from other devices.

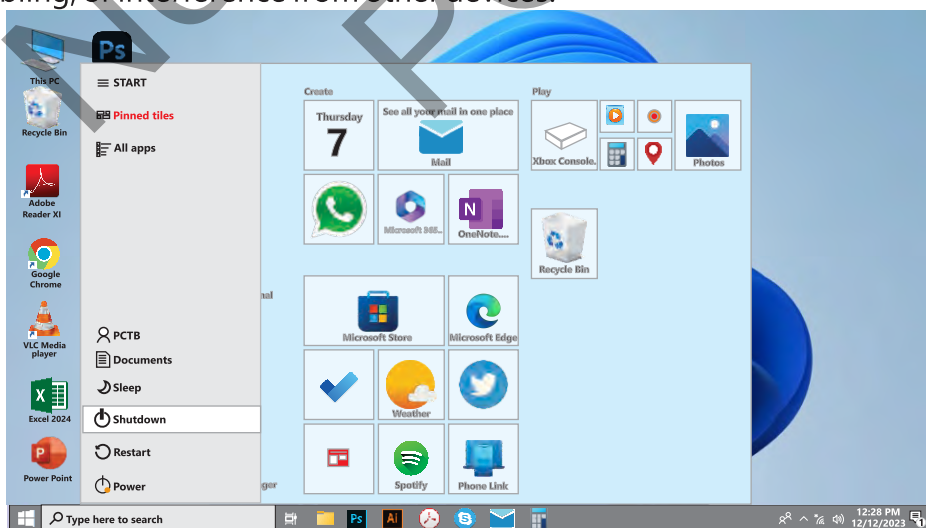


Figure 5.10: A typical monitor

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Most of the monitor problems are linked with the cabling, or interference from other devices. For example, **uneven electrical currents** can cause some strange problems to the monitor as with the rest components of the computer. If you suspect that your power supply is causing some problem, simply plug the monitor into the wall separately. Another remedy is to purchase Uninterruptible Power Supply (UPS) which can be useful during power outage times. **Interference from speakers, fans, and telephone** can produce electromagnetic fields which can appear in really cheap multimedia speakers linked with your system which should be shielded. **Badly connected cables** can not only have electromagnetic interference like the rest of the monitor but will also distort signal if interfered with. Though this is unlikely in most cases as the cable is shielded itself, however this can happen. **Long cables** attached to the monitor can cause problems as well. It is better to keep the cable length below 5'. The longer the cable corresponds to weaker signals.

### 5.3.2 Troubleshooting Printer

Printers are essential devices for producing hard copies of documents. However, they may encounter various problems that affect their performance. The following instructions are useful to troubleshooting three common types of printers: Dot Matrix, Inkjet, and Laser.

#### Dot Matrix Printer Troubleshooting

Dot matrix printers use a print head with small pins that strike an ink ribbon to create text and images on paper. The following are some common issues along with suggested solutions for Dot Matrix Printers:

- **Faded or Poor Print Quality** which is caused by worn-out ribbon or misaligned print head.  
**Solution:** replace the ink ribbon and ensure that the print head is correctly positioned.
- **Paper Jams:** Misaligned paper or worn-out feed rollers can result in paper jamming.  
**Solution:** adjust the paper alignment, remove jammed paper carefully, and clean or replace feed rollers if necessary.
- **Printer Not Printing:** This issue may occur due to loose cables, incorrect printer settings, or a faulty print head.  
**Solution:** Check and secure all cables, set the correct printer driver, and clean or replace the print head if needed.
- **Noisy Operation** is caused due to dirt buildup or mechanical wear. To avoid this, clean internal components and lubricate moving parts as per

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the manufacturer's guidelines.

### Inkjet Printer Troubleshooting

Inkjet printers spray tiny droplets of ink onto paper to make an image. Figure 15 shows a typical laser printer. They are commonly used for color printing and photo printing. Common issues include:

- **Blurred or Smudged Prints** are caused due to low ink levels, clogged print head, or damp paper.  
**Solution:** replace ink cartridges, clean the print head, and use dry, high-quality paper.
- **Lines in Printouts** appear due to dirty or misaligned print heads.  
**Solution:** Use the printer's built-in cleaning function or manually clean the print head with a lint-free cloth and alcohol.
- **Printer Not Recognizes Ink Cartridges** due to Incorrectly installed cartridges or non-genuine ink.  
**Solution:** Remove and reinstall cartridges properly and use recommended ink brands.
- **Slow Printing Speed** is caused by high-resolution settings or outdated drivers.  
**Solution:** Lower the print resolution for draft prints and update printer drivers.

### Laser Printer Troubleshooting

Laser printers use toner powder and a heated fuser to print images and text. Figure 16 shows a typical laser printer. They are commonly used for high-speed, high-volume printing. Common issues include:

- **Faded or Light Prints** occur due to low toner levels or a dirty laser lens.  
**Solution:** Shake the toner cartridge to distribute toner evenly or replace it if empty. Clean the laser lens if needed.
- **Paper Jams** happens due to incorrectly loaded papers, worn-out rollers, or damp paper.  
**Solution:** Remove jammed paper carefully, clean rollers, and store paper in a dry place.
- **Error Messages on Display** occur due to connectivity issues, firmware problems, or hardware malfunctions.  
**Solution:** Restart the printer, check cables and connections, and update firmware.

### Tidbits

Follow the following general instructions for general printer maintenance:

- Regularly clean dust from the printer
- Use High-Quality Paper and Ink/Toner
- Perform Regular Print Head Cleaning to maintain print quality for inkjet printers.
- Check paper alignment to prevent jams and misprints
- Update Drivers and Firmware to ensure compatibility and performance improvements.

### 5.3.3 Troubleshooting Keyboard

Keyboards allow users to input data into a computer, but they may develop issues over time. The keys on the keyboard are often classified as alphanumeric keys (letters and numbers), punctuation keys (comma, period, semicolon, and so on) and special keys (function keys, control keys, arrow keys, Caps Lock key, and so on). Common issues include:

- **Keyboard Not Responds** due to loose or disconnected cable, driver issues, or faulty keyboard.

**Solution:** Check and reconnect the cable or wireless connection, restart the computer, and update keyboard drivers. If the issue persists, try a different keyboard.

- Dust, dirt, or liquid spills leads to **Sticky** or **Unresponsive Keys**.

**Solution:** Clean the keyboard with compressed air or a soft cloth. If keys are stuck due to liquid damage, allow the keyboard to dry completely or replace it if necessary.

- **Wrong Characters Appear** due to incorrect keyboard layout settings.

