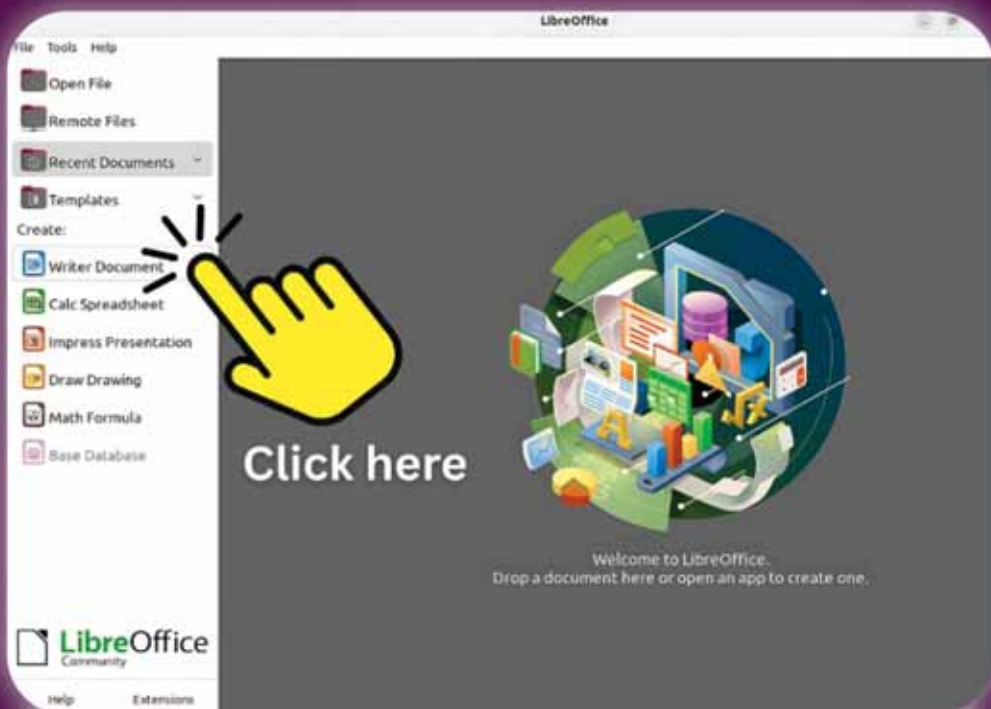


COMPUTER STUDIES

Standard 9

રાજ્ય સરકારની વિનામૂલ્યે યોજના હેઠળનું પુસ્તક



Computer Studies

Standard 9



PLEDGE

India is my country.
All Indians are my brothers and sisters.
I love my country and I am proud of its rich and
varied heritage.
I shall always strive to be worthy of it.
I shall respect my parents, teachers and all
elders and treat everyone with courtesy.
I pledge my devotion to my country and its people.
My happiness lies in their well-being and prosperity.

રાજ્ય સરકારની વિનામૂલ્યે યોજના હેઠળનું પુસ્તક



Gujarat State Board of School Textbooks
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PREFACE

The Gujarat State Secondary and Higher Secondary Education board has prepared new syllabi based on the open source operating system and compatible open source software tools for various topics of Computer Studies. These syllabi are sanctioned by the Government of Gujarat.

It is a matter of pleasure for the Gujarat State board of School Textbooks to place this textbook of **Computer studies** before the students of **Standard 9** prepared according to the new syllabus.

Before publishing the textbook, its manuscript has been fully reviewed by experts and teachers teaching at this level. Carrying out suggestions given by teachers and experts, we have made necessary changes. Also, this manuscript has been checked by the experts' panel selected by Gujarat State Secondary and Higher Secondary Education Board before giving the approval to it. The suggestions and corrections cited by them have been incorporated and then this book has been published.

The board has taken special care to make this textbook interesting, useful and free from errors. However, we welcome suggestions to enhance the quality of the textbook.

Vinaygiri Gosai

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FUNDAMENTAL DUTIES

It shall be the duty of every citizen of India : *

- (A) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;
- (B) to cherish and follow the noble ideals which inspired our national struggle for freedom;
- (C) to uphold and protect the sovereignty, unity and integrity of India;
- (D) to defend the country and render national service when called upon to do so;
- (E) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;
- (F) to value and preserve the rich heritage of our composite culture;
- (G) to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures;
- (H) to develop the scientific temper, humanism and the spirit of inquiry and reform;
- (I) to safeguard public property and to abjure violence;
- (J) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement;
- (K) to provide opportunities for education by the parent or the guardian, to his child or, as the case may be, ward between the age of six and fourteen years.

* Constitution of India : Section 51-A

About This Textbook...

Dear Teachers,

With the growing need to strengthen digital literacy, the Gujarat Government has taken major steps to ensure that students are prepared for modern technological advancements through various initiatives including promoting Computer Education with latest developments using open source technologies. These open-source solutions enable schools to freely install, use and share software without licensing concerns, making computer education more accessible and future-ready. Recognizing the rapid advancements in the computer field—especially in areas such as Artificial Intelligence, cybersecurity and data handling—it became necessary to update the curriculum to meet today's learning needs. Therefore, newly updated content for Standards 9 to 12 has been introduced in a phased manner, focusing on open-source operating systems, essential productivity tools, database management, programming, foundational AI concepts, safe Internet practices, and basic cybersecurity awareness. These updates aim to provide students with a strong and relevant foundation in computer studies for higher classes and emerging technologies.

This textbook for 9th standard is the first in series for the subject of ‘Computer Studies’. The aim has been to provide elementary knowledge of Computers, introduction to Open Source Operating System–Ubuntu including Utilities, Word Processor known as Writer, Presentation tool Impress and the concepts of Computer Security. An attempt has been made to create a good base for the students to learn other topics as well as open source software in later years. It is worth to mention that no assumption has been made about students having any prior knowledge of computers.

We hope the coverage will be useful to the students and you will enjoy teaching and conducting practicals on the systems with Ubuntu operating system and necessary software.

Dear Students,

Computers are an essential part of modern life. We use them in schools, offices, shops, hospitals and homes for many different tasks. This book will help you understand what a computer is, how it works, and how it helps us in daily life. You will learn about various types of computers such as desktops, laptops, servers, tablets and smartphones along with their specific uses. The book also introduces computer peripherals like the keyboard, mouse, monitor, printer and scanner which help us give input and receive output from the computer. You will study how computers represent data using numbers and symbols to process information quickly and accurately. These concepts are explained through easy examples and pictures, helping you connect what you learn to the technology you use every day.

In the next part, you will explore the operating system (OS) — the heart of a computer system. The OS acts as a bridge between the user and the hardware, allowing smooth communication between them. You will learn how it performs important functions like process control, memory handling, file management, input-output management and device coordination. You will also get familiar with Ubuntu, a popular and free operating system and explore its useful utilities that help you manage files and applications. This part also introduces word processing, where you will learn to create, format and design documents. It also covers the advance features and mail merge. Understanding the tools of word processing — such as font styles, alignment, paragraph settings, tables, pictures and mail merge — will help you prepare clean, creative and professional-looking documents. These skills are valuable not only for schoolwork but also for future studies and office tasks.

The final part of the book focuses on presentation software and computer security. You will learn how to make attractive and effective presentations using slides, text, images, charts and animations to express your ideas clearly. This will help you improve your communication and presentation skills. The last chapter explains how to stay safe while using computers and the Internet. You will understand how to protect your personal data, use strong passwords and prevent computer viruses or online threats. By the end of this book, you will have both theoretical understanding and practical knowledge to use computers confidently, creatively and safely in your everyday life.



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Introduction to Computer

Introduction

In today's world, computers have become an essential part of day-to-day life. We watch movies, play games, and do homework with the help of computers. This chapter introduces the fundamental concepts of computers. A computer is an electronic machine that processes data, performs tasks like writing, calculating, drawing, browsing the Internet and stores information for future use. This chapter explains the meaning and origin of the word “computer” and differentiates between hardware, software and firmware. The evolution of computers through hardware and software is described across five generations. We shall also learn about various types of software. The advantages of computers are discussed, including speed, accuracy, automation, versatility and storage. We shall learn about the basic components and the overall architecture of the computer. Input and output devices such as keyboards, mouse, scanners, speakers and monitors are introduced with examples.

What is a Computer?

The word “computer” comes from the Latin word “computare” which means “to calculate.” Long ago, the word “computer” was used for people who solved math problems by hand or with the help of simple tools. But as technology grew, especially in the 21st century, the word “computer” started to mean electronic machines that can not only do calculations but also solve problems, manage data and help us do many tasks automatically. As discussed in the introduction part, a computer is an electronic device that takes input in the form of data and instructions, processes it using a set of instructions, and gives output. It can also store data for future use. Computers work very fast, are accurate, and help us in many other daily tasks.

Hardware, Software and Firmware

Let us understand few important terms related to computers, such as hardware, software and firmware.

Hardware refers to the physical parts of a computer system. These are the components that we can see and touch. Hardware is essential for the working of a computer. Some of the key hardware components are: Central Processing Unit (CPU), Monitor, Keyboard, Mouse, Speakers etc.

Software is a collection of programs, procedures and documentation that performs different tasks on a computer system. It is not a physical component, so it cannot be touched. Software acts as an interface between the user and the hardware. As per figure 1.1, there are two main types of software: System software and Application software.

Firmware is a special type of software that is embedded directly into a hardware device. It provides the low-level control for the device's specific hardware. Unlike regular software, firmware is stored in non-volatile memory and is not meant to be changed frequently. Examples include Basic Input/Output System, software in routers, and control software in washing machines and microwaves.

Types of Software

Now let us understand different types of software used in computers. It covers Application Software and System Software with simple examples. By learning these concepts, we shall gain basic knowledge of how software works and supports daily tasks on digital devices.

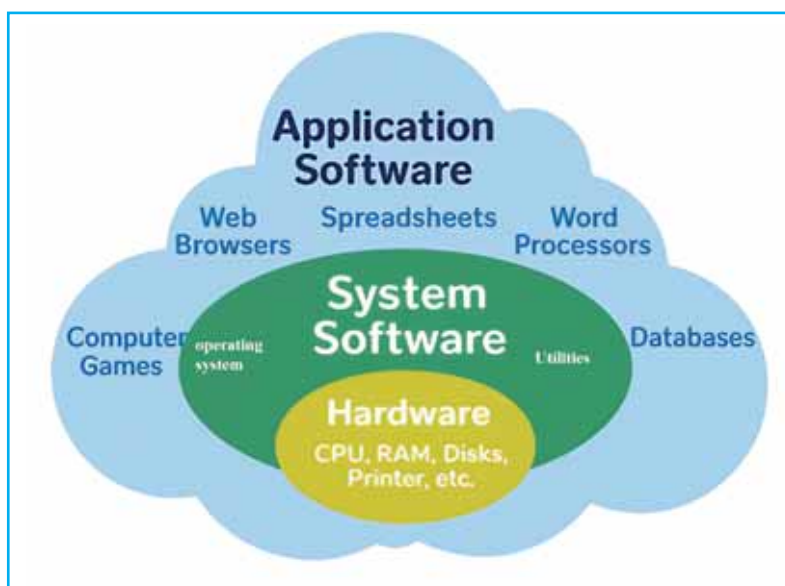


Figure 1.1 : Types of Software and Hardware Examples

Application Software: These are designed to help users perform specific tasks such as writing, designing, or playing games. Examples include Microsoft Word, PowerPoint, VLC Media Player, and Tally.

System Software: These manage and control the hardware and allow the application software to function. It includes the operating system (like Windows, Linux), device drivers, and utility programs like antivirus software. Both of the above can be further classified as :

Open Source Software: These are software whose source code is available to everyone. It can be used, modified, and distributed freely. It promotes collaboration and learning. Example: Linux, LibreOffice.

Proprietary Software: These are commercial software that are owned by a company or individual. The source code is not shared with users, and one must purchase a license to use it. Example: Microsoft Windows, Adobe Photoshop.

Advantages of a Computer

Computers offer many advantages that make them essential in our daily life. They help in storing vast data, automating work and handling multiple jobs like writing, learning, gaming and designing. Their reliability and versatility make them essential in education, business, communication and daily life; improving productivity and saving time for users. Computers offer below advantages, which we discuss one by one.

- Speed
- Automation
- Storage
- Accuracy
- Versatility
- Diligence

Speed

Computers are incredibly fast, processing millions of instructions every second. This amazing speed allows them to complete jobs very quickly and efficiently. Complex math problems that could take people hours or even days to solve can be handled by computers in just seconds.

Accuracy

Computers are extremely accurate machines. As long as the information given to them and the instructions they follow is correct, they will always produce the right results. Unlike us, they never make mistakes in calculations. This perfect accuracy is why we rely on computers for precise tasks like science experiments, managing money, and building bridges or machines.

Automation

Once a computer is given instructions for a task, it can perform that task automatically, without needing constant human help. We see it everywhere: robots building things in factories, traffic lights changing on their own, and even in common appliances like our washing machine or microwave oven working automatically.

Versatility

Think of computers as amazing all rounder! They can handle countless different jobs. We can use them to write reports, make videos, play games, or control robots. Because we can do such a wide variety of tasks so well, computers are useful tools for almost everyone, whether we are a student, a scientist or a business owner.

Storage

Computers can hold enormous amounts of information like documents, photos, videos, and programs in a surprisingly small space. We can save this data and get it back whenever we need it. We use storage devices such as hard drives, solid-state drives, USB (Universal Serial Bus) drives, and even online cloud storage. It is discussed in more detail later.

Diligence

Unlike people, computers do not get tired. Computers can work non-stop for hours, days, or even longer without slowing down. This ability to work constantly 24 x 7, makes them perfect for jobs that are very repetitive.

The Journey of Hardware in Computer Evolution

The journey of computers began long before the modern machines we use today. Early humans created simple tools like the Abacus, which used beads and rods for counting and basic calculations. This was followed by mechanical calculators like the Pascaline, invented by blaise Pascal, and the Difference Engine, designed by Charles Babbage known as the "Father of the Computer." These inventions laid the foundation for future computing devices. The major breakthrough came with ENIAC (Electronic and Numerical Integrator and Calculator), the first electronic general-purpose computer. It was massive in size and vacuum tubes to perform thousands of calculations in a short

time. ENIAC proved that machines could solve complex problems faster than humans. After these inventions, the evolution of computers took off rapidly. From large, room-sized machines to the compact and powerful computers we use today, technology has transformed every part of our life. Let us explore evolution of computer through hardware and software as shown in figure 1.2.