**Solution:** Go to system settings and set the correct keyboard layout (e.g., English-US).

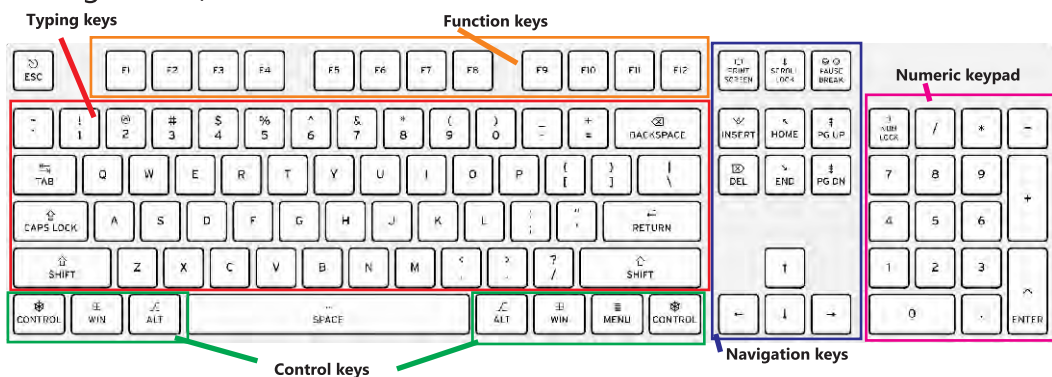


Figure 5.11: A Typical Desktop Computer Keyboard



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### 5.3.4 Troubleshooting Modem

Modems connect computers to the internet, but they may face connectivity problems.

- **No Internet Connection:** Loose cables, ISP issues, or modem malfunction can lead to no internet connectivity.  
**Solution:** Check all cables, restart the modem, and contact the Internet Service Provider (ISP) if needed.
- **Slow Internet Speed:** It occurs due to overloaded network, outdated firmware, or interference.  
**Solution:** Limit the number of connected devices, update modem firmware, and place the modem in an open area.
- **Frequent Disconnections** happen due to weak signal, overheating, or faulty modem.  
**Solution:** Move the modem to a better location, ensure proper ventilation, and replace it if necessary.

### 5.3.5 Troubleshooting Mouse

Mouse is a device that controls the movement of the cursor or pointer on a displayscreen.

A computer mouse helps navigate the screen, but it can encounter various issues.

- **Mouse Not Moving or Clicking:** It occurs due to disconnected or faulty cables, dead batteries (wireless), or driver issues.  
**Solution:** Reconnect the mouse, replace batteries, or update the driver.
- **Cursor Moving Erratically:** It occurs due to dirty optical sensors or interference.  
**Solution:** Clean the sensor with a soft cloth and avoid using the mouse on a reflective or uneven surface.
- **Double-Clicking Instead of Single-Clicking:** This can happen due to faulty mouse switch or incorrect settings.  
**Solution:** Adjust the double-click speed in system settings. If the problem continues, consider replacing the mouse.

### 5.3.6 Troubleshooting RAM

Random Access Memory (RAM) affects a computer's speed and performance.

- **Computer Runs Slowly:** It can happen due to insufficient RAM or excessive background programs.

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**Solution:** Close unnecessary programs and consider upgrading RAM.

- **Frequent Crashes or Blue Screen Errors:** This occurs due to faulty or loose RAM modules.

**Solution:** Reseat the RAM by removing and reinserting it. If the issue continues, test with another RAM module.

- **System Not Detecting RAM:** it can be due to incompatible or damaged RAM.

**Solution:** Check compatibility with the motherboard and replace the RAM if needed.

### 5.3.7 Troubleshooting Hard Drive

A hard drive stores data and the operating system, but it may develop issues over time.

- **Computer Not Booting:** It happens due to corrupt OS, disconnected cables, or failing hard drive.

**Solution:** Check cables, try booting into safe mode, or reinstall the operating system.

- **Slow File Access or Freezing** occurs due to fragmented data or failing hard drive.

**Solution:** Run disk cleanup and defragmentation. If problems persist, back up data and replace the hard drive.

- **Strange Noises from Hard Drive** stems due to mechanical failure.

**Solution:** Immediately back up important data and replace the hard drive to prevent data loss.

## 5.4 Troubleshooting Steps for Windows

1. Restart Your Computer – Sometimes, a simple restart can fix minor issues.
2. Check Cables and Connections – Ensure the hard drive is properly connected.
3. Run Disk Check (CHKDSK):
  - ❑ Press Windows + R, type cmd, and press Enter.
  - ❑ Type chkdsk /f and press Enter to scan and fix errors.
4. Scan for Viruses: Use Windows Defender or any antivirus software to remove malware.
5. Free Up Space: Delete unnecessary files and use Disk Cleanup (type it in the Start menu).



6. Check Hard Drive Health:
  - ✓ Press Windows + R, type cmd, and enter wmic diskdrive get status.
  - ✓ If it shows OK, the drive is fine; if not, consider replacing it.
7. Backup Important Data: If issues continue, save your important files to an external drive or cloud storage.
8. Replace the Hard Drive: If nothing works, the hard drive might be damaged and needs replacement.

## 5.5 IP Addressing: Configuration Issues and Solutions

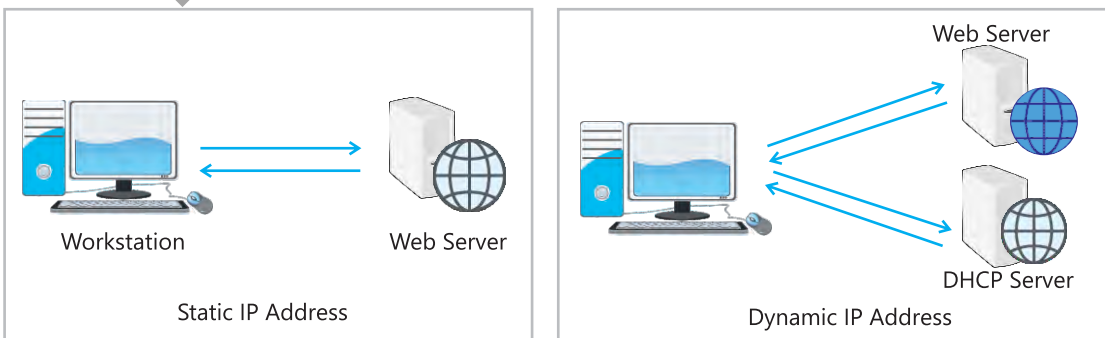
Internet Protocol (IP) addressing is a fundamental aspect of network configuration, enabling devices such as computers, phones, and other devices to communicate within a network and access the internet. However, misconfigured IP addresses are a common source of connectivity issues. This section explores IP addressing principles, common configuration errors, and step-by-step solutions to resolve them.

### 5.5.1 Understanding Static vs. Dynamic IP Addresses

**Static IP Addresses:** A static IP address is manually assigned and remains constant, i.e., does not change over time. It is ideal for servers, network printers, security cameras and other devices which require permanent network access.

**Example:** 192.168.1.100 (IPv4), 2001:db8::1 (IPv6).

**Dynamic IP Addresses:** It is assigned automatically by a Dynamic Host Configuration Protocol (DHCP) server, and it can change periodically. It is suitable for general-purpose devices like laptops and smartphones and other devices that don't need a permanent address.



**Figure 5.12:** Static vs permanent IP address

| Feature       | Static IP                                | Dynamic IP                         |
|---------------|------------------------------------------|------------------------------------|
| Configuration | Manual                                   | Automatic (via DHCP)               |
| Use Case      | Servers, security cameras, remote access | Everyday devices (laptops, phones) |
| Stability     | Permanent address                        | Changes periodically               |
| Complexity    | Requires technical knowledge             | Plug-and-play                      |

**Table 5.2** Static vs permanent IP address

### Troubleshooting Tools (for Windows)

| Tool Name      | Purpose                                                                   | Steps to use                                                                                                                                                                        | Results                                                                                                                                                                                                                                                   |
|----------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ping</b>    | Tests connectivity between your device and a target                       | <ul style="list-style-type: none"> <li>-<b>open</b> command line interface</li> <li>-<b>type</b> ping [target]</li> <li>-<b>Example:</b> ping google.com or ping 8.8.8.8</li> </ul> | <ul style="list-style-type: none"> <li>-<b>Reply from [IP]:</b> Success! The target is reachable.</li> <li>-<b>Request timed out:</b> The target is offline, unreachable</li> <li>-<b>Destination host unreachable:</b> No route to the target</li> </ul> |
| <b>tracert</b> | Traces the path packets take to reach a destination (showing all routers) | <ul style="list-style-type: none"> <li>-<b>open</b> command line interface</li> <li>-<b>type</b> tracert [target]</li> <li>-<b>Example:</b> tracert google.com</li> </ul>           | <ul style="list-style-type: none"> <li>-Each hop shows the IP and response times.</li> <li>-* * *: No response from that hop</li> <li>- High delay (&gt; 100ms) at a hop indicates network congestion.</li> </ul>                                         |

|                 |                                                    |                                                                                                                                       |                                                                                                                                                                                       |
|-----------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>nslookup</b> | Queries DNS servers to resolve domain names to Ips | <b>open</b> command line interface<br>- <b>type</b> nslookup [domain/IP]<br>- <b>Example:</b> nslookup google.com or nslookup 8.8.8.8 | - <b>Non-authoritative answer:</b> Cached result from a non-primary DNS server<br>- <b>Server can't find [domain]:</b> DNS resolution failed (check domain spelling or DNS settings). |
|-----------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Activity: Checking and Configuring an IP Address

**Objective:** Learn how to find and configure an IP address.

**Instructions:**

- Press **Windows + R**, type "**cmd**", and press Enter.
- Type "**ipconfig**" and press Enter to view the IP address.
- Open **Control Panel** → **Network and Internet** → **Network Connections**.
- Right-click **Wi-Fi or Ethernet**, select **Properties**.
- Select "**Internet Protocol Version 4 (TCP/IPv4)**" and click **Properties**.
- Choose "**Use the following IP address**" and enter:
  - ✓ IP Address: **192.168.1.100**
  - ✓ Subnet Mask: **255.255.255.0**
  - ✓ Default Gateway: **192.168.1.1**
- Click **OK** and restart the network connection.

## 5.6 Port Forwarding

Port forwarding is like a specific instruction for your internet router telling where to send incoming data. It works by opening a door (called a port) for specific types of internet traffic, making sure it reaches the correct device or service inside your home network. So, port forwarding acts like a mailroom clerk who knows exactly which room to deliver a package to.

### 5.6.1 Working of Port Forwarding

- Internet data travels in small packets, each labeled with an address (like sending a letter with a home address).
- Your router (the internet box at home) receives the data and checks which port should go.
- The router sends the data directly to the correct device or service if port forwarding is set up.

Port forwarding is useful in gaming, remote access, security cameras, and hosting websites or servers.

### **Remember**

Port forwarding

- Allows multiplayer games to connect smoothly (in gaming).
- allows you to control your home computer from anywhere (remote access).
- Helps you view live footage from your cameras remotely (Security Cameras)
- Enables others to access your hosted content (web hosting or servers)

## **EXERCISE**

### **Multiple Choice Questions**

1. Which tool is used to remove unnecessary files from a hard drive?  
(a) Disk Defragmenter  
(b) Task Manager  
(c) Disk Cleanup (d) Device Manager
2. What is the main purpose of disk defragmentation?  
(a) To delete unused files  
(b) To organize fragmented files for faster access  
(c) To increase disk space  
(d) To clean viruses
3. Which of the following drives should NOT be defragmented?  
(a) HDD (Hard Disk Drive) (b) External USB Drive  
(c) SSD (Solid State Drive) (d) Network Drive
4. How do you check if a drive needs defragmentation in Windows?  
(a) Open Task Manager (b) Run Disk Cleanup  
(c) Use the "Analyze" option in Disk Defragmenter  
(d) Restart the computer
5. Which Windows tool helps boot the system with minimal drivers for troubleshooting?  
(a) Device Manager (b) Safe Mode  
(c) Disk Cleanup (d) Task Scheduler

- 
6. What should you do if a program is causing system crashes?
- (a) Update the operating system
  - (b) Reinstall the program
  - (c) Uninstall the program
  - (d) Change the system language
7. If Safe Mode does not fix the issue, what is the next step?
- (a) Use Windows Recovery Environment (WinRE)
  - (b) Install more RAM
  - (c) Unplug the monitor
  - (d) Run Disk Defragmenter
8. What is the main function of antivirus software?
- (a) Speed up the internet
  - (b) Scan and remove malicious programs
  - (c) Install new software
  - (d) Improve screen resolution
9. What is "phishing"?
- (a) A type of computer game
  - (b) A method of stealing personal information through fake emails
  - (c) A tool for speeding up a computer
  - (d) A type of software update
10. What does an IP address do?
- (a) Stores files on a computer
  - (b) Identifies devices on a network
  - (c) Increases internet speed
  - (d) Detects malware

### Short Questions

1. Name two system tools used for computer maintenance.
2. What does Disk Defragmenter do?
3. Why should an SSD not be defragmented?
4. What is the purpose of a System Restore?
5. How can malware be prevented?
6. What is the difference between a static and dynamic IP address?

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7. What command is used to check the IP address of a computer?
  8. What is port forwarding?

### Long Questions

1. Explain the importance of computer maintenance and list some key maintenance tasks.
2. Describe the role of Disk Defragmenter and explain the process of defragmenting a hard drive.
3. What are common software troubleshooting methods used when a computer fails to start properly?
4. What are the key differences between static and dynamic IP addresses? Provide their advantages and disadvantages.
5. Explain port forwarding and its applications in networking.

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# AI Technologies

### Student Learning Outcomes:

By the end of this chapter, students will be able to:

- Understand the role of AI tools in enhancing documentation and productivity and explore popular AI tools such as Grammarly, QuillBot, and ChatGPT for writing assistance and content improvement.
- Learn about AI applications in daily life and various industries and discuss their ethical implications.
- Apply AI tools to improve written assignments and create documents showcasing AI's everyday applications, such as virtual assistants and recommendation systems.