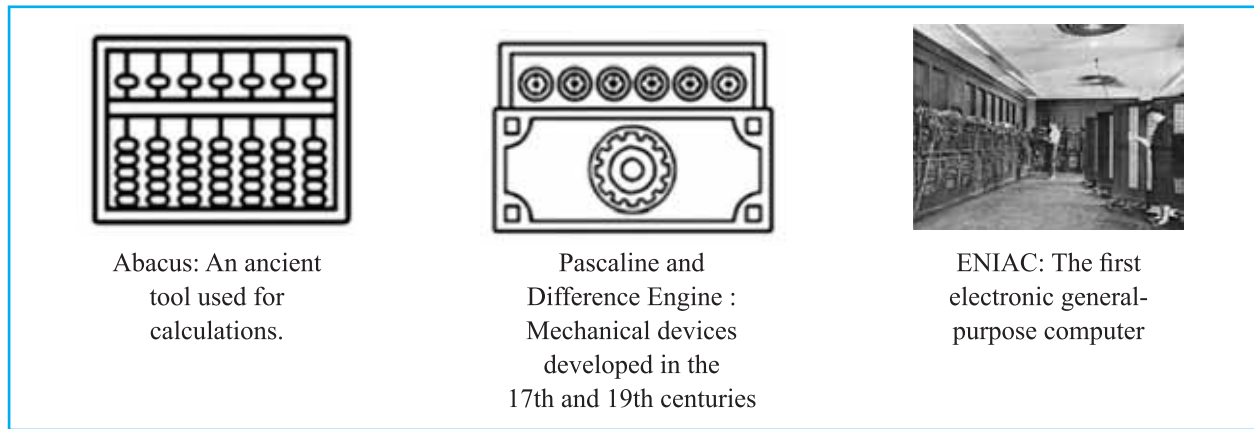


Figure 1.2 : Early Computing Devices

First Generation – Vacuum Tubes

The first generation of computers used vacuum tubes for processing and storage. These computers were extremely large, often taking up entire rooms. They were very slow, produced a lot of heat, and required a lot of electricity. Data was entered using punched cards and output was also received through them. Programming was done in machine language, which was difficult to write and understand. These computers were mainly used for scientific calculations and military applications. A well-known example is the ENIAC, one of the earliest electronic general-purpose computers.

Second Generation – Transistors

Second-generation computers replaced vacuum tubes with transistors. Transistors were much smaller, generated less heat, and were more reliable, making the computers faster and more efficient. These computers also used magnetic tape for storage. Programming languages like Assembly language and early versions of high-level languages were used. They became more common in business and government institutions. An example of a second-generation computer is the IBM 1401.

Third Generation – Integrated Circuits (IC)

Third-generation computers used integrated circuits (IC), which allowed many transistors to be placed on a single chip. This development made computers smaller, more powerful and more efficient. They consumed less power and were more affordable. For the first time, users interacted with computers using keyboards and monitors. These computers supported high-level programming languages like BASIC and COBOL and were the beginning of personal computing. They marked a big step toward modern computers.

Fourth Generation – Microprocessors

Fourth-generation computers introduced microprocessors, where the entire CPU was placed on a single chip. This made computers even smaller, cheaper and faster. These computers became

common in homes, schools and offices. They used hard disks and SSDs for storage and supported a wide variety of applications. Operating systems like Windows and Linux became popular. The internet and modern software developed rapidly during this time. Laptops, desktops and tablets are examples of fourth-generation computers.

Fifth Generation – AI, Quantum, Cloud

Fifth-generation computers focus on advanced technologies such as Artificial Intelligence (AI), cloud computing and quantum computing. These computers can understand human language, learn from experience and make decisions. They are used in smart phones, smart watches, voice assistants like Alexa, and self-driving cars. Cloud technology allows users to store and access data from anywhere. Fifth-generation computers are smart, powerful and play a big role in today's digital world.

The Journey of Software in Computer Evolution

The journey of software in computer evolution has played a crucial role in shaping the five generations of computers. In the first generation software was almost non-existent. Programs were written in machine language, using binary code (0s and 1s), which made programming extremely difficult and time-consuming. The second generation introduced assembly language, which allowed symbolic instructions and simplified coding to some extent, though it still required knowledge of hardware. The third generation marked a major shift with the development of high-level programming languages like FORTRAN, COBOL, and BASIC. It also introduced operating systems that allowed better file management and multitasking. The fourth generation saw significant advancements with the arrival of graphical user interfaces (GUIs) and user-friendly software such as Microsoft Windows, Photoshop, and office applications. These made computers more accessible to non-technical users. Operating systems like UNIX and Linux gained popularity in academia and enterprises. Finally, the fifth generation (present and beyond) focuses on artificial intelligence (AI), natural language processing (NLP) and cloud-based software. Intelligent applications like virtual assistants, smart home software and AI-powered chatbots represent this generation. Software has grown from complex, hardware-specific code to intelligent systems capable of learning and adapting to user needs across platforms.

Indian Computer History

India's first domestically designed and built digital computer was the TIFRAC (Tata Institute of Fundamental Research Automatic Calculator). Developed at Mumbai's Tata Institute of Fundamental Research (TIFR), the project was spearheaded by Professor R. Narasimhan and Dr. Homi J. Bhabha. TIFRAC officially became operational in February 1960. This computer represented a landmark achievement in India's technological progress. Its construction utilized 2,700 vacuum tubes, 1,700 germanium diodes, and 12,500 resistors. Notably, TIFRAC featured an early core memory system with a capacity of 2,048 words, each 40 bits long. An image of TIFRAC is shown in figure 1.3.



Figure 1.3 : TIFRAC (Tata Institute of Fundamental Research Automatic Calculator)

Block Diagram of a Computer

A computer system is made up of I/O devices and a Central Processing Unit (CPU). Figure 1.4 shows the block diagram of CPU, which consists of the Control Unit, Arithmetic and Logic Unit, and Memory Unit, to produce the final output. Arrows indicate data flow and interactions among the core components.

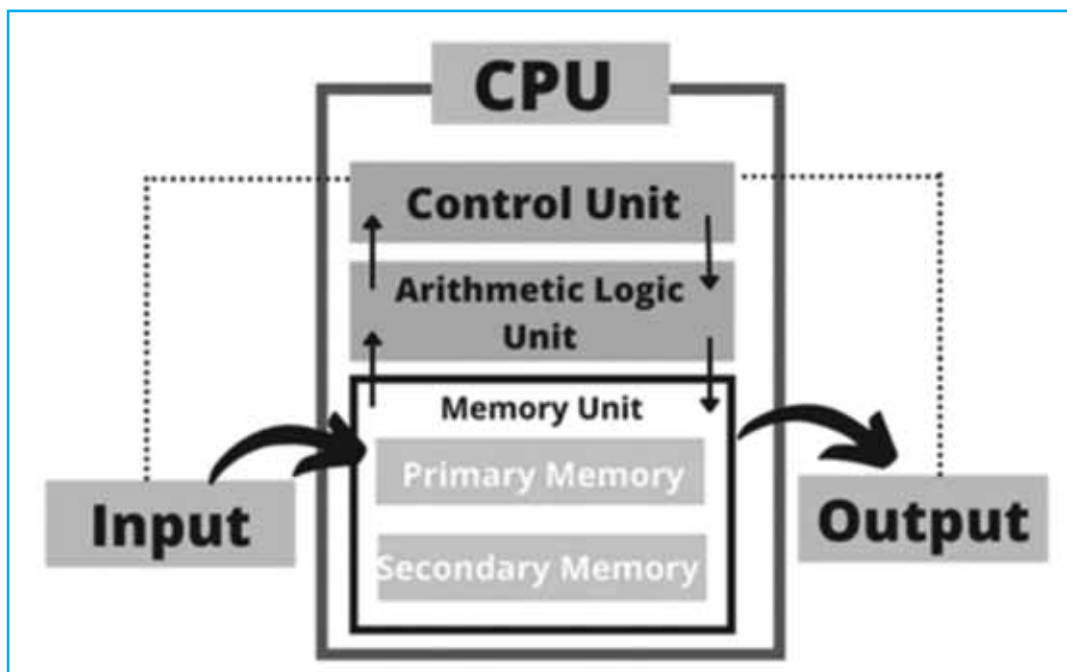


Figure 1.4 : Block Diagram of Computer

Computers cannot think or act on their own. They need instructions and data from the user. Input devices are the tools that help us send information to the computer. These devices allow us to enter data like text, images, sound, and instructions so the computer can process and respond. Output devices are the tools that help the computer send information to us. These devices allow the computer to display or present data like text, images, sound, and results so that users can see, hear, or receive the processed information.

Input

Input means the data that we give to a computer to be worked on. This is the first step in how a computer works. We usually give input through devices called input devices. Some common input devices are: Keyboard, Mouse, Scanner, Microphone, Camera and Touch Screen.

Keyboard

Figure 1.5 shows a keyboard. It is one of the most important input devices. It has keys for typing letters (A-Z), numbers (0-9), and special symbols (like @, #, %, etc.). It also includes function keys, arrow keys, and control keys like Shift, Ctrl, and Alt. Students use the keyboard to type homework, search on internet, and write messages or emails.

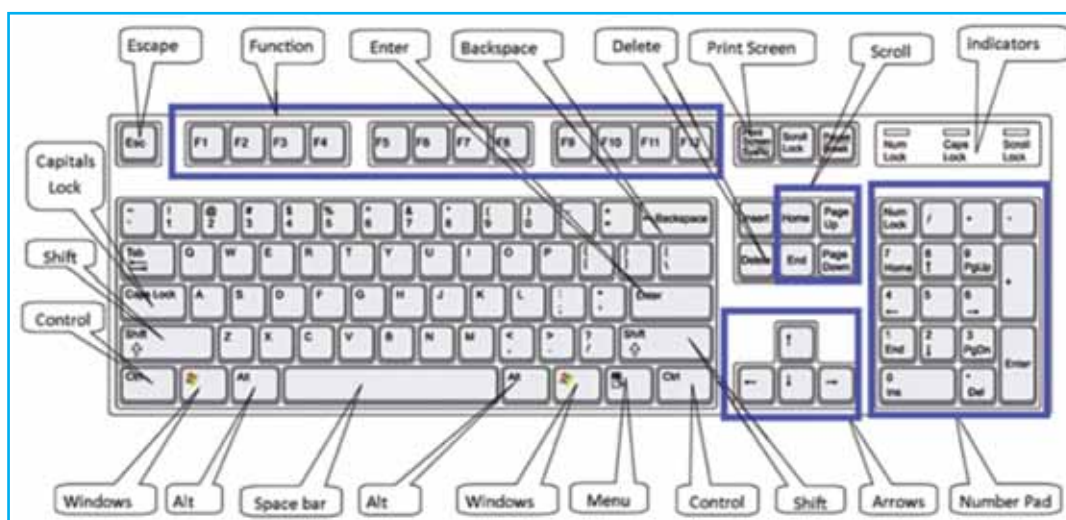


Figure 1.5 : QWERTY – Keyboard

Let us understand keyboard keys and their functions in table 1.1

Key Name	Function
Digits (0–9)	Used for entering numbers
English Alphabets (a–z)	Used for typing words and sentences
Mathematical Operators (+, -, *, /)	Used for mathematical operations
Punctuation Marks and Symbols	Used for grammar and special functions
Function Keys (F1 to F12)	Perform specific functions depending on the software
Enter Key	Used to execute a command or move to the next line
Spacebar	Inserts a space between words
Shift	Used to type capital letters and upper symbols on keys
Caps Lock	Toggles capital letters on and off
Backspace	Deletes the character before the cursor
Delete	Removes the character after the cursor
Tab	Moves the cursor to the next tab stop (used for indentation)
Control (Ctrl)	Used with other keys for shortcuts (e.g., Ctrl+C to copy)
Escape (Esc)	Cancels or exits the current operation
Arrow Keys	Arrow keys to move the cursor up, down, left, or right
Alter (Alt)	Used with other keys to perform special commands

Table 1.1 : Keyboard keys and their Functions

Mouse

A mouse is a pointing device used to move the cursor on the computer screen. It usually has two buttons left and right and a scroll wheel. We use the mouse to click on icons, open files, select text and drag-and-drop items. It helps in navigating and controlling the computer easily. It is shown in figure 1.6



Figure 1.6 : Mouse

Scanner

A scanner is used to convert printed documents and images into digital format. When we place a page or photo on the scanner, it makes a digital copy that can be saved on the computer. This is helpful for saving handwritten notes or old photographs in digital form. It is shown in figure 1.7



Figure 1.7 : Scanner

Microphone

A microphone accepts sound and sends it to the computer. It is shown in figure 1.8. It is used for voice typing, online meetings, and recording songs or speeches. Many students use microphones to attend online classes and speak in video calls or voice chats.



Figure 1.8 : Microphone

Camera (Webcam)

A camera, especially a webcam, captures images and videos. It is used in video calls, online classes, and recording educational videos. Today laptops have built-in cameras. Students can use them to participate in virtual classrooms or record presentations. It is shown in figure 1.9



Figure 1.9 : Camera (Webcam)

Touch screen

A touch screen allows users to interact directly with the devices by touching it with an icon. It combines both input and output functions. Touch screens are common in smart phones, tablets and smart boards. Students use them to play educational games, open apps, and scroll through pages without using a mouse or keyboard. It is shown in figure 1.10



Figure 1.10 : Touch Screen

Joystick

A joystick is an input device consisting of a vertical stick that moves a graphic cursor in the same direction as the stick. It often has a button on top to select the option the cursor is pointing to. Joysticks are most commonly used with video games, training simulators and for controlling robots. Joystick is shown in figure 1.11.

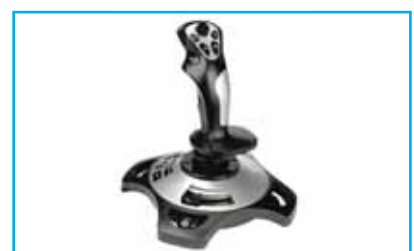


Figure 1.11 : Joystick

Central Processing Unit (CPU)

After getting the input, the computer begins to work on it by following the instructions from a program. This work is done by the **Central Processing Unit (CPU)**, which is often called the "brain" of the computer. CPU is the primary unit that performs calculations and executes instructions. It consists of the Arithmetic and Logic Unit (ALU) and the Control Unit (CU). The ALU performs arithmetical operations and logical comparisons, while the CU directs data flow and instruction sequences. CPU is shown in figure 1.12.

Control Unit (CU)

The Control Unit is like traffic police of the computer. It controls and manages all parts of the computer. It does not process data, but it makes sure that everything works in the right order. It decides which instruction to execute next. It sends signals to other parts like the ALU and memory to work properly. It controls the input and output devices as well.