## Introduction

Artificial Intelligence (AI) is the ability of machines to perform tasks that typically require human intelligence. A few examples of such tasks are learning, problem-solving, and making decisions. AI is becoming an integral part of our daily routine, and it is changing the way of our writing, communication, and interaction with technology.

Everyone is required to acquire AI knowledge as (i) AI is transforming industries like education, healthcare and entertainment, making processes faster and more efficient, (ii) AI skills are in high demand as businesses are relying more on intelligent systems and automation, and (iii) AI helps solve real-world problems by reducing human errors, and enabling new solutions in different sectors.

From virtual assistants (e.g. Siri, and Google Assistant) to AI-powered writing tools (e.g., Grammarly and ChatGPT), AI improves our productivity, creativity, and efficiency. Recommendation systems (e.g., Netflix, YouTube) and chatbots are also examples of AI.

### Do You Know?

Alexa is a virtual assistant developed by Amazon, designed to make your life easier by helping you with everyday tasks using your voice only. You can ask questions, set reminders, play music, control smart home devices, and much more.



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This chapter explores how AI technologies support documentation, content creation, multimedia editing, and various industries. It also introduces ethical considerations and hands-on applications for students to experience AI firsthand.

## 6.1 AI in Documentation and Content Creation

In the present technology era, creating and managing written content is a very vital skill, whether for school assignments, professional reports, or personal projects. However, writing and editing can be time-consuming and challenging which creates space for AI. AI-based tools are revolutionizing the way we write, edit, and manage content. These tools help improve grammar, summarize long texts, and even generate ideas, making documentation and content creation faster, easier, and more efficient.

### 6.1.1 AI-Powered Writing Tools

AI-based writing tools help in correcting grammar, improving sentence structure, and enhancing clarity. ChatGPT, Grammarly, DeepSeek, and QuillBot are a few examples of AI-powered tools.

- **ChatGPT** generates text, ideas, and structured content.
- **Grammarly** detects spelling, grammar, and punctuation errors.
- **DeepSeek** provides AI-based writing assistance with contextual suggestions and document enhancement.

Sometimes a poorly written text paragraph can be confusing. In such a situation, we can use AI tools like ChatGPT to generate an improved paragraph of the same text. A poorly written paragraph uses unnecessarily complex language, contains grammatical mistakes and makes false assumptions about the reader's knowledge. Therefore, a good paragraph (i) uses simple language as complicated words or phrases require more effort to understand without adding any value, (ii) has reasonable sentence-length as run-on sentences can sometimes be confusing, and (iii) makes accurate assumptions about the knowledge of the reader as inaccurate assumptions can confuse or bore the reader.

Let us take a short example paragraph and ask ChatGPT to improve it. In response to our query (called prompt), ChatGPT will provide the desired result.

| Candidate Paragraph for Improvement                                                                                                                                                                                                                                                       | Improved Paragraph by ChatGPT                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| In today's tutorial on neural networks in Python, we're diving into a world that's as complex as it is fascinating, where we will apply the advanced concepts of machine learning. Neural networks, with their layers and nodes, are straightforward – they're like your brain's neurons! | In today's tutorial on neural networks in Python, we will explore an exciting part of machine learning. Neural networks may sound complex, but they work in a similar way to how brains process information. They are made up of layers and small units called nodes, just like brain neurons. |

### Activity: Using AI writing tool

**Objective:** Text writing improvement.

**Instructions:**

Provide students a short paragraph on any topic such as "The Importance of Education".

**Ask students to:**

Use Grammarly, QuillBot, ChatGPT, or DeepSeek to improve writing. Compare the original and revised versions and note improvements.

## Real World Applications

AI tools save time and enhance creativity, making content creation more efficient for everyone. Journalists, bloggers, students, businesses and researchers use AI tools to create content faster and more effectively.

- **Journalists** use AI-based tools like Grammarly and Hemingway Editor to check grammar and improve readability.
- **Students** use AI assistants like ChatGPT to brainstorm ideas, summarize research papers, and improve their writing. Moreover, Students use Grammarly to proofread essays and assignments before submission, ensuring clarity and correctness.
- **Businesses** utilize ChatGPT to generate customer support responses and marketing copy, saving time and effort.
- **Researchers** use ChatGPT or DeepSeek to refine academic papers, ensuring clarity in their writing.

### Do You Know?

Grammarly, one of the most popular AI writing tools, not only corrects grammar and spelling but also suggests improvements in tone, clarity, and style.

### 6.1.1 AI for Summarization and Productivity

In today's fast-paced world, we are often flooded with large amounts of information, such as long articles, research papers, or books. Reading and understanding them can be time-consuming. This is where AI-powered summarization tools play a vital role. These tools use advanced algorithms to analyze text, extract the most important points, and provide a shorter version of the content without losing its meaning.

#### How Does AI Summarization Work?

AI summarization tools use a branch of AI called NLP which helps computers understand, interpret, and generate human language. Popular AI summarization tools like QuillBot, SMMRY, and Resoomer use techniques to help users save time and focus on the most important information.

#### Hands-On Activity: Summarizing a Long Article

Let us try using an AI summarization tool to see how it works. We will use QuillBot, a free and easy-to-use tool for this task.

##### Step 1: Access QuillBot

- Go to the QuillBot website ([www.quillbot.com](http://www.quillbot.com)) and select the **Summarizer** tool as shown in Figure 6.1.

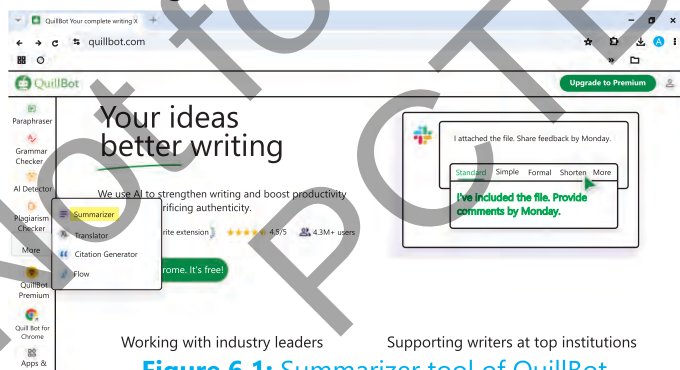


Figure 6.1: Summarizer tool of QuillBot

##### Step 2: Input the Text

- Copy and paste the text into the summarizer tool. Figure 6.2 shows both fields i.e., text input or document upload (on left) and desired summary (on right).

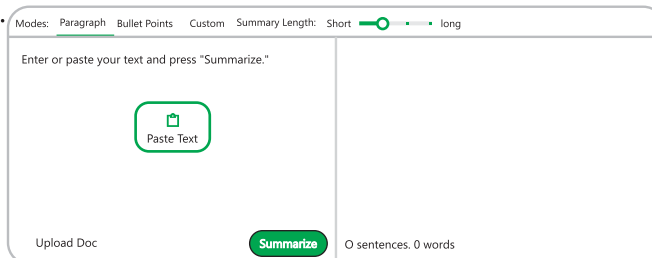


Figure 6.2: Interface for text input/document upload and getting summary

### Step 3: Adjust the Settings

- Choose the length of the summary. Most tools allow you to select how short or detailed the summary to be.

### Step 4: Generate the Summary

- Click the **Summarize** button. The tool will analyze the text and provide a shorter version.

#### Do You Know?

**QuillBot provides** 8 tools on a single platform. These tools include:

- i. paraphraser to increase fluency,
- ii. grammar checker to fix mistakes,
- iii. plagiarism checker to prevent plagiarism,
- iv. AI detector to analyze text,
- v. translator to unlock language,
- vi. summarizer to summarize text,
- vii. citation generator to cite sources, and
- viii. flow to write with AI.

#### Activity: Using QuillBot summarization tool

**Objective:** Text summary generation.

**Instructions:**

Provide students a research paper or a news article or a book chapter.

**Ask students to:**

Use QuillBot, to generate the summary of the given input. Compare the original text and the summarized text revised versions and check whether the summarized text captures the main idea.

### Real-World Applications of AI Summarization

AI summarization tools are not just for students; they are used in many industries to save time and improve productivity. Here are some real-world applications:

- **News and Media:** News agencies use AI summarization to create short versions of long articles or reports. This helps readers get the latest updates quickly.
- **Business World:** In the business world, professionals often deal with lengthy reports, meeting notes, or emails. AI summarization tools can help them extract the most important information, saving time and

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improving decision-making.

- **Legal and Medical Fields:** Lawyers and doctors often deal with large amounts of text, such as legal documents or medical records. AI summarization tools can help them quickly find relevant information.
- **Customer Support:** Companies use AI summarization to analyze customer feedback or support tickets. This helps them identify common issues and improve their services.

### Advantages of AI Summarization

- **Saves Time:** AI summarization tools can process large amounts of text in seconds.
- **Improves Productivity:** By focusing on the most important information, you can work more efficiently.
- **Enhances Understanding:** Summaries make complex information easier to understand by breaking it down into key points.
- **Accessible:** Many AI summarization tools are free or low-cost, making them accessible to students and professionals alike.

### Limitations of AI Summarization

- **Loss of Context:** Sometimes, AI tools may miss important details in the text.
- **Accuracy Issues:** The summary may not always be 100% accurate, especially with abstractive summarization.
- **Dependence on Quality of Input:** If the original text is poorly written or unclear, the summary may also be unclear.

## 6.2 AI in Multimedia

Multimedia, which includes images, videos, and audio, plays a key role in our daily lives. Whether you are designing a poster, editing a video, or creating a presentation, AI can help you achieve quality results with minimal effort.

### 6.2.1 AI for Image Creation and Editing

With AI-based tools, you can generate amazing visuals, remove backgrounds, enhance photo quality, and even create art from scratch and this all can happen with just a few clicks.

#### How Does AI Work in Image Creation and Editing?

AI tools for image creation and editing use a combination of machine learning

and computer vision technologies. Here is how they work:

- **Image Recognition:** AI can analyze an image to identify objects, people, and scenes.
- **Image Generation:** AI can create new images from scratch based on text descriptions.
- **Image Enhancement:** AI can enhance the quality of an image by adjusting brightness, contrast, and sharpness.
- **Background Removal:** AI can automatically detect and remove the background from an image.

### Hands-On Activity: Creating and Editing Images with AI

For this activity, we will use Canva, a popular design platform that incorporates AI features.

#### Step 1: Choose a Tool

- Go to the Canva website ([www.canva.com](https://www.canva.com)) and create a free account.

#### Step 2: Create a New Design

- Click on **make me an image** and choose a template (e.g., poster, social media post, or presentation slide) (as shown in Figure 6.3)

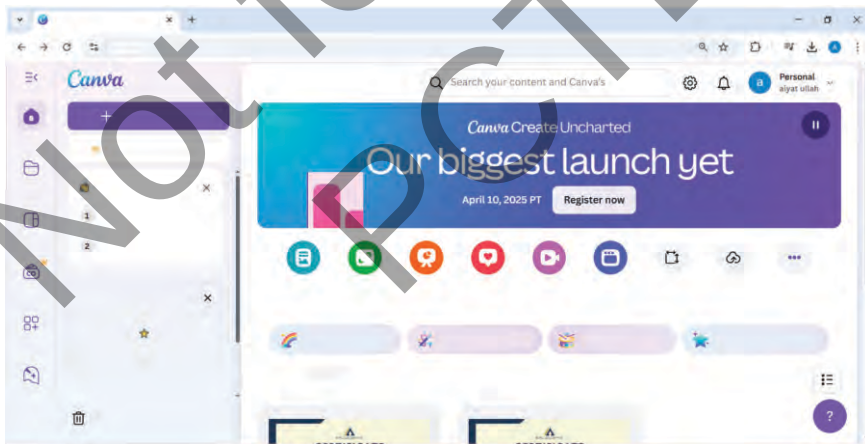


Figure 6.3: Create image using Canva

#### Step 3: Use AI to Generate an Image

- In the text box, type a description of the image you want (e.g., "a futuristic city" or "a sunny beach"). Canva's AI will suggest images that match your description.
- Select an image and add it to your design (as shown in Figure 6.4)



Figure 6.4: Select image

### Step 4: Edit the Image

- Use Canva's editing tools to adjust the image. Click on Edit in design. Then, you can perform various tasks, for example:
  - **Background Removal:** Use the background remover tool to delete the background and replace it with something else.

### Step 5: Add Text and Effects

- Add text to your design and use AI-powered features like text-to-image to generate visuals that match your text.

### Step 6: Save and Share

- Once you are done with your design, save and share it with your classmates or even on social media.

## Real-World Applications of AI in Image Creation and Editing

AI-powered image tools are used in many industries to create attractive visuals and streamline workflows. Here are some real-world examples:

- **Social Media and Marketing:** Businesses use AI tools to create eye-catching social media posts, advertisements, and banners.
- **Photography:** Photographers use AI tools to enhance their photos. For example, AI can automatically adjust lighting, or even restore old, damaged photos.

### Popular AI Tools for Image Creation and Editing

Following is the list of some popular AI-based tools that can be explored:

- **DALL·E:** An AI tool that generates images from text descriptions.

**Remove.bg:** A tool that automatically removes backgrounds from images.



### Do You Know?

**DALL·E**, an AI tool, is provided by OpenAI. It can generate unique images from text descriptions. For example, if you type "a futuristic city with flying cars," DALL·E will create an attractive visual of that scene.

## 6.2.2 AI for Video and Audio Editing

Video and audio editing are essential skills in today's multimedia-driven world. Whether you are creating a school presentation or a podcast, editing can make your content more engaging and professional.