Arithmetic and Logic Unit

The Arithmetic Unit is a part of the ALU. It does all the arithmetical calculations in the computer. It performs addition, subtraction, multiplication, division, etc. For example, if we do $25 + 30$ on a calculator app, this unit does that job. The Logic Unit is the second part of the ALU. It helps the computer make decisions using logic operations. It checks things like greater than, less than, or equal to. It helps in comparing numbers, and making yes/no (true/false) decisions.

Memory Unit

The Memory Unit is the place where the computer stores data. It can store data for a short time or a long time. It has Primary Memory and Secondary Memory. Primary Memory (like Random Access Memory-RAM) is called volatile memory because everything is lost when the power goes off. Secondary Memory (Solid State Drive –SSD, Hard Disk Drive-HDD) is called non-volatile memory because it stores data permanently. Let us discuss here storage part in detail, because it is part of memory unit.

Primary Storage (Main Memory)

Primary storage, also known as main memory, is the memory that the CPU accesses directly. It is volatile, meaning data is lost when the computer is turned off. Random Access Memory Stores data temporarily while the computer is running. Read Only Memory stores permanent instructions needed to start the computer. Figures 1.13 and 1.14 show RAM and ROM respectively, while their differences are outlined in table 1.2.

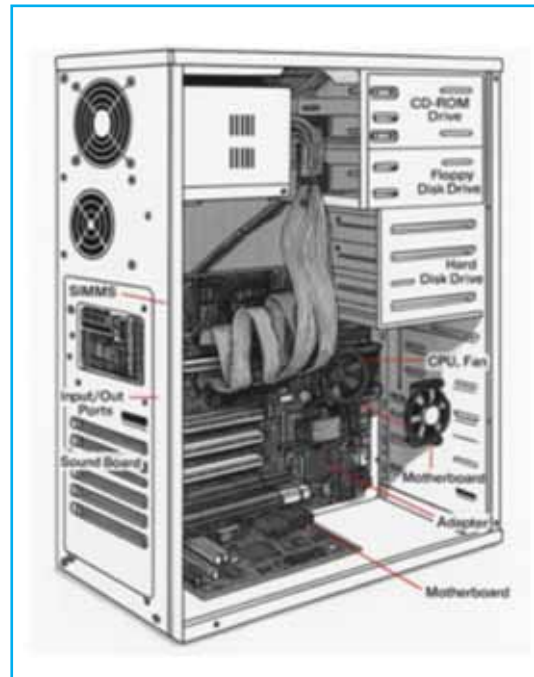


Figure 1.12 : CPU

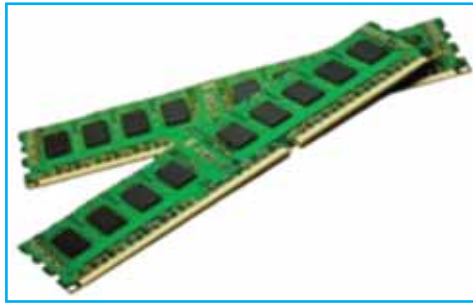


Figure1.13 : RAM

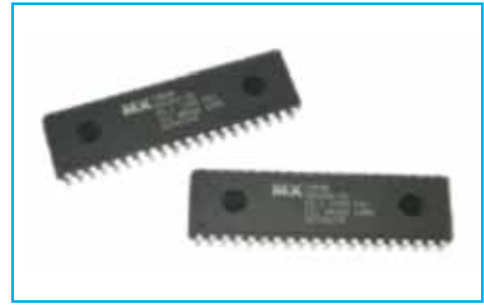


Figure1.14 : ROM

Feature	RAM (Random Access Memory)	ROM (Read-Only Memory)
Definition	Temporary memory used to store data currently in use	Permanent memory used to store firmware or boot instructions
Volatility	Volatile – data is lost when power is off	Non-volatile – data is retained even when power is off
Function	Helps in processing and multitasking	Stores essential instructions for booting and basic functions
Data Accessibility	Read and write operations allowed	Mostly read-only (cannot be modified easily)
Speed	Fast	Comparatively slower
Size	Typically larger (GBs)	Smaller in size (KBs or MBs)
Usage	Used by CPU during operation to store temporary files	Stores system firmware
Modifiability	Can be updated or changed easily	Difficult to modify or requires special tools

Table 1.2 : Memory (RAM and ROM)

Secondary Storage

Secondary storage is used to store data permanently. It retains data even when the computer is turned off. It includes devices like:

- Hard Disk Drive (HDD): A traditional storage device with large capacity.
- Solid State Drive (SSD): A modern storage device with faster speed and no moving parts.
- Optical Discs: CDs, DVDs used for media storage.
- Flash Drives: Pen drives, USB drives used for portable data storage.
- Floppy Disk: It is a type of removable magnetic storage medium, historically used for storing and transferring data on computers.
- Memory Cards: Used in cameras, mobile phones, and tablets.

Secondary storage devices are shown in figure 1.15, 1.16, 1.17 and 1.18.

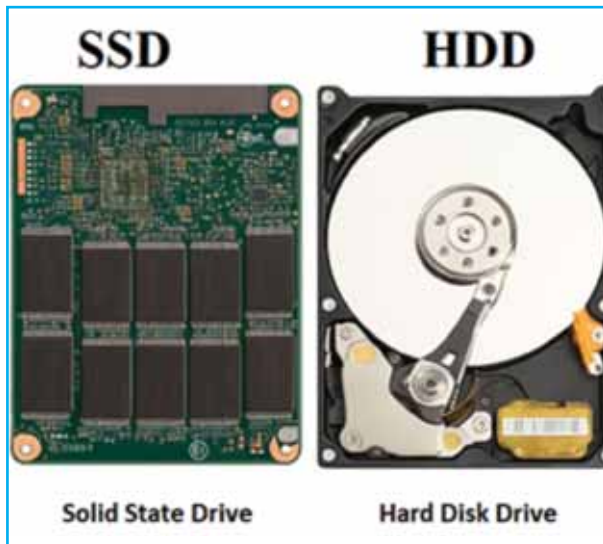


Figure 1.15 : SSD / HDD



Figure 1.16 : CD / DVD Drive



Figure 1.17 : Floppy Disk



Figure 1.18 : Pen Drive / USB

Motherboard

It is the single, largest board that acts as the central hub or "backbone" of the entire PC. It holds the most crucial components, such as the CPU and the RAM, directly in dedicated sockets. Its main job is to provide the electrical connections and pathways, known as buses, that enable all hardware components to communicate and work together. Every internal part, like the hard drive, graphics card, and all external ports (USB, audio, etc.), plugs into the motherboard. It manages the distribution of power throughout the system from the power supply unit.

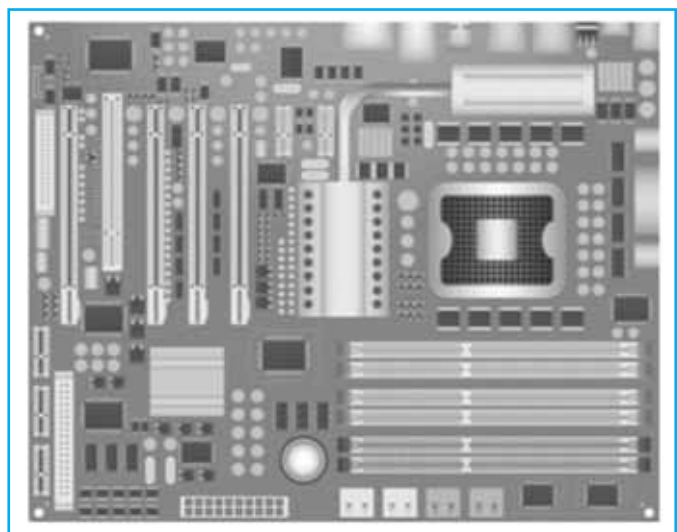


Figure 1.19 : Motherboard

Output

Output devices are hardware components that allow a computer to communicate the results of its processes to the user. These devices take information from the computer and convert it into a form that humans can understand, such as text, images, sound or video.



Figure 1.20 : Monitor

Monitor

A monitor is also called a Visual Display Unit (VDU). It displays text, pictures and videos on the screen. It is one of the most important output devices, and is used when we are working on documents, watching videos or using any software. Figure 1.20 shows a sample image of CRT, LCD and LED monitors.

Printer

A printer is used to make a hard copy (paper version) of documents or images from the computer. It is useful for printing homework, assignments, charts and pictures. Common types include inkjet, laser and dot matrix printers. It is shown in figure 1.21.



Figure 1.21 : Printer

Speakers

Speakers output sound from the computer. They let us hear music, sound effects in games, voice from videos or audio from online classes. Speakers are essential for multimedia activities like listening to music, watching movies or video conferencing. It is shown in figure 1.22.



Figure 1.22 : Speakers

Summary

This chapter provides a comprehensive overview of computers, including their definition, components and evolution. It explains key terms like hardware, software, and firmware, and distinguishes between application, system, open-source and proprietary software. The block diagram, input/output devices, CPU functions, and memory units have been also discussed. We have also discussed the historical evolution of computers through hardware and software generations.

EXERCISE

1. Define a computer in your own words.
2. What are the main components of a computer? Describe each with examples.
3. Explain the difference between hardware, software and firmware.
4. Describe the benefits of a computer in our daily life.
5. What are input and output devices? Give five examples of each.
6. Explain the function of the CPU and its components.
7. Differentiate between RAM and ROM.
8. Describe the different types of secondary storage devices.
9. Write a short note on the evolution of computers through different generations.
10. Explain secondary storage device.

11. State whether true or false.

- (1) Software is a physical component of a computer.
- (2) A keyboard is an input device.
- (3) CPU stands for Central Program Unit.
- (4) ROM stores data temporarily.
- (5) Touch screen acts as both input and output device.

12. Fill-in the blanks.

- (1) A _____ is an electronic device that processes data.
- (2) _____ is used to store data permanently.
- (3) _____ is the brain of the computer.
- (4) Linux is an example of _____ software.
- (5) Data is given to the computer using _____ devices.

13. Multi-choice questions. Choose the most correct answer.

- (1) Which of the following is a characteristic of fifth-generation computers?
 - (a) Use of vacuum tubes
 - (b) Assembly language
 - (c) Artificial Intelligence
 - (d) Magnetic tape
- (2) What is the function of the Arithmetic Logic Unit (ALU)?
 - (a) Stores data
 - (b) Controls hardware
 - (c) Performs calculations and logic
 - (c) Manages input devices
- (3) Which key is used to move the cursor to the next tab stop?
 - (a) Enter
 - (b) Tab
 - (c) Ctrl
 - (d) Shift



Types of Computers and Data Representations

Introduction

A computer is an electronic device that accepts input, processes data according to instructions, stores results and produces output that people can use. A program is a set of step-by-step instructions that tells the computer what to do. Software is a collection of programs designed for various tasks, whereas hardware refers to the physical components of a computer, including the keyboard, screen, processor and storage devices. Data refers to information in any form, such as numbers, text, images, audio or video that a computer handles during its work. Computers are essential today because they enable faster, more accurate and easier work management in daily life. In education, computers support smart classrooms, digital content and online examinations used by schools and colleges. In banking and finance, computers enable UPI payments, ATMs, and secure online transactions for families and businesses. Computers are essential in modern life, allowing communication through messaging and video calls, managing patient records in healthcare and delivering government services via e-governance portals. They also offer a vast collection of entertainment options, ranging from streaming platforms and music to interactive games on various devices. It is essential to recognize that different computers are designed for specific tasks. Laptops are ideal for school work, phones are versatile for use anywhere, and supercomputers excel at handling large tasks, such as weather forecasting. Understanding these types helps us learn how computers process information internally. Computers represent text, pictures, and sound as numbers, allowing data to be stored and processed reliably. Learning the basics of number systems and storage builds the foundation for making good choices in education, banking, healthcare, public services and entertainment.

Types of Computer Systems

When we refer to a computer, we typically mean a computer system. A computer system consists of two main components: hardware and software. Think of it like a human body. The hardware refers to all the physical parts that you can see and touch, such as the screen, keyboard, mouse and the memory chips inside. The software is the set of instructions and programs that tell the hardware what to do. It is like the brain or the thoughts that make the body work. An app on your phone is software, and so is the operating system, like Android or Windows. Imagine a computer like a bicycle. The hardware consists of the frame, pedals, and wheels that make up the bicycle. The software is the rider who knows how to use it and decides where to go. Now, let us learn about the common types of computer systems in the subsection.

Laptops and Desktops

Laptops and desktops, as shown in figure 2.1, are the workhorses of personal and professional computing. The primary difference lies between portability and upgradability. A desktop is modular, meaning you can easily upgrade



Figure 2.1 : Laptop and Desktop

individual components, such as the graphics card, RAM or storage over time. This makes them cost-effective and powerful for specialized tasks, such as high-end gaming or professional video editing. Laptops integrate everything into a single, portable unit, offering convenience at the cost of limited upgradability. They are ideal for students and professionals who need to work from different locations. Laptops and desktops represent key subtypes of microcomputers. Both these are widely used for improving personal efficiency by enabling the use of applications that allows us to create documents, presentations, software or play multimedia. The main distinction lies in portability versus power and compatibility.

Technical Specifications:

- CPU (Central Processing Unit): The "brain" of the computer. Standard options include Intel's Core series (i3, i5, i7, i9) and AMD's Ryzen series (3, 5, 7, 9). A higher number generally means better performance.
- RAM (Random Access Memory): This is the computer's short-term memory for multitasking. A minimum of 8 GB is required for smooth performance, 16 GB is recommended for most users and 32 GB or more is recommended for professionals and gamers.
- HDD (Hard Disk Drive): A slower, mechanical drive that offers large storage capacity at a low price.
- SSD (Solid-State Drive): Much faster than an HDD, SSDs enable the computer to boot up quickly and feel responsive. 512 GB is a good starting point for an SSD.
- GPU (Graphics Processing Unit): Essential for gaming, video editing and design software. NVIDIA's GeForce (RTX series) and AMD's Radeon (RX series) are the market leaders. For general use, the integrated graphics in the CPU are sufficient.
- Display: For laptops, standard sizes are 14 inches and 15.6 inches. A Full HD (1920x1080 pixels) resolution is standard.

Tablets

Tablets, as shown in figure 2.2, occupy a space between smartphones and laptops. They are primarily designed for media consumption, web browsing and light productivity. Their main advantage is a large touchscreen interface that is intuitive and excellent for reading watching videos and drawing. With accessories like a detachable keyboard and a stylus, a high-end tablet can perform many of a laptop's functions, making it a versatile tool for students and artists.