### Activity: Using Design a Poster Using AI Tools

#### **Activity : Design a Poster Using AI Tools**

**Objective:** Practice using AI tools to create a visually appealing poster.

#### **Instructions:**

Choose a topic for your poster (e.g., a school event, a social cause, or a favorite hobby). Use an AI tool like Canva or DALL·E to create and edit images for your poster. Add text, effects, and other design elements to make your poster stand out. Present your poster to the class and explain how you used AI tools to create it.

### How Does AI Work in Video and Audio Editing?

AI tools for video and audio editing use advanced technologies like machine learning, speech recognition, and computer vision to automate and enhance the editing process. The details about how AI tools work in video and audio editing are provided below:

- **Automated Editing:** AI can analyze video and audio files to automatically cut, trim, and arrange clips.
- **Speech-to-Text:** AI can convert spoken words into text (transcription) or generate natural-sounding speech from text.
- **Noise Reduction:** AI can remove background noise from audio recordings, making voices clearer and more professional.

### Hands-On Activity: Editing a Video with AI

For this activity, we will use Runway ML, a user-friendly platform that incorporates AI features.

#### **Step 1: Choose a Tool**

- Go to the Runway ML website ([www.runwayml.com](http://www.runwayml.com)) and create a free account.



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## Step 2: Upload a Video

- Upload a short video clip (1-2 minutes) that you want to edit.

## Step 3: Use AI to Trim and Arrange Clips

- Use the Auto-Trim feature to remove unnecessary parts of the video.
- Arrange the clips in the order you want using the drag-and-drop interface.

## Step 4: Add Effects and Enhancements

- Use AI-powered effects like background blur or color correction to improve the video quality.
- Add transitions between clips to make the video flow smoothly.

## Step 5: Add Subtitles

- Use the Speech-to-Text feature to automatically generate subtitles for your video. Edit the subtitles to ensure they are accurate and match with the audio.

## Step 6: Export and Share

- Once you are happy with your edited video, export it and share it with your classmates or on social media.

## Real-World Applications of AI Tools in Video and Audio Editing

AI-based video and audio editing tools are used in many industries to create quality content and streamline workflows. Here are some real-world examples:

- **Social Media and Content Creation:** YouTubers, TikTokers, and influencers use AI tools to edit their videos quickly and efficiently.
- **Gaming:** Game developers use AI to create and edit in-game videos, trailers, and cutscenes.

## Popular AI Tools for Video and Audio Editing

Here are some popular AI-powered tools that you can explore:

- **Descript:** A tool for editing audio and video by editing text transcripts.
- **Adobe Premiere Pro (AI Features):** A professional video editing tool with AI-powered features like auto-reframe and scene detection.

## 6.3 AI in Coding and Automation

Coding is the language of the digital world. However, writing code can be challenging, especially for beginners. It requires logical thinking, attention to

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detail, and a lot of practice. This is where AI-powered tools are changing the way we write code, making it faster, easier, and more accessible for everyone.

### 6.3.1 AI-Powered Coding Assistants

AI-powered coding assistants are tools that help developers write code more efficiently. These tools use machine learning to understand code, suggest improvements, and even write code automatically.

#### How Do AI-Powered Coding Assistants Work?

AI-powered coding assistants use advanced technologies like NLP and machine learning to analyze code and provide suggestions. Here is how they work:

1. **Code Completion:** As you type, the AI predicts what you are trying to write and suggests code pieces.
2. **Error Detection:** The AI analyzes your code to find errors or bugs and suggests fixes.
3. **Code Generation:** The AI can write code for you based on a description or example.
4. **Learning from Context:** The AI learns from the code you write and the projects you work on, so its suggestions become more accurate over time.

#### Hands-On Activity: Using an AI-Powered Coding Assistant

Let us try using an AI-powered coding assistant. For this activity, we'll use GitHub Copilot, a popular tool developed by GitHub and OpenAI.

##### Step 1: Choose a Tool

- Go to the GitHub Copilot website (<https://copilot.github.com>) and sign up for access (if required).

##### Step 2: Install the Tool

- Follow the instructions to install GitHub Copilot in your code editor (e.g., Visual Studio Code).

##### Step 3: Start Coding

- Open a new file in your code editor and start writing code. For example, you can write a simple Python program to calculate the sum of two numbers.

##### Step 4: Use AI Suggestions

- As you type, GitHub Copilot will suggest code snippets.
- Accept the suggestions by pressing **Tab** or **Enter**.

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## Step 5: Experiment with Code Generation

- Write a comment describing what you want the code to do.
- GitHub Copilot will generate the code for you based on your description.

## Step 6: Test the Code

- Run the code to see if it works as expected. If there are errors, GitHub Copilot will suggest fixes.

## Step 7: Reflect on the Experience

- Ask yourself: Did the AI suggestions make coding easier? Were the suggestions accurate? How could this tool help you in future projects?

## Real-World Applications of AI-Powered Coding Assistants

AI-powered coding assistants are used in many industries to improve productivity and code quality. Here are some real-world examples:

- **Data Science and Machine Learning:** Data scientists use AI tools to write and optimize code for data analysis and machine learning models.
- **Automation and Scripting:** IT professionals use AI tools to write scripts for automating repetitive tasks.

## Popular AI-Powered Coding Assistants

Here are some popular AI-powered coding tools that you can explore:

- **Tabnine:** An AI tool that provides code completion and suggestions for multiple programming languages.
- **Kite:** An AI-powered coding assistant that integrates with popular code editors like VS Code and PyCharm.

### 6.3.2 AI for Task Automation (Automating Repetitive Tasks)

In our daily lives, we often perform repetitive tasks that can be time-consuming and boring. Whether it is organizing files, sending emails, or managing schedules, these tasks can take up a lot of our time and energy. AI-powered tools can automate these repetitive tasks.

#### How Does AI Work in Task Automation?

AI-powered task automation tools use technologies like machine learning, NLP, and Robotic Process Automation (RPA) to perform repetitive tasks. Their work is provided here:

1. **Rule-Based Automation:** AI tools can follow predefined rules to perform tasks. For example, an AI tool can automatically sort emails into folders based on specific keywords.

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2. **Learning from Data:** AI tools can learn from past actions and improve over time. For example, an AI tool can learn your email habits and suggest responses or categorize emails automatically.
  3. **Integration with Apps:** AI tools can connect with other apps and services to automate workflows. For example, an AI tool can automatically save email attachments to a cloud storage service like Google Drive.

### **Hands-On Activity: Automating a Task with AI**

For task automation task, we will use Zapier, a popular platform that connects apps and automates workflows.

#### **Step 1: Choose a Tool**

- Go to the Zapier website ([www.zapier.com](http://www.zapier.com)) and create a free account.

#### **Step 2: Create a New Automation (Zap)**

- Click on Create Zap to start building your automation.

#### **Step 3: Choose a Trigger**

- Select an app and event that will trigger the automation. For example, choose Gmail as the app and New Email as the trigger.

#### **Step 4: Set Up the Trigger**

- Connect your Gmail account and set up the trigger. For example, you can set the trigger to activate when you receive an email with a specific subject line.

#### **Step 5: Choose an Action**

- Select an app and action that will be performed when the trigger is activated. For example, choose Google Drive as the app and Upload File as the action.

#### **Step 6: Set Up the Action**

- Connect your Google Drive account and set up the action. For example, you can set the action to save email attachments to a specific folder in Google Drive.

#### **Step 7: Test and Activate**

- Test the automation to make sure it works as expected. Once you are satisfied, activate the Zap.

#### **Step 8: Reflect on the Experience**

- Ask yourself: Did the automation save your time? How could this tool help you in your daily life or schoolwork?

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## Popular AI Tools for Task Automation

Here are some popular AI-powered task automation tools that you can explore:

- **Microsoft Power Automate:** A tool that automates workflows across Microsoft apps and services.
- **Google Assistant:** A virtual assistant that can perform tasks based on voice commands.

### Activity: Automate a Daily Task Using AI

**Objective:** Practice using an AI-powered task automation tool to automate a daily task.

**Instructions:**

Choose a repetitive task that you perform daily (e.g., organizing emails, saving files, or setting reminders). Use an AI tool like Zapier or IFTTT to automate the task. Test the automation to see if it works as expected. Share your automation with the class and explain how it saves you time

## 6.4 AI in Daily Life and Industries

AI is already a part of our everyday lives. From the moment we wake up to the time we go to bed, AI is working behind the scenes to make our lives easier, more efficient, and more enjoyable. Whether it is recommending a movie on Netflix, helping us navigate with Google Maps, or even filtering spam emails, AI is everywhere.

### 6.4.1 AI in Daily Life

From virtual assistants to personalized recommendations, AI is making our lives more convenient and connected.

### Real-World Applications of AI in Daily Life

AI is used in different ways to make our daily lives easier. Here are some real-world examples:

- **Virtual Assistants:** Virtual assistants like Siri, Alexa, and Google Assistant help us perform tasks hands-free.
- **Navigation and Travel:** Apps like Google Maps and Waze use AI to provide real-time traffic updates, suggest the fastest routes, and even predict arrival times.
- **Health and Fitness:** AI-powered apps like Fitbit and MyFitnessPal track your activity, heart rate, and diet, providing personalized recommendations to help you stay healthy.

**Online Shopping:** E-commerce platforms like Amazon use AI to recommend products based on your browsing and purchase history.

**Do You Know?**

1. AI is used in self-driving cars to detect obstacles, read traffic signs, and make decisions in real-time. Companies like Tesla and Waymo are leading this technology.
2. In healthcare, AI can predict diseases like diabetes or heart conditions by analyzing patient data, sometimes even before symptoms appear.

**Hands-On Activity: Exploring AI in Daily Life**

Let us explore how AI is used in daily life by trying out some AI-powered apps and tools.

**Activity 1: Virtual Assistant**

1. Open a virtual assistant app like Google Assistant, Siri, or Alexa on your phone or smart speaker.
2. Ask the assistant a few questions or give it commands. For example:
  - "What's the weather today?"
  - "Set a reminder for my homework at 7 PM."
3. Observe how the assistant responds and performs the tasks.

**Activity 2: Smart Home Simulation**

1. If you have access to a smart home device (e.g., a smart bulb or thermostat), try controlling it using a virtual assistant or app.

For example, ask Alexa to turn off the lights or adjust the thermostat.

**Activity: Automate a Daily Task Using AI**

**Objective:** Reflect on how AI is used in your daily life and explore its impact.

**Instructions:**

For one week, keep a journal of all the times you interact with AI-powered tools or apps. For example:

- Did you use a virtual assistant?
- Did you receive a personalized recommendation?
- Did you use a navigation app?

Write down your observations and reflect on how AI made your life easier or more enjoyable. Share your journal with the class and discuss the role of AI in daily life.

**6.4.2 AI in Industries**

AI is not just transforming our daily lives; it is also revolutionizing industries across the globe. From healthcare and education to transportation and

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entertainment, AI is being used to solve complex problems, improve efficiency, and create new opportunities.

### How Does AI Work in Industries?

AI in industries works by analyzing large amounts of data, identifying patterns, and making decisions or predictions based on that information. Here's how AI is applied in different sectors:

- **Data Analysis:** AI can process and analyze vast amounts of data quickly, helping businesses make informed decisions.
- **Automation:** AI can automate repetitive tasks, reducing the need for manual labor and increasing efficiency.
- **Predictive Analytics:** AI can predict future trends or outcomes based on historical data, helping businesses plan and prepare.

### Real-World Applications of AI in Industries

AI is being used in different ways to transform industries. Here are some real-world examples:

- **Medical Imaging:** AI-powered tools can analyze medical images like X-rays and Magnetic Resonance Imaging (MRI) scans to detect diseases such as cancer or fractures. For example, Google's DeepMind has developed AI that can diagnose eye diseases from retinal scans.
- **Drug Discovery:** AI is used to speed up the process of discovering new drugs. For example, AI can analyze chemical compounds to identify potential treatments for diseases.
- **Virtual Health Assistants:** AI-powered chatbots and virtual assistants can provide medical advice, schedule appointments, and remind patients to take their medication. For example, Babylon Health uses AI to offer virtual consultations.

#### Activity: Research an AI Application in an Industry

**Objective:** Explore how AI is used in a specific industry and present your findings.

**Instructions:**

Choose an industry (e.g., healthcare, education, transportation, retail, manufacturing, or entertainment). Research how AI is being used in that industry. For example:

- What problems is AI solving?
- What tools or technologies are being used?

Create a short presentation or report to share your findings with the class.



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## 6.5 Ethical Considerations in AI

As AI becomes more integrated into our lives, it's important to consider the ethical implications of its use. Issues like bias, privacy concerns, and job displacement are critical topics that need to be addressed to ensure that AI benefits everyone fairly and responsibly.

### 6.5.1 Bias in AI

#### What is Bias in AI?

Bias in AI refers to situations where AI systems produce unfair outcomes. This can happen when the data used to train AI systems contains biases, or when the algorithms themselves are designed in a way that favors certain groups over others.

#### Real-World Examples of Bias in AI

- **Facial Recognition:** Some facial recognition systems have been found to be less accurate for people with darker skin tones. This can lead to unfair treatment or even wrongful arrests.
- **Hiring Algorithms:** AI tools used in hiring processes have been shown to favor certain demographics, such as men over women, based on biased training data.

#### Why Does Bias Happen?

- **Biased Data:** If the data used to train AI systems reflects existing biases, the AI will learn and replicate those biases.
- **Lack of Diversity:** If the teams developing AI systems are not diverse, they might not consider the needs of all groups.
- **Algorithm Design:** Sometimes, the way an algorithm is designed can unintentionally favor certain outcomes.