Tablets are compact, portable microcomputers with touchscreen interface. It uses a mobile operating systems, it lies between smartphones and laptops in terms of size. As it is small and very portable, it allows to consume multimedia on the move.



Figure 2.2 : Tablet

Technical Specifications:

- Processor: Tablets use mobile-first processors designed for efficiency. Key players are Apple's A-series and M-series chips (in iPads) and Qualcomm's Snapdragon series or MediaTek's Dimensity series (in Android tablets).
- RAM: Typically ranges from 4 GB in budget models to 8 GB or 16 GB in high-end ones.
- Storage: Internal Storage usually ranges from 64 GB to 512 GB. Some Android tablets offer expandable storage via a microSD card.
- Display: Screen size is typically between 10 to 13 inches. Display quality is a key feature, with high-resolution LCD or vibrant OLED panels.
- Connectivity: Models are available as Wi-Fi only or Wi-Fi + Cellular, allowing you to use a SIM card for internet access on the go.

Mobile Phones

For most people in India and around the world, the smartphone is their primary computing device. It is shown in figure 2.3. It is a powerful, connected, all-in-one device. Beyond communication, it serves as a wallet (UPI), a navigator (GPS), a high-quality camera, and an entertainment hub. The modern smartphone's power lies in its SoC (System on a Chip), which integrates multiple components efficiently, and its access to vast app ecosystems (Google Play Store and Apple App Store). Mobile phones, often classified as microcomputers are handheld personal devices. They are highly portable computing systems with compact designs that integrate telephony, internet connectivity, and touch-sensitive screens. It allows for seamless communication, app-based tasks and multimedia access on the move.



Figure 2.3 : Mobile Phone

Technical Specifications:

- SoC (System on a Chip): This single chip houses the CPU, GPU, and other critical components. Dominant SoCs include Apple's Bionic series, Qualcomm's Snapdragon 8 series, and MediaTek's Dimensity 9000 series.
- RAM: Ranges from 6 GB in budget phones to 12 GB or 16 GB in flagship models.
- Camera System: This is a major focus. Specifications include megapixels (MP), aperture size, and multiple lens options (wide, ultra-wide, and telephoto). Computational photography (software processing) is just as important as the hardware.
- Battery: Measured in milliampere-hours (mAh), with 4500-5000 mAh being common. Fast charging capability (e.g., 30W, 67W, 120W) is also a key feature.
- Display: Most phones now use bright and colourful AMOLED or OLED displays with high refresh rates (90Hz or 120Hz) for smoother scrolling.

Servers

Servers, as shown in figure 2.4, are the backbone of the Internet and corporate networks. Unlike personal computers, they are designed for extreme reliability, scalability, and performance under a constant workload. A server's job is to manage network resources and respond to requests from client computers 24 x 7. They often feature redundant components (such as dual power supplies) so that if one part fails, the server continues to run. They typically run specialized server operating systems, such as Windows Server or a Linux distribution (e.g., Ubuntu Server, Red Hat Enterprise Linux). Servers are a type of computer often classified as minicomputers (midrange systems) or powerful workstations based on their size and performance characteristics. They often fall within the category of microcomputer and mainframe. They are specifically designed for a particular purpose, such as managing emails, files or web pages. They are designed to handle a high volume of concurrent users and data transactions.

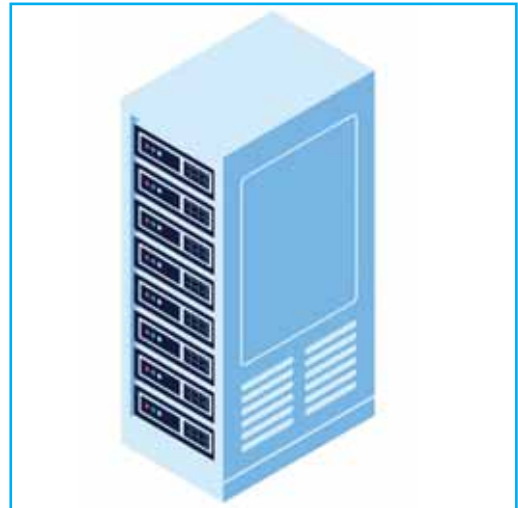


Figure 2.4 : Server

Technical Specifications:

- CPU: Server-grade processors like Intel's Xeon or AMD's EPYC series, which feature a high number of cores to handle thousands of simultaneous tasks.
- RAM: Uses ECC (Error-Correcting Code) RAM, which prevents data corruption.
- Storage: Utilises enterprise-grade SSDs or HDDs configured in a RAID (Redundant Array of Independent Disks) setup. RAID protects data by distributing it across multiple drives.
- Networking: Multiple high-speed network ports are standard for handling high volumes of traffic.
- Form Factor: Can be a Tower (looks like a desktop) for small offices or Rack-mounted (flat units that slide into a cabinet) for data centres.

Supercomputers

Supercomputers, as shown in figure 2.5, are at the absolute peak of computing power, designed to solve problems that are too complex for any other type of machine. Their architecture is based on massive parallel



Figure 2.5 : Supercomputer

processing, where a problem is broken down into millions of smaller tasks that are solved simultaneously by thousands of processors. Their performance is measured in FLOPS (Floating-Point Operations Per Second), with modern systems reaching Petaflops (quadrillions of FLOPS) and Exaflops (quintillions of FLOPS). Building and maintaining them requires a massive infrastructure for power and cooling.

Technical Specifications:

- **Architecture:** Composed of thousands of interconnected servers called nodes. Each node contains multiple CPUs and often several GPUs, which are excellent at parallel tasks.
- **Interconnect:** A custom, extremely high-speed, low-latency network that connects all the nodes. This is a critical component that enables the nodes to function as a single, cohesive system.
- **Storage:** Uses a specialized parallel file system that can read and write terabytes of data per second. Total storage capacity is measured in Petabytes (PB).
- **Cooling:** Advanced liquid cooling systems are necessary to manage the immense heat generated by the processors.

Graphics Processing Unit (GPU) Based System

In a server, a Graphics Processing Unit (GPU) acts as a powerful computational accelerator. Although originally built for graphics, a GPU's primary role in a server is to perform massive calculations for tasks such as AI, data analysis, and scientific simulations. Think of the CPU as a brilliant general manager who can handle any complex task one by one, very quickly. The GPU, on the other hand, is like a massive team of thousands of workers. Each worker is not as skilled as the manager, but they can all perform the same simple task simultaneously. This ability to perform thousands of tasks at once is known as parallel processing, and it is what makes GPUs essential for modern high-performance computing.

Technical Specifications:

- **GPU Cores:** Unlike a CPU's few powerful cores, a GPU has thousands of smaller cores designed for parallel work. More cores generally mean better performance.
- **VRAM (Video RAM):** This is the GPU's own ultra-fast, dedicated memory. It is used to store graphics data, such as high-resolution textures and 3D models.
- **Interconnect:** High-end servers often contain multiple GPUs that need to communicate with each other directly at very high speeds.

Comparison of Computer Systems

To make the differences more straightforward to understand, a simple comparison table is provided in table 2.1.

Type	Portability	Processing Power	Storage	Typical Users	System Classification
Laptop/Desktop	Medium-High	Medium-High	Medium-High	Students, Teachers, Families, Office Workers	Microcomputer/ Workstation
Tablet	High	Low-Medium	Low-Medium	Learners, Field workers, Home users	Microcomputer
Mobile Phone	Very High	Low-Medium	Low-Medium	Everyone	Microcomputer
Server	Low	High	High	Schools, Colleges, Banks, Enterprises	Minicomputer/ Mainframe
Supercomputer	Very Low	Very High	Very High	Scientists, Researchers, Government	Supercomputer
GPU based system	Very Low	Very High	Low-Medium	Gamers, Content Creators, AI Developers	Micro/Mini/ Mainframe/Super Computer

Table 2.1 : Types of Computer Systems

Each category of computer has its own strengths and is designed to meet specific needs, ranging from simple daily tasks, such as chatting with friends to handling complex challenges like weather prediction or space exploration. To perform these tasks, all computer systems rely on a process called data representation. Therefore, in the next section, we will learn about how data is represented inside computers.

Data Representation

Imagine trying to communicate using only a light switch. You have only two signals to send: ON or OFF. This is exactly how a computer works! Since it is an electronic machine, it does not understand words or pictures directly. Instead, it understands the presence of an electric current (ON, which it represents as a '1') or the absence of a current (OFF, which it represents as a '0').

Everything you see and do on a computer, from typing a letter to watching a video, is converted into long strings of 1s and 0s. This simple two-digit language is called the binary number system and it is the only language a computer truly understands. To learn the computer's language, we must first understand how it uses just two digits to represent everything. To understand how computers “think”, we first need to look at the number system we use every day.

The Decimal System (Base-10)

The number system we use in our daily lives is called the decimal or base-10 system. It is called base-10 because it uses ten different digits: 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. The value of a digit in a decimal number depends on its position, which is referred to as its place value. Each place value is a power of

10. For example, let us look at the number 257.

We can break it down like this:

$$257 = (2 \times 100) + (5 \times 10) + (7 \times 1)$$

Or, using powers of 10:

$$257_{10} = (2 \times 10^2) + (5 \times 10^1) + (7 \times 10^0)$$

The small '10' written after the number is called the base or radix, which tells us it is a decimal number.

The Binary System (Base-2): The Computer's Language

Computers use the binary or base-2 system. It is called base-2 because it uses only two digits: 0 (representing OFF) and 1 (representing ON). Each of these digits is called a bit (short for binary digit). Just like the decimal system, the binary system also has place values, but instead of being powers of 10, they are powers of 2.

...	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
...	128	64	32	16	8	4	2	1

To work with computers, it is helpful to know how to convert numbers between the decimal and binary systems.

Converting Binary to Decimal

To convert a binary number to a decimal number, you multiply each binary digit by its place value (a power of 2) and add all the results together. The table method makes this easy.

Example 1: Convert 1101_2 to decimal.

Binary Digit	1	1	0	1
Place Value (Power of 2)	$2^3 = 8$	$2^2 = 4$	$2^1 = 2$	$2^0 = 1$
Calculation (Binary Digit * Place Value)	$1 * 8 = 8$	$1 * 4 = 4$	$0 * 2 = 0$	$1 * 1 = 1$

Now, add the results of the calculation: $8 + 4 + 0 + 1 = 13$

So, $1101_2 = 13_{10}$.

Example 2: Convert 10110_2 to decimal.

Binary Digit	1	0	1	1	0
Place Value (Power of 2)	$2^4 = 16$	$2^3 = 8$	$2^2 = 4$	$2^1 = 2$	$2^0 = 1$
Calculation (Binary Digit * Place Value)	$1 * 16 = 16$	$0 * 8 = 0$	$1 * 4 = 4$	$1 * 2 = 2$	$0 * 1 = 0$

Now, add the results of the calculation: $16 + 0 + 4 + 2 + 0 = 22$

So, $10110_2 = 22_{10}$.

Converting Decimal to Binary

To convert a decimal number to binary, you can use a table of place values. You find the largest power of 2 that is less than or equal to your number, place a '1' in that position, subtract that value from your number, and repeat the process with the remainder.

To convert a decimal number into binary, our goal is to figure out which powers of 2 add up to our number. Think of it like giving someone change, but you only have special coins with the values 1, 2, 4, 8, 16, 32, and so on. The process is a simple game of “What's the biggest coin I can use?” Start with the given decimal number (the total amount of change you need to provide) and follow these steps:

1. Identify the Starting Point: Find the largest "binary coin" (a power of 2) that is less than or equal to the decimal number.
2. Place the First '1': Place a '1' in that coin's position in the binary number. Then, subtract the coin's value from the decimal number to get a new remainder.
3. Move to the Next Coin: Consider the next smaller binary coin.
4. Decide and Place: Compare this coin to the current remainder.
 - If the coin fits, place a '1' in its position and subtract its value from the remainder.
 - If the coin does not fit, place a '0' in its position.
5. Repeat: Continue this process, moving down to the next smaller coin each time, until the remainder is zero.

Example 1: Convert 13_{10} to binary.

First, a list of the binary place values (powers of 2) is needed. For converting the number 13, the relevant values are: ..., 16, 8, 4, 2, 1.

The goal is to find the largest place value that is less than or equal to 13.

Start with the largest value, 16.

Is 16 less than or equal to 13? No, it's too big. Move to the next smaller value, 8.

Is 8 less than or equal to 13? Yes, it fits! Since 8 is the largest power of 2 that fits into 13, it becomes the starting point for the conversion. Therefore, a '1' is placed in the 8's position.

Place Value	8	4	2	1
Binary Digit	1			

Remainder: $13 - 8 = 5$.

Now, the remainder is 5, and the next smaller place value is 4. Is 4 less than or equal to the remainder, 5? Yes, it fits. So, '1' is placed in the 4's position.

Place Value	8	4	2	1
Binary Digit	1	1		

Remainder: $5 - 4 = 1$.

Now, the remainder is 1, and the next smaller place value is 2. Is 2 less than or equal to the remainder, 1? No, it is bigger than 1. So, '0' is placed in the 2's position.

Place Value	8	4	2	1
Binary Digit	1	1	0	

Remainder: There is no update in the remainder, and it remains 1 only.

The remainder is still 1. The final place value is 1. Is 1 less than or equal to 1? Yes, it fits exactly. So, '1' is placed in the 1's position.

Place Value	8	4	2	1
Binary Digit	1	1	0	1

Remainder: $1 - 1 = 0$.

Since the remainder is now 0, the conversion is complete.

By combining the digits placed at each step, the final binary number is 1101.

So, $13_{10} = 1101_2$.

Example 2: Convert 125_{10} to binary.

First, a list of the binary place values (powers of 2) is needed. For converting the number 125, the relevant values are: ..., 128, 64, 32, 16, 8, 4, 2, 1.

The goal is to find the largest place value that is less than or equal to 125.

Start with the largest value, 128.

Is 128 less than or equal to 125? No, it's too big. Move to the next smaller value, 64.

Is 64 less than or equal to 125? Yes, it fits! Since 64 is the largest power of 2 that fits into 125, it becomes the starting point for the conversion. Therefore, a '1' is placed in the 64's position.

Place Value	64	32	16	8	4	2	1
Binary Digit	1						

Remainder: $125 - 64 = 61$.

Now, the remainder is 61, and the next smaller place value is 32. Is 32 less than or equal to the remainder, 61? Yes, it fits. So, '1' is placed in the 32's position.

Place Value	64	32	16	8	4	2	1
Binary Digit	1	1					

Remainder: $61 - 32 = 29$.

Now, the remainder is 29, and the next smaller place value is 16. Is 16 less than or equal to the remainder, 29? Yes, it fits. So, '1' is placed in the 16's position.

Place Value	64	32	16	8	4	2	1
Binary Digit	1	1	1				

Remainder: $29 - 16 = 13$.

Now, the remainder is 13, and the next smaller place value is 8. Is 8 less than or equal to the remainder, 13? Yes, it fits. So, '1' is placed in the 8's position.

Place Value	64	32	16	8	4	2	1
Binary Digit	1	1	1	1			

Remainder: $13 - 8 = 5$.

Now, the remainder is 5, and the next smaller place value is 4. Is 4 less than or equal to the remainder, 5? Yes, it fits. So, '1' is placed in the 4's position.

Place Value	64	32	16	8	4	2	1
Binary Digit	1	1	1	1	1		

Remainder: $5 - 4 = 1$.

Now, the remainder is 1, and the next smaller place value is 2. Is 2 less than or equal to the remainder, 1? No, it is bigger than 1. So, '0' is placed in the 2's position.

Place Value	64	32	16	8	4	2	1
Binary Digit	1	1	1	1	1	0	

Remainder: There is no update in the remainder, and it remains 1 only.

The remainder is still 1. The final place value is 1. Is 1 less than or equal to 1? Yes, it fits exactly. So, '1' is placed in the 1's position.

Place Value	64	32	16	8	4	2	1
Binary Digit	1	1	1	1	1	0	1

Remainder: $1 - 1 = 0$.

Since the remainder is now 0, the conversion is complete.

By combining the digits placed at each step, the final binary number is 1111101.

So, $125_{10} = 1111101_2$.

In the previous section, we understood the concepts of the binary and decimal number systems. Computers only understand binary, but long strings of 0s and 1s, such as 1101011010001101, are complicated for people to read without making errors. To fix this, programmers use the Octal (base-8) and Hexadecimal (base-16) number systems as a compact, human-friendly shorthand for long binary numbers.

The Octal System (Base-8)

The octal system uses eight digits: 0, 1, 2, 3, 4, 5, 6, and 7. Its power lies in its simple relationship with binary: one octal digit represents exactly a group of three binary bits.

Example: Convert the binary number 101110_2 to its equivalent octal representation.

1. Group the bits: Starting from the right, group the binary digits into sets of three. The first three digits from the rightmost are 110, and the next three digits are 101. However, we read it from left to right. So, the sequence is 101 followed by 110.
2. Convert each group: Find the decimal value of each three-bit group.
 - $101 = (1 \times 4) + (0 \times 2) + (1 \times 1) = 5$
 - $110 = (1 \times 4) + (1 \times 2) + (0 \times 1) = 6$
3. Combine the results: The octal number is 56. So, $101110_2 = 56_8$.

The Hexadecimal System (Base-16)

The hexadecimal system is even more common in modern computing. It uses sixteen digits: 0-9 and the letters A, B, C, D, E, F to represent the values 10, 11, 12, 13, 14, and 15. Each hexadecimal digit represents exactly a group of four binary bits.

Example: Convert binary 11010100_2 to hexadecimal.

1. Group the bits: Starting from the right, group the binary digits into sets of four. The first four digits from the right side are 0100, and the next four digits are 1101. However, we read it from left to right. So, the sequence is 1101 followed by 0100.
2. Convert each group: Find the value of each four-bit group.
 - $1101 = (1 \times 8) + (1 \times 4) + (0 \times 2) + (1 \times 1) = 13$. The hexadecimal digit for 13 is D.
 - $0100 = (0 \times 8) + (1 \times 4) + (0 \times 2) + (0 \times 1) = 4$. The hexadecimal digit for 4 is 4.
3. Combine the results: The hexadecimal number is D4. So, $11010100_2 = D4_{16}$.

Note: If a binary number doesn't have an exact number of digits to form complete groups for octal (3 bits) or hexadecimal (4 bits) conversion, add leading zeros to the leftmost group. This process is called padding. Adding zeros to the left of a number does not change its value (for example, the number 5 is the same as 05 or 005). This allows us to create a complete group for the final conversion step.

Data Storage

Data storage functions like a digital filing cabinet for a computer, providing a secure location to store all kinds of digital information for future use. Once the computer processes data, such as writing an assignment or editing a photo, data storage ensures that the work is saved. It enables the computer to retain everything from school projects and family pictures to games and applications, whether for a brief period or many years. The key concepts and terms related to data storage are summarised in table 2.2 below for easier review.

Concept	Explanation
Bit	The smallest possible unit of data, representing a single 0 or 1.
Byte	A group of 8 bits, typically used to represent a single character like the letter 'A' or the number '5'.
Storage Units	Measures for data capacity, increasing in size: KB (Kilobyte - a text file), MB (Megabyte - a photo), GB (Gigabyte - a movie), TB (Terabyte - a computer's hard drive).
Primary Storage (RAM)	The computer's fast, short-term memory is used for currently running apps. It is volatile, meaning data is lost when the power is turned off. Think of it as a temporary work desk.
Secondary Storage	The computer's permanent, long-term memory, which saves files even when the computer is powered off. It is non-volatile or persistent. Examples include HDDs, SSDs, and USB pen drives. Think of it as a bookshelf.
Good Storage Practices	Methods for keeping data safe include making backups (extra copies), utilizing cloud storage (such as Google Drive), and organizing files into folders for easy retrieval and access.

Table 2.2 : Data Storage

Applications of Computers

Computers are highly valuable due to their wide range of applications across various domains. Table 2.3 highlights the significant applications of computer systems in today's world, ranging from everyday communication to advanced scientific research.

Application Area	Description and Examples
Education and E-learning	Makes learning more interactive in schools and colleges. Examples include the use of smart classrooms, digital content, and online examinations.
Business and Finance	Manages financial transactions and business operations. Daily examples include UPI payments, using ATMs, and secure online transactions for families and businesses.
Communication and Social Media	Connects people instantly across the world for easy sharing of information. Typical uses are messaging and video calls, email and social media apps.
Entertainment and Multimedia	Provides a vast collection of digital content for leisure and creativity, ranging from streaming platforms and music to interactive games accessible on various devices.
Science and Research	Solves complex scientific problems using large-scale calculations and data analysis. Supercomputers are utilized for tasks such as weather forecasting and space research.
Healthcare	Improves diagnostics and manages patient information. Computers are used for managing patient records, controlling medical equipment and telemedicine.
Government and Public Services	Delivers faster and more transparent services to citizens. Examples include e-governance portals for accessing public services and Aadhaar-enabled systems.
Embedded Systems	A small computer built inside another machine for a specific function. Examples include the systems inside ATMs, intelligent washing machines and modern cars.

Table 2.3 : Applications of Computers

Summary

A computer system combines physical hardware with instructional software to perform tasks. Systems range from personal laptops and mobile phones to powerful servers and supercomputers, each designed for specific needs. At their core, computers understand only the binary language of 0s and 1s, representing all data in this format. Octal and Hexadecimal systems serve as a human-friendly shorthand for long binary numbers. Data storage is used to save this information in bits (0 or 1) or bytes (8 bits) format. Storage includes temporary Primary Storage (such as RAM) for active tasks and permanent Secondary Storage (like an SSD) for long-term storage. These systems enable countless applications in modern life. Key uses include education, banking, communication and healthcare. The type of application determines the kind of computer needed, but all rely on data representation and storage to function.

EXERCISE

1. Describe two key features and one everyday use of a tablet.
2. What is the primary function of a server and where are they typically located?
3. What is the main difference in design and use between a laptop and a desktop computer?
4. What does it mean for a storage device to be "volatile"? Which type of storage is volatile?
5. Why is it important to back up essential files? Mention one standard method for creating a backup.
6. Describe two ways computers are essential in modern banking and finance.
7. Decimal to Binary Conversion: Convert the number 53 to its binary equivalent. Show the steps used to find the answer.
8. Binary to Decimal Conversion: Convert the binary number 110101 to its equivalent decimal number. Show the steps used to find the answer.
9. Binary to Octal Conversion: Convert the binary number 11110 into its octal equivalent. Explain how you grouped the bits and if any padding was needed.
10. Binary to Hexadecimal Conversion: Convert the binary number 1011010 to its hexadecimal equivalent, explaining the process of grouping and padding.
11. **State whether true or false.**
 - (1) The binary number system uses ten digits (0-9).
 - (2) Primary storage is volatile, meaning it loses all its data when the computer is turned off.
 - (3) A desktop computer is designed to be portable and easily carried around.
 - (4) The computer that controls a smart washing machine is an example of an embedded system.
 - (5) A bit is a group of 8 bytes.
12. **Fill-in the blanks.**
 - (1) A computer is an electronic device that accepts _____ , processes data, stores results and produces output.
 - (2) The physical components of a computer like the keyboard and screen are referred to as _____.
 - (3) The _____ number system is often used as a shorthand for binary because one of its digits can represent a group of four bits.
 - (4) A group of 8 bits is known as a _____.
 - (5) A _____ is the type of computer best suited for complex tasks like weather forecasting.
13. **Multi-choice questions. Choose the most correct answer.**
 - (1) A collection of programs designed to perform various tasks on a computer is known as what?
(a) Hardware (b) Data (c) Software (d) Input

- (2) Which type of computer is designed to provide services or data to other computers called clients?
(a) Laptop (b) Supercomputer (c) Tablet (d) Server
- (3) What is the most important feature of a tablet, allowing for typing and navigation without a physical keyboard?
(a) Pointing device (b) Long battery life
(c) Touchscreen (d) Lightweight design
- (4) What is the name for a set of step-by-step instructions that tells a computer what to do?
(a) A program (b) Hardware (c) Data (d) A system
- (5) What is the decimal equivalent of the binary number 101 ?
(a) 3 (b) 4 (c) 5 (d) 6
- (6) To convert a binary number to its octal equivalent, the binary digits are grouped into sets of how many?
(a) Two (b) Three (c) Four (d) Eight
- (7) In data storage, what is a group of 8 bits called?
(a) A kilobyte (b) A bit (c) A byte (d) A gigabyte
- (8) The computer system found inside a smart washing machine or an ATM is an example of what?
(a) A supercomputer (b) An embedded system
(c) A server (d) A desktop computer
- (9) Weather forecasting by the Indian Meteorological Department (IMD) is a task performed by which type of computer?
(a) Server (b) Supercomputer
(c) Laptop (d) Mainframe Computer
- (10) Using smart classrooms and digital content for learning is an application of computers in which field?
(a) Education (b) Transportation
(c) Agriculture (d) Government Services

Laboratory Exercise

1. Open the Calculator application on your computer and switch it to "Programmer" mode.
 - Click on DEC (Decimal) and type in the number 50.
 - Write down the equivalent BIN (Binary), OCT (Octal), and HEX (Hexadecimal) numbers that the calculator displays.
2. Convert the binary number 11011 to its decimal equivalent.
3. Prepare a table which shows decimal numbers (0-15) in binary.
4. List three hardware components you can see or touch. Then, list three software programs or applications that are installed on your computer.
5. Assume one high-quality MP3 song is about 5 MB. How many such songs could you store on a 32 GB pen drive? (Hint: 1 GB is approximately 1,000 MB). Show your calculation.





Introduction to Operating System

Introduction

We have studied the fundamental components of the computer hardware including CPU, memory, storage and Input/output devices. These components together form the backbone of the modern computer systems. The main objective of the computer system is to make it functional so that users can perform their tasks. Hardware alone can not fulfill this purpose as working directly with the hardware is almost impossible for the common person due to its complexity. That is where the operating system comes into the way to make the system user friendly through bridging the gap between hardware and user. An operating system is a software that manages all the hardware and provides the environment to run user applications efficiently.

Operating system works as resource manager and manages the CPU, memory, storage and input/output devices very efficiently and runs the applications without any errors. Operating system is divided mainly in two components: Shell and Kernel. The shell provides the user interface through which user can interact with operating system by issuing the commands, if it is text-based. Modern operating systems also provide the GUI (Graphical User Interface) based interface where user can interact by clicking the mouse. The kernel is the core of the operating system which provides the necessary software modules for managing all the hardware resources and the applications.

Modern operating systems have evolved over the years where initially it was serial processing with lots of human intervention. The batch processing is the improved version which allows grouping the tasks in a batch and a whole batch is executed with little or no intervention. Multiprogramming allows multiple programs to reside in memory at a time and improves the CPU utilization. Finally, the evolution of the time-sharing operating systems allowing multiple users to interact simultaneously laid the foundation of the modern and contemporary operating systems. The types of operating systems depend on the hardware environment on which it works. Considering this we can categorize them into desktop operating systems, server operating systems and mobile operating systems. Finally, we will learn about the major functions of the operating systems.

This chapter discusses the fundamentals of the operating systems, its evolution and types, and functions in details with examples wherever necessary.

What is an Operating System?

An operating system is a software which acts as an interface between hardware and user i.e application programs. The primary objective of the operating systems is

- Provide an interface to the user for running their application programs in convenient fashion.
- Act as a resource manager who allocates the various resources to the application programs including CPU, memory, storage and I/O devices in efficient manner.

Let us understand the role of operating system with a simple example. Assume that a manufacturing unit uses a machine to produce some items. First thing is we need to provide the raw materials as input. Once the raw materials are loaded, we have to operate the machine following step-by-step instructions provided in their user manuals to convert raw materials to the desired items as output.

Who will carry out this step-by-step process? A person called machine operator is carrying out this process. These types of environment need human intervention at every point in process. Let us assume that machine is fully automatic where almost no human intervention is needed. In this case, the automation hardware and logic built inside performs all the steps. This not only makes it convenient to operate the machine but also works in very efficient manner. This automation inside the machine is just like an operating system in the computer systems.

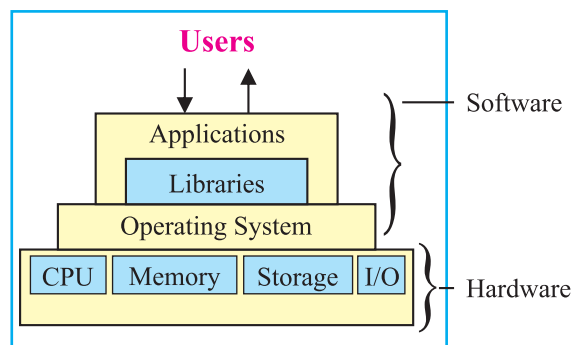


Figure 3.1 : Layered View of Computer System

Figure 3.1 shows the simplistic and layered view of the computer system divided into hardware and software layer. The hardware layer is the layer consists of CPU, memory, storage and I/O devices. The software layer further divided into operating system, libraries and application programs. The operating system hides the details of the hardware and allows the user to execute their application programs with the help of libraries. User runs their applications programs through the operating system and thus uses the hardware to carry out their tasks. User sends a request by clicking the mouse or providing input using keyboard to the application programs. Application programs in-turn internally use some library which sends request to the operating system and finally operating system activates necessary hardware to complete the request. The response will be sent to the user in reverse order and displayed on the screen. Hence, operating system plays a vital role in making use of the computer system very easy and convenient for the end users who even have no knowledge of the hardware.