#### How Can We Address Bias in AI?

- **Diverse Data:** Ensure that the data used to train AI systems is representative of all groups.
- **Diverse Teams:** Include people from different backgrounds in the development of AI systems.
- **Regular Audits:** Test AI systems regularly to identify and correct biases.

### 6.5.2 Privacy Concerns

AI systems often rely on large amounts of personal data to function effectively. This raises concerns about how that data is collected, stored, and used. If not



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handled properly, AI can lead to invasions of privacy, data breaches, and misuse of personal information.

### Real-World Examples of Privacy Concerns

- **Social Media:** Platforms like Facebook and Instagram use AI to analyze user behavior and target ads. This can feel disturbing to users who do not want their data used in this way.
- **Healthcare:** AI systems in healthcare use sensitive patient data to make diagnoses and treatment recommendations. If this data is not properly protected, it could be misused.

### Why Are Privacy Concerns Important?

- **Data Security:** Personal data can be hacked, leading to identity theft or fraud.
- **Consent:** Many people are unaware of how their data is being used and have not given explicit consent.
- **Surveillance:** AI-powered surveillance systems can track people's movements and activities, raising concerns about freedom and autonomy.

### How Can We Address Privacy Concerns?

- **Data Protection Laws:** The government has established the National Commission for Personal Data Protection (NCPDP) in 2023, to protect personal data.
- **Transparency:** Companies should be transparent about data collection and use.
- **User Control:** Users should have control over their data, including the ability to delete it or opt out of data collection.

## 6.5.3 Job Displacement

Job displacement occurs when AI and automation replace human workers in certain tasks or jobs. While AI can create new opportunities, it can also lead to unemployment in industries where machines can perform tasks more efficiently than humans.

### Real-World Examples of Job Displacement

- **Manufacturing:** Robots and AI-powered machines are replacing human workers in factories, especially for repetitive tasks like assembly.
- **Retail:** Self-checkout systems and AI-powered inventory management are reducing the need for cashiers and stock clerks.

## Why Is Job Displacement a Concern?

- **Unemployment:** Workers who lose their jobs to AI may struggle to find new employment, especially if they lack the skills for new roles.
- **Economic Inequality:** Job displacement can widen the gap between rich and poor, as AI technologies owners benefit while others lose their livelihoods.
- **Social Impact:** Losing a job can have serious emotional and social consequences, including stress and loss of identity.

## How Can We Address Job Displacement?

- **Reskilling and Education:** Provide training programs to help workers learn new skills for jobs that are in demand.
- **Universal Basic Income (UBI):** Some experts suggest providing a basic income to everyone, regardless of employment status, to reduce the impact of job displacement.
- **Job Creation:** Encourage the development of new industries and jobs that complement AI technologies.

### Activity: Build and Present Your AI Project

**Objective:** Apply your knowledge of AI by building a project and presenting it to the class.

**Steps:**

**Choose a Project Idea:**

Select one of the three project ideas (chatbot, recommendation system, or AI-powered presentation).

**Use AI Tools and Platforms:**

Follow the detailed steps provided for your chosen project. Use tools like Google Dialogflow, Python libraries, or Beautiful.ai to build your project.

**Present Your Project:**

Prepare a short presentation to showcase your project to the class.

## 6.6 Project (Build Your Own AI-Powered Tool)

In this section, you will get the chance to build your own AI-powered chatbot.

### **Project Idea: Create a Chatbot Using Google Dialogflow or ChatGPT API**

A **chatbot** is an AI-powered tool that can simulate conversations with users.

### **Steps to Create a Chatbot:**

#### **1. Choose a Platform:**

- **Google Dialogflow:** A user-friendly platform for building chatbots.
- **ChatGPT API:** A more advanced option for creating conversational AI.

#### **2. Set Up Your Account:**

- For Google Dialogflow, go to Dialogflow and create a free account.

- For ChatGPT API, sign up for access at OpenAI.

### 3. Define the Purpose of Your Chatbot:

- Decide what your Chatbot will do. For example: answer Frequently Asked Questions (FAQs) about a school event, provide information about a hobby or topic, or even act as a virtual assistant for daily tasks.

### 4. Design the Conversation Flow:

- Plan how the Chatbot will interact with users. For example: greet the user, ask questions to understand their needs, or provide relevant responses.

### 5. Build the Chatbot:

- In Dialogflow, create intents (user requests) and responses (Chatbot replies).
- In ChatGPT API, write code to define the chatbot's behavior using Python.

### 6. Test Your Chatbot:

- Use the built-in testing tools to interact with your Chatbot and make sure it works as expected.

### 7. Deploy and Share:

- Deploy your Chatbot on a website, app, or messaging platform like WhatsApp or Facebook Messenger.

## EXERCISE

### Multiple Choice Questions

1. Which AI tool is commonly used for grammar and spelling correction?  
(a) ChatGPT (b) Grammarly  
(c) QuillBot (d) DALL.E
2. What is the main purpose of AI summarization tools?  
(a) To write original content  
(b) To shorten long texts while retaining key points  
(c) To translate languages (d) To create images
3. Which AI tool can generate images from text descriptions?  
(a) Canva (b) DALL.E  
(c) QuillBot (d) Zapier
4. What does AI use to recognize objects in images?  
(a) Natural Language Processing (NLP)  
(b) Computer Vision  
(c) Speech Recognition  
(d) Predictive Analytics

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5. Which AI tool helps developers write code faster?  
(a) GitHub Copilot      (b) Grammarly  
(c) Canva      (d) Zapier
  6. Which industry uses AI for personalized recommendations?  
(a) Healthcare      (b) Retail  
(c) Education      (d) Transportation
  7. What is the primary use of AI in healthcare?  
(a) To play games  
(b) To diagnose diseases and analyze medical images  
(c) To write novels      (d) To create music
  8. What is the main ethical concern of AI in daily life?  
(a) Job displacement      (b) Privacy  
(c) Bias      (d) All of these
  9. What is bias in AI?  
(a) A type of AI algorithm  
(b) Unfair or discriminatory outcomes in AI systems  
(c) A programming language  
(d) A type of data storage
  10. Which of the following is a privacy concern related to AI?  
(a) Data breaches      (b) Bias in algorithms  
(c) Job displacement      (d) Lack of creativity

### Short Answer Questions

1. How does AI help in Speech-to-text generation?
2. How does AI help in video editing?
3. What is the purpose of AI in image creation?
4. What is GitHub Copilot used for?
5. What is the main benefit of AI in task automation?
7. Give an example of AI in daily life.
8. How is AI used in the retail industry?

### Long Answer Questions & Practical Challenges

1. Explain how AI is used in healthcare. Provide examples.
2. What are the advantages and limitations of AI in Education?
3. Explain how AI is used in the transportation industry.
4. What are the key features of an AI-powered recommendation system?
5. How can AI be used to address environmental challenges?