Need of the Operating System

We know that any task on computer is ultimately performed by the hardware actions controlled and coordinated by the operating system. In absence of the operating system, one must have detailed knowledge of the hardware in order to perform any task which will limit the use of computer system by only expert users possessing the in-depth knowledge of hardware. That is where the need of the operating system arises. The operating system hides all the functional and circuit details of the hardware and allows user to perform the task by either writing programs or executing application programs. We can say that the operating systems have made the reach of the computers to common man by providing simple and human friendly interface and environment.

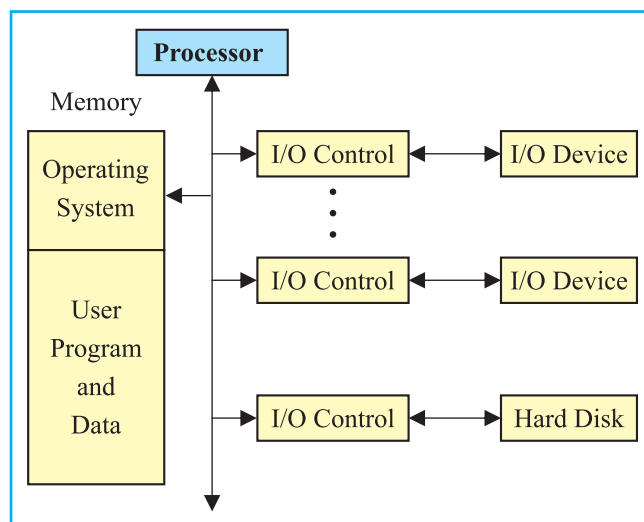


Figure 3.2 : Operating System as Resource Manager

The main job of the operating system, apart from providing interface, is to act as resource manager to ensure the efficient use of the hardware resource for executing the application programs. Figure 3.2 gives the detailed view of the operating system as resource manager.

Remember that operating system is also a software which executes on processor just like user programs or applications but the purpose is different. The main purpose is to provide the necessary environment for executing user programs by allocating necessary resource including processor, memory, storage and I/O devices. As shown in figure, some portion of the memory is occupied by the operating system and rest portion is used by the user programs and data. The portion of the operating system which remains in memory is its core or nucleus and known as kernel which provides all the services to manage the hardware for efficiently executing the user programs and applications. When computer system is started, kernel and other necessary functionalities of the operating system are loaded into memory, starts executing and provides interface to user to interact with the system. Once user program is loaded on request, execution control is transferred to the user program. After completing user program, control is regained by the operating system. Hence, control is switching between operating system and user programs or application as long as system is ON. We can say that at any time either part of operating system or user program is running. The operating system allocates the processor to the user program to execute and also allocates other resources dynamically for its execution. This makes the operating system a supervisor of the system which is used only in strict control of the operating system.

Components of Operating System

The operating system is mainly divided into two major components: Shell and Kernel. Let us discuss the role of both of them in overall working of the operating system.

Shell

We know that operating system provides the interface between user and hardware. The shell is the part of operating system which acts as user interface and directly interacts with the user. In other way, we can say shell is the face or voice of the operating system. It talks to you and listens what you want to do. It means it accepts the user request, pass it to the operating system where it is performed and produces the response which you can read. The shell can be either text-based or GUI (Graphical User Interface) based.

Most popular text-based operating system MS-DOS widely used on IBM-PCs earlier was using command-based interface. It is also called CLI (Command Line Interface). Once MS-DOS starts, it will display a prompt as

```
C:\>
```

That means, it is ready to accept the user commands. For example, following command lists the files and directories in current directory.

```
C:\>dir
```

After typing command “dir” on the prompt, once user presses the Enter key, the command is passed to the kernel for execution and the result i.e. list of files and directories will be listed on the screen and then command prompt displays again indicating control is returned back to operating system to receive the next input.

Modern operating systems like Microsoft Windows provides GUI based interface where user can interact with operating system using mouse clicks. By clicking a mouse on particular icon, operating system activates and requested task is performed. The results are displayed on the screen. In next chapter, we will get introduction of the Ubuntu operating system which supports both the types of shell interface, CLI and GUI. Normally, once you start Ubuntu, GUI interface is displayed. To start the command interface, you can switch to command prompt which will display separate window with text-based interface having the command prompt as above.

Kernel

The kernel is the core part of the operating system and it can be considered as brain of the operating system which handles all the important jobs inside the computer system. For example, when you start a new job, press a mouse button or enter data from keyboard, all of these are managed by kernel internally in smooth manner. The kernel directly communicates with all the hardware components of the computer system and ensuring smooth execution of user programs and applications. The kernel of the operating system manages the important tasks like executing the programs, managing the memory, manages the storage through file organization and handles the communication with I/O devices.

The command or request given by the user through the shell is passed to the kernel. The kernel fulfills the request by using the appropriate hardware components and completes the request and sends response back to user through the shell.

Evolution of Operating System

Modern operating systems that we use today are result of the development and innovation of many years. In initial years of computing, there were really no operating system and machines were used manually using switches and punch cards. Due to improvement in computer hardware, it was a need to use computers in faster and efficient way which resulted into gradual development of the operating systems. It evolved from serial processing to batch processing and then multiprogramming to time sharing systems. This section briefly discusses the evolution of operating systems.

Serial Processing

Early computers developed in 1940s and 1950s were having no operating systems and programmers were directly interacting with machines using toggle switches, display lights and printer. Program code in machine language was loaded using card reader. The errors during the execution were shown through lights and if completed normally, the output was sent to printer. The main problem of serial processing is scheduling i.e. in what fashion machine is accessible to programmers for executing their programs. One of the solutions is to create slots of 30 minutes. Each programmer can use the computer for 30 minutes when his/her turn comes. If programmer finishes earlier, time is wasted or if not finished in time, he/she will be in trouble. Another problem of this system is setup time. Once you get your slot, few minutes are wasted in setting up all the required things to execute the program. This method is called serial processing as users use system in serial fashion.

Batch Processing

Serial processing wastes the significant amount of processor time. Considering the high cost of the early computers, optimal utilization of the processor was important. Keeping this in mind, first batch operating system was developed by the General Motors in early 1950s for using on IBM 701 machine. Then it was refined and implemented for IBM 704 by many customers of the IBM. By the early 1960s, numbers of companies developed their own batch operating systems for their computer systems.

The basic idea of the batch operating system is that the monitor program which is the resident part of the operating system permanently resides in the memory. Rest of the memory is available for the user program and data. Programmers submit their program on card reader or tape to the operator. Operator creates the batch of these programs and put on the input device. These programs are executed one by one. Once the current program is completed, control is transferred back, monitor loads another program and transfer control to user program for its execution. Thus, control is switching between monitor and user program.

The problem of scheduling and setup time both are solved by monitor. The monitor schedules programs for execution one by one from the batch without intervention. These types of systems have two different modes of execution: user mode and kernel mode. A user program executes in user mode in which some areas of memory (area where monitor program resides) is restricted and some critical instructions are not executed. It is needed so that user program can not disturb the monitor program residing in memory. The monitor program executes in system mode known as kernel mode in which it can access restricted area of memory as well as can run privileged instructions. It is needed as operating system, monitor program here, acts as resource manager for all the hardware components and provides environment for executing user programs.

Multiprogramming

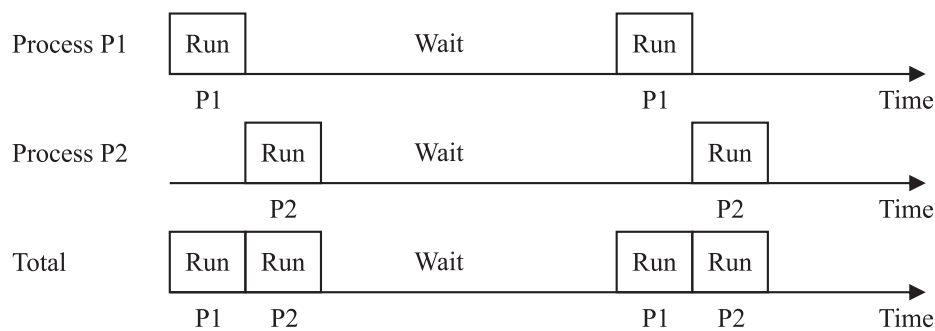
The batch programming solves the problem of automatic sequencing of the jobs or processes (program currently executing is called process). However due to the fact that I/O is much slower compared to processor, we can not use processor efficiently. The jobs are either CPU-intensive or I/O intensive or mix. The CPU-intensive jobs are most of the time performing computation with CPU while I/O intensive jobs are using I/O most of the time. When a process is busy with I/O, the processor remains idle and it results into the inefficiencies or we can say that processor utilization is not optimum. This is the characteristics of the uniprogramming i.e. only one job or process is running at a time.

In uniprogramming, the operating system occupies some portion of the memory and rest is used by the currently running process say P1. P1 executes for some time and then it requires to use I/O device, for example printer. While process P1 is using I/O, processor is idle and waiting for the I/O to finish so that it can resume the process P1. It is shown in figure 3.3. Once the process P1 finishes, monitor program removes it from memory and loads the next process and starts executing. This results into inefficient use of the processor.



Figure 3.3 : Execution in Uniprogramming System

Assume that we have sufficiently large amount of memory and we can load two programs i.e. processes in the user part of memory without overlapping each other. Let us assume initially process P1 starts executing and after some time it wants to use some I/O device like printer. While P1 is busy with the printer, monitor program switches to the process P2 and continue to execute the same until it needs I/O or completes. If process P2 starts using I/O, then processor resumes the process P1. This can continue until one of them completes when the monitor loads third process. This is shown in figure 3.4(a). We can extend the same concept for three or more processes provided sufficient memory is available. Figure 3.4(b) shows the execution of three processes. This concept of running two or more processes at a time is called multiprogramming.



(a) Two Processes

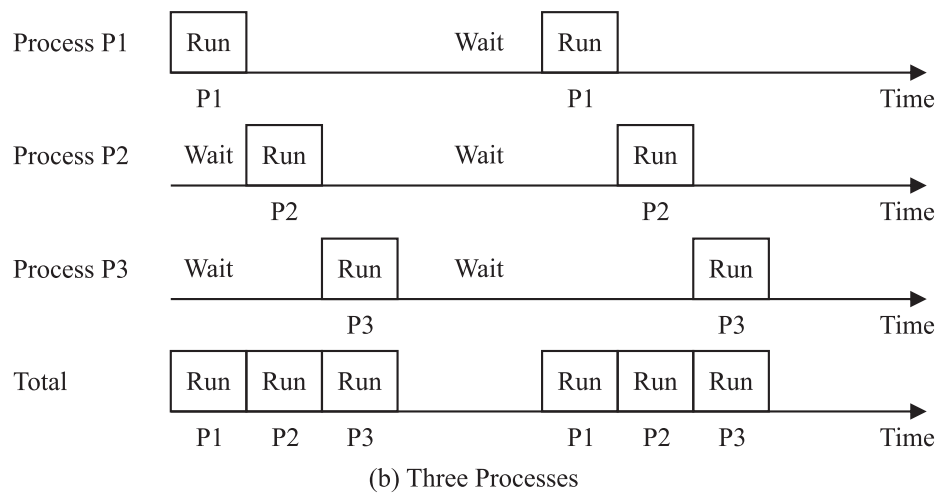


Figure 3.4 : Execution in Multiprogramming

The multiprogramming operating system throws new challenges. First challenge is the order in which processes are scheduling which is called scheduling policy. It may be purely first come first serve or based on other criteria like priority or the characteristics of the process itself. Second challenge is protecting one process from another for any accidental changes which needs sophisticated memory management and security mechanism. Third challenge is to avoid the conflict for using I/O devices. For example, while one process is using printer and another process demands the same as there is only one printer. Hence, the multiprogramming operating systems are on one side very sophisticated but on other side very complex. The modern operating systems follow the concept of multiprogramming in very efficient manner. Hence, we can say that modern operating systems are one of the examples of most complex software ever designed which is very sophisticated, dynamic and efficient.

Time Sharing

The batch processing with multiprogramming improves the processor utilization but users can not directly interact with their programs while programs are under execution. Modern software like transaction processing systems need to interact with program while executing. This led to development of the concept of time-sharing systems. That means we can use multiprogramming with time sharing for handling multiple interactive jobs.

The time-sharing multiprogramming system divide the processor time among the multiple processes. Each process runs for the fixed time slot called quantum in turn. Multiple users can interact with the system through terminals. For example, if there are N processes running simultaneously in interleaving manner with each process runs for $1/N$ time in time sharing manner. This allows N users simultaneously to interact with the system just like a dedicated personal computer as like desktop computers. MIT (Massachusetts Institute of Technology) developed first time sharing system called CTSS (Compatible Time-Sharing System) in 1961 for the IBM 709.

The primary objective of the batch processing multiprogramming systems is to improve the processor utilization whereas time sharing multiprogramming systems improve the response time in interactive systems. In batch processing the jobs are put into the bunch and controlled by the JBL (Job Controlled Language) while time sharing systems are controlled by providing commands at the terminal directly by user. The most popular multitasking (handling multiple programs at a time) provides the interactive environment using Shell for interactive users at the same time it also supports batch processing for background or noninteractive processes. Thus, combining the benefit of both processor utilization and response time with interactive environment.

Types of Operating Systems

Previous section discussed the evolution of the operating systems. Although basic concepts remain same, hardware of the computer systems decide what types of variation or changes are needed to customize the operating system for efficiently working on that hardware. The hardware of the computer systems varies depending on the purpose and use of the system. Apart from the hardware, the specific environment including the user needs also determines the types of the operating system. Considering all these facts we can broadly categorize the operating systems into following three categories.

- Desktop operating systems
- Server operating systems
- Mobile operating systems

Desktop Operating Systems

A desktop operating system is designed for personal computer environments mainly desktops and laptops. CP/M (Control Program for Microcomputers) was the first desktop operating system widely used in late 1970s and early 1980s. It was developed by Gary Kildall at Digital Research Inc. in 1974. It was targeted for systems based on 8-bit processor Intel 8080 or Zilog Z80. The main storage system was floppy disk and interface was text-based.

MS-DOS (Microsoft Disk Operating System) was the another most popular desktop operating system used on IBM-PC machines which was developed in 1981. The MS-DOS was text-based single tasking operating system which can be used by only one user at a time. It was providing support for file system for storing the various types of files used by the different applications. IBM-PC with DOS operating system was widely used for various applications for personal use as well as in office environments for word processing, spreadsheets and small databases. People were also using it for developing small and customized applications using programming languages like BASIC, C, Pascal, COBOL, FORTRAN, etc. In 1984, Apple introduced the Macintosh System Software which popularized the GUI (Graphical User Interface). In 1985, Microsoft released the Windows 1.0 with graphical user interface which worked as foundation for the modern Windows operating systems. Linux emerged as open-source alternative in 1990s providing powerful and customizable desktop environments.

Windows 11, macOS Ventura and Ubuntu Desktop are the latest examples of the desktop operating systems.

Following are the technical features of the desktop operating systems.

- Provides GUI interface with windows, icons, menus and mouse support
- Supports advance file systems with user permissions and encryption
- Multitasking support allowing multiple programs to run at a time and multiple users having their own login accounts
- Device driver management with automatic detection and hardware management with plug-and-play and updates
- Supports network protocols for connecting to Internet
- Support various peripheral devices like printers, scanners, webcams, audio/video devices etc.

- Additionally, provides powerful security feature, software installation and updates, system configuration and power management

Server Operating Systems

A server operating system is mainly designed to provide the services to the multiple clients over the networks with resource sharing among the clients. Examples of services are database services, file sharing, web hosting, authentication, virtualization and many more. The server operating systems provide highly reliable, scalable and secured multiuser support.

The server operating system started with use of the mainframe systems like UNIVAC and IBM's os/360. The multiuser multitasking operating system UNIX developed by the Bell lab in 1970s laid the foundation of the modern server operating systems. In 1980s UNIX variant like BSD became very popular in networked computing. Microsoft came with Windows NT server operating system in market in early 1990s with GUI based administration. Linux became the strong open-source alternative for server in 1991 with Red Hat and Debian. The late 1990s and early 2000s was time for the services like web hosting, emails and database which created demand for more robust server operating systems which resulted into following developments.

- Windows Server 2000/2003 with support of Active Directory and better integration with enterprise systems.
- Enterprise UNIX systems like Solaris, HP-UX and AIX for mission-critical workloads.
- Virtualization and cloud computing like VMware, AWS (Amazon Web Services), Microsoft Azure, Google clouds etc. further contributed in reshaping the server operating systems.
- Modern server operating systems like RHEL (Red Hat Enterprise Linux), Ubuntu Server and Windows Server 2022 are very secured, scalable and cloud-ready.

Following are the technical features of the server operating systems.

- Supports concurrent access by multiple users or clients over network
- Provides enterprise level file and storage management using advanced file systems
- Provides sophisticated backup and recovery in case of failures
- Advanced security features including user authentication, role-based access, encryption and firewall
- Resource monitoring and management for tracking the usage of CPU, memory, disk and network
- Scalability for more hardware and more servers
- Provides command-line and remote administration
- Background service for web, database access, DNS and mail service
- High performance and stability with 24x7 running with high workloads and less crashes
- Maintains system logs for monitoring and auditing
- Support for network management, cloud management, virtualization, package and update management, cluster and load balancing

Mobile Operating Systems

A mobile operating system is designed for smartphones and tablets. It is mainly designed for supporting low power requirement, touchscreen interface, mobile connectivity and sensor integration. Applications are running in sandbox environment to protect the resources and user privacy.

Palm OS developed in 1996 and Symbian in late 1990s were used in PDAs (Personal Digital Assistant) and early smartphones. Major change occurred in mobile operating systems with launch of iOS for iPhone by Apple in 2007. In 2008, Google launched the Android operating system which is most widely used today. It is open-source and supporting wide range of hardware. Both of these operating systems are continuously updated to match with the hardware updates and changing demand. iOS 18.5 and Android 16 are the latest versions of the mobile operating systems.

Following are the technical features of the mobile operating systems.

- Touchscreen interface with gesture making it very user friendly
- Power efficient with sleep mode and settings
- Built-in connectivity for Wi-Fi, Bluetooth, Mobile networks, GPS etc.
- Multimedia support with audio/video, streaming and smart accessories
- Multitasking support with multiple applications running at a time and switching between them
- Built-in voice assistance with Siri on iOS and Google Assistant on Android
- Accessibility features including speech-to-text, voice control, screen magnifiers etc.
- Applications are running in sandbox model preventing application to interfere with other apps or system
- Security and privacy with app permissions, biometric, encryption and sandboxing
- Notification system, Support for apps through store, sensor integration, device compatibility, over-the-air (OTA) updates

Functions of Operating system

An operating system performs many functions to keep computer running smoothly and providing the proper environment for running the user applications. This section discusses the most important and common functions of the operating systems.

User Interface

User interface provides the way to users to interact with computer systems. It is either CLI (Command Line Interface) or GUI (Graphical User Interface). Users can issue the commands or instruct the operating system for executing the task or performing operations like deleting a file, copying a file etc. Windows desktop screen or Linux terminal/DOS prompt are the examples of interface. For example, issuing '`ls -l`' command on Linux terminal or clicking an icon on Windows desktop are example of interaction. We have already learn that Shell component of the operating system is responsible for providing the user interface.

Process Management

Modern operating systems are multitasking means they allow multiple programs to run simultaneously. Program under execution is called a process. Multiple programs running means operating system needs to manage multiple processes and ensure that all of them gets processor time to execute in fair and efficient manner. Operating system should quickly switch from one process to another as user switch from one application to another. Operating system needs to manage all the details for the running processes using very efficient data structures. In addition, process management manages the life cycles of each process with current status of each process from start to end. The various status includes

- **New:** Process is prepared to load in memory
- **Ready:** waiting in queue but ready to execute if processor time is given
- **Running:** currently executing on processor
- **Blocked:** not able to proceed as waiting for I/O device which is not available
- **Exit:** Completed the execution.

Process management uses very sophisticated and efficient algorithms to manage the process life cycle for interactive users.

Process Scheduling

Multitasking system also shares the processor time with all the ready processes. The scheduling is the policy for assigning processor for execution to one of the ready process. The scheduler selects one of the process from the ready queue and assign it to the processor whenever processor is free. Modern operating systems use time sharing policy known as Round Robin. The processor time is divided into small equal size quantum q and a process when scheduled runs for maximum q time. If it does not finish in that time, it leaves the processor and next process is assigned to processor by scheduler. The outgoing process joins the ready queue and waits for its next turn during which it resumes from the point where it left. This ensures that all the processes are given fair chance and, in each turn, they proceed further and eventually completes. Practically, the scheduling is much more complex phenomena than described as it involve many parameters including process priority, characteristics of the process, user or system process and many more.

Memory Management

Operating system needs to keep track of total memory available for the user programs and data as well as system needs. Whenever a new program or application started, it provides the memory to the new process from the available memory without disturbing the other processes. It maintains the details of which process is allocated how much memory at which locations and updates the details whenever new process is loaded or removed or additional memory is demanded by any process. Modern operating systems are using very sophisticated virtual memory management techniques to allow many and large processes to run with limited memory.

File Management

Dealing with files and folders is very common when we use the computers. We perform various operations like create, open, close, delete, move, copy on files and folders. File management is responsible for all these operations. We are using Windows Explorer to manage our files and folders on Windows operating systems. You will find very similar hierarchical directory structure in Ubuntu Linux also. These are examples of the file management. File management uses very sophisticated file systems to manage files and folders on the storage media like disk and pen drives. Windows file systems FAT32, NTFS, Linux file system ext4 and macOS file system APFS (Apple File System) are examples of latest file systems.

Device Management

I/O devices are integral part of the computer systems which include keyboard, mouse, hard disks, DVDs, monitors, printers, scanners etc. These devices are shared among the processes running on the system. Device management plays key role in controlling these devices and communicating with them. It is likely that systems have only one printer and it is demanded by two processes which are active in system. How to resolve this issue so that both the processes can print their content one by one without mixing? It is managed by device management together with process management in efficient manner.

Security and Access Control

Multiuser multitasking operating systems provide various level of protection and security. The user can access the systems using their login accounts only. File and directory access is governed by file and directory permissions. The resident portion of the operating system and one process from another process are protected by protection rules and privilege levels. Device access is also strictly governed by protection rules. Hence, at every level protection and security mechanism ensures the integrity of the system and protects from any unauthorized access and accidental changes.

Summary

The chapter begins by revisiting the fundamental components of computer hardware - CPU, memory, storage, and I/O devices - which together enable a functional computer system. However, interacting directly with hardware is complex, making operating systems essential. The operating system acts as a bridge between hardware and users, offering a user-friendly environment for running applications efficiently. The operating system functions as a resource manager managing the CPU, memory, storage, and I/O devices to ensure smooth application execution. It has two core components: the shell, which provides user interaction through command-line or graphical user interface, and the kernel, which manages hardware and system resources.

The chapter then explores the evolution of operating systems from manual serial processing to automated batch systems, multiprogramming for better CPU use, and finally to time-sharing systems that allow simultaneous multi-user interaction. Modern operating systems are categorized based on their hardware environments: desktop, server and mobile operating systems. The chapter also covers the major functions of an operating system such as process management, scheduling, memory management, file management, device management and security and access control with relevant examples.

EXERCISE

1. What is an operating system? List the purpose of the operating system.
2. Describe the layered architecture of the computer system and give the role of the operating system.
3. Why do we say operating system is a resource manager?
4. What is Shell? Give its purpose and use.
5. What is kernel? What are its important functions?
6. What is multiprogramming? What are its benefits?
7. How does time-sharing operating system work?
8. Compare the desktop and server operating systems.
9. List the technical features of the server operating system.
10. List major functions of the operating system.

11. State whether true or false.

- (1) Shell is the interface of the operating system.
- (2) Touch screen is the interface of mobile operating systems.
- (3) Kernel of the operating system directly communicates to the hardware.
- (4) Time-sharing systems improve the response time.
- (5) MS-DOS is mobile operating system.

12. Fill-in the blanks.

- (1) _____ operating system is used for sharing resource over network.
- (2) Connectivity is the main feature of _____ operating systems.
- (3) DOS stands for _____
- (4) _____ assigns the processor to the next process.
- (5) _____ and _____ popular mobile operating systems.

13. Multi choice questions. Choose the most correct answer.

- (1) What is the major purpose of the operating system?
 - (a) Providing user interface
 - (b) Acting as resource manager
 - (c) Both A and B
 - (d) Keeping computer busy all the time
- (2) Which of the following OS provides only text-based interface?
 - (a) MS-DOS
 - (b) Ubuntu Desktop
 - (c) Windows 11
 - (d) Linux

- (3) Which of the following operating system is designed for providing services to multiple clients?
(a) Mobile OS (b) Server OS (c) Desktop OS (d) Android OS
- (4) The main feature of the mobile operating system is
(a) Services to multiple clients (b) Personal use for executing programs
(c) Communication (d) Scalability
- (5) Which of the following is not the function of kernel?
(a) Allocating memory to process (b) Communication with I/O devices
(c) Process scheduling (d) User Interface
- (6) Which of the file system is used on Apple machines?
(a) APFS (b) ext4 (c) NTFS (d) FAT32
- (7) File access is part of function.
(a) Process management (b) Memory management
(c) File management (d) Security and access control
- (8) operating system provides clustering and load balancing.
(a) Mobile (b) Desktop (c) Server (d) MS-DOS
- (9) Purpose of batch processing is to...
(a) Improve the processor utilization (b) Improve the response time
(c) Both A and B (d) Faster exaction
- (10) Which of the following concept divide the processor time among the processes?
(a) Interactive workload (b) Multiprogramming
(c) Time sharing (d) Process management





Introduction to Ubuntu

Introduction

As discussed in the previous chapter, an operating system (OS) is a system software that manages the hardware and software resources of a computer and provides a common platform to run various computer programs. It acts as an intermediary between the user and the computer hardware, enabling users to interact with the computer and run applications. In this chapter, we will learn about a very popular operating system, named Ubuntu. The word Ubuntu in Southern African philosophy means “humanity to others”. With the goal of providing access to computer technology to everyone, the Ubuntu operating system was first released in 2004. Since then Ubuntu has emerged as a very popular open source, free to use operating system. In this chapter, we will learn about the basic functionalities of the Ubuntu operating system.

Some Popular Operating Systems

Before discussing the Ubuntu operating system in detail, let us have a quick overview of some popular operating systems.

microsoft Windows

microsoft Windows is a widely used operating system developed by Microsoft, known for its user-friendly graphical interface. It supports a broad range of applications, hardware, and devices, making it popular in homes, businesses, and educational institutions. Windows offers features like multitasking, file and folder management, system security, networking, and regular updates. It includes tools like File Explorer, Task Manager, and Control Panel for easy system navigation and control.

macOS

macOS is Apple's proprietary operating system for Mac computers, known for its sleek design, stability, and strong integration with Apple hardware and software. Built on a Unix-based foundation, it offers high performance, security, and reliability. The user interface is intuitive, featuring the Dock, Finder, and Mission Control for efficient navigation and multitasking. MacOS supports a wide range of applications, including productivity, creativity and development tools. MacOS provides seamless integration with other Apple devices through features like Handoff, AirDrop, and iCloud which enhances overall user experience.

Linux

Unlike Windows and macOS which are commercially available operating systems, Linux is a free, open source operating system. Following the philosophy of the Unix operating system, Linux provides high performance, security, reliability and portability. It provides a Command Line Interface (CLI) along with an impressive Graphical User Interface (GUI) which makes it very user-friendly. A major advantage of Linux is that it provides the complete freedom to customize and configure as per the user's choice. Linux also provides excellent interoperability with Microsoft Windows. We can easily access the Windows file system from the Linux environment. The office suites on Linux OpenOffice and LibreOffice provide good interoperability with the Microsoft Office suite.

Linux has many flavours, known as distributions, which are designed for different needs. RedHat and Debian are two major Linux distributions which offer great stability and are ideal for servers. Over the years many different Linux variants like Fedora, CentOS, Kali, etc. have emerged. Ubuntu is one of the fastest growing Linux distributions.

Ubuntu

The Ubuntu operating system is free to download, use, and modify, which makes it particularly appealing for students, developers, educational institutions, and startups. Ubuntu is a gateway into the Linux ecosystem and open-source world. It empowers users with a free, customizable, secure, and powerful computing environment. Ubuntu comes pre-packaged with essential software such as a web browser (Firefox), email client (Thunderbird), office suite (LibreOffice), media player, and more. Additional software can be easily installed through its Software Center or via command-line tools like Advanced Package Tool (APT).

Basic Terminology related to Ubuntu

Table 4.1 summarizes some basic terminology which we will use to discuss Ubuntu Operating system.

Term	Meaning
Ubuntu	A user-friendly Linux distribution developed by Canonical Ltd.
Kernel	The core of the operating system that manages hardware and system processes.
Terminal	A command-line interface used to execute commands.
Shell	The program that interprets and runs commands typed into the terminal (e.g., Bash).
Desktop Environment (DE)	Graphical interface including panels, windows, icons, etc. (e.g., GNOME, KDE, XFCE).
Launcher / Dock	The panel or bar that gives access to favourite applications.
Package	A bundle containing a program and metadata needed for installation.
Repository (Repo)	A server or database where Ubuntu software packages are stored.
Root	The superuser account with full administrative privileges.
Sudo	Stands for “superuser do”; allows a permitted user to run administrative commands.
Permissions	Rules that determine who can read, write, or execute a file or directory.

Table 4.1 : Basic Terminology

Working with Ubuntu Linux

Ubuntu Linux has a very user-friendly Graphical Interface and a very useful Command Line Interface through which users can run various programs, create files and manage directories. Being a secured operating system Ubuntu allows us to create a username and password through which we can protect the access to the system. At the start, Ubuntu greets with the login screen similar to the one shown in Figure 4.1.



Figure 4.1 : Ubuntu Login Screen

Ubuntu User types

Ubuntu has predefined types of users who have different access privileges. The different Ubuntu user types are summarized in table 4.2. Every Ubuntu user belongs to a specific group.

User Type	Tasks
Root User (Superuser)	Username: root Permissions: Full access to all commands and files on the system. Typical Use: System administration tasks such as installing packages, managing users, changing critical system settings. Note: In Ubuntu, direct login as root is disabled by default for security reasons. Instead, users gain root privileges using the <i>sudo</i> command.
Sudo User	Permissions: Regular user with administrative privileges via <i>sudo</i> . Typical Use: Can perform administrative tasks by prefacing commands with <i>sudo</i> , e.g., <i>sudo apt update</i> .
Regular User	Permissions: Limited to their own home directory and certain allowed system-wide read access. Typical Use: Daily usage such as running applications, editing personal files, browsing the web, and compiling programs in user space. Examples: Created during installation or by administrators for other users.
System Users	Purpose: Used by system services and daemons (background processes). Characteristics: No login shell (/usr/sbin/nologin or /bin/false), typically have UID < 1000. Examples: www-data (used by web servers like Apache), mysql (used by MySQL server), daemon, syslog.
Guest User (if enabled)	Permissions: Very limited, temporary user with no access to system settings or permanent file storage. Typical Use: Temporary access for someone who needs to use the system without affecting it. Note: Disabled by default in newer Ubuntu versions due to security concerns.

Table 4.2 : Ubuntu User types

Usually, we access the Ubuntu operating system as a regular user. A regular user can create files and run application programs. To perform daily office work like making new documents, listening to music, playing games, or browsing the Internet, we need to login as a regular user.

Ubuntu Directory Structure

Once we login to the Ubuntu system we get access to the file and directories stored in the system. The overall directory structure of Ubuntu is shown in figure 4.2. Note that, the subdirectories shown in the figure 4.2 are not a comprehensive list of all Ubuntu subdirectories, but it should be sufficient to understand the overall directory structure.

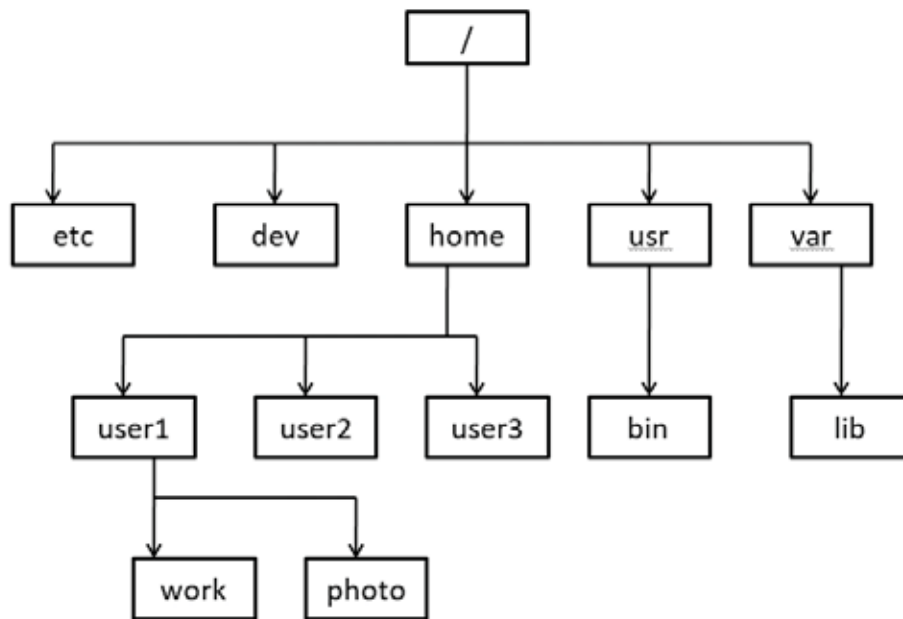


Figure 4.2 : Ubuntu Directory Structure

As shown in the figure 4.2, Ubuntu uses a hierarchical directory structure that starts from the root directory (/). Each directory under / serves a specific purpose. */home* directory stores subdirectories specific to 'regular users' of the system, e.g. *user1*, *user2* and *user3* are directories of regular users *user1*, *user2* and *user3*, respectively. Table 4.3 summarizes the purpose of directories shown in Figure 4.2

Directory Name	Purpose
<i>/etc</i>	Contains system-wide configuration files and shell scripts. Example: • <i>/etc/passwd</i> – user account information • <i>/etc/hostname</i> – name of the system
<i>/dev</i>	Contains special device files representing hardware. Example: • <i>/dev/sda1</i> – first partition of the first hard disk • <i>/dev/null</i> – null device
<i>/home</i>	Contains personal directories for users. Example: • <i>/home/user1</i> – home directory for user "user1" • <i>/home/user/Documents</i> – personal documents

<i>/usr</i>	Secondary hierarchy for read-only user data and programs. Contains many subdirectories: • <i>/usr/bin</i> – non-essential user binaries (e.g., firefox) • <i>/usr/lib</i> – libraries • <i>/usr/share</i> – shared data
<i>/var</i>	Contains files that change frequently (logs, spool files). Example: • <i>/var/log/syslog</i> – system log • <i>/var/mail/username</i> – user mailbox

Table 4.3 : Some Useful Ubuntu Directories

Ubuntu Desktop Interface

Once we successfully login to the Ubuntu operating system, its graphical interface, known as Desktop Environment (DE), provides a graphical way to access various files, directories and programs. The Ubuntu operating system allows users to choose from multiple desktop environments. GNOME and KDE are two most popular DEs available in not just Ubuntu but almost all Linux distributions. Here, we will discuss the GNOME desktop environment.

GNOME Desktop

GNOME (GNU Network Object Model Environment) is a free, open-source desktop environment used by default in Ubuntu and many other Linux distributions. Designed for simplicity and ease of use, GNOME provides a clean, modern interface with intuitive navigation, minimal distractions, and strong accessibility support. It includes a suite of core applications like Files, Terminal, Settings, and GNOME Software. Figure 4.3 shows a typical GNOME desktop screen. GNOME uses a minimalist approach, avoiding desktop clutter and emphasizing keyboard shortcuts and gestures for navigation. It supports extensions for customization, allowing users to tailor the desktop to their preferences.

The GNOME desktop environment emphasizes productivity through features like activity overview, dynamic workspaces, and keyboard shortcuts. As shown in the figure 4.3, the core GNOME Shell includes a top bar, which includes *activities*, *notification* and *system menu*. The left side panel of the interface is known as *Dash* (also referred as *Dock*) which provides access to various applications. The central area is used to display files and directories. As we can see in figure 4.3, the home directory is visible on the desktop by default. We can access the files stored in the home directory by clicking on it. We can also create other directories and files, and place them on the Desktop along with the home directory.

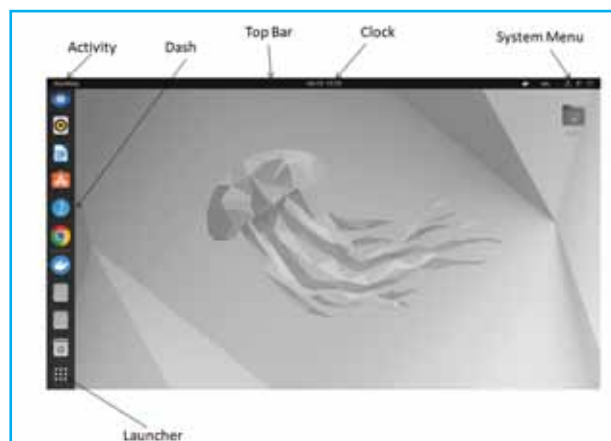


Figure 4.3 : Ubuntu GNOME Desktop

The common components of GNOME desktop are as follows,

Top Bar: As the name suggests, the top bar is located at the top of the desktop. It includes the following components,

- **Activities:** One of GNOME's key features is the *Activities Overview*, accessed by clicking *Activities* or pressing the Super (Windows) key. This view displays all open windows, virtual workspaces, and a search bar that allows quick access to applications, files, and settings. Figure 4.4 shows activity overview on a typical Ubuntu desktop.

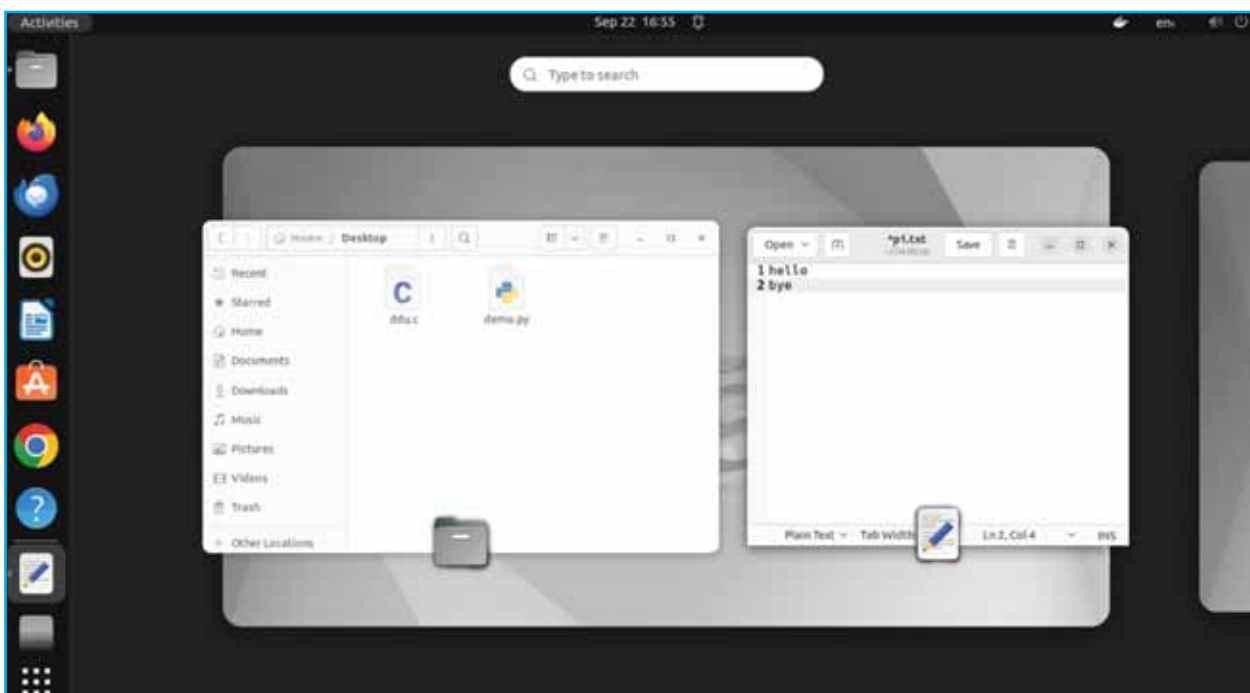


Figure 4.4 : Ubuntu Activity Overview

- **Notifications:** The center part of the top bar shows a clock. By clicking on the clock, we can see the current date, a month-by-month calendar, a list of upcoming appointments and new notifications. We can access the date and time settings and open the calendar application directly from the menu.
- **System Menu:** The top right corner of the top bar shows the system menu. By clicking on the system menu we can access some basic system settings. We can set audio, WiFi, Bluetooth etc features from the system menu. Figure 4.5 shows an expanded view of the system menu. The top part of the menu shows volume control, the battery status (in case of laptop), and buttons to launch Settings. The button allows you to suspend or power off the computer. Sliders allow you to control the sound volume or screen brightness.

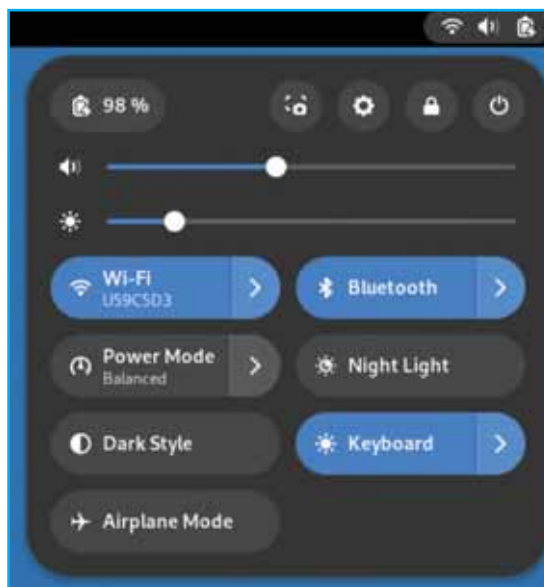


Figure 4.5 : Gnome System Menu

We can open multiple instances of the GNOME files as shown in Figure 4.8. In figure 4.8, the left side interface shows */Home/Pictures* directory and the right side interface shows */Home* directory (We can read the path at the top). Now let us move a file from */Home/Pictures* directory (Left Window) to *Home* directory (Right Window). In order to do this, we will first hover the mouse over the file which we want to move (*Ubuntul.png* in the figure). We click on the file and drag the mouse towards the right side window.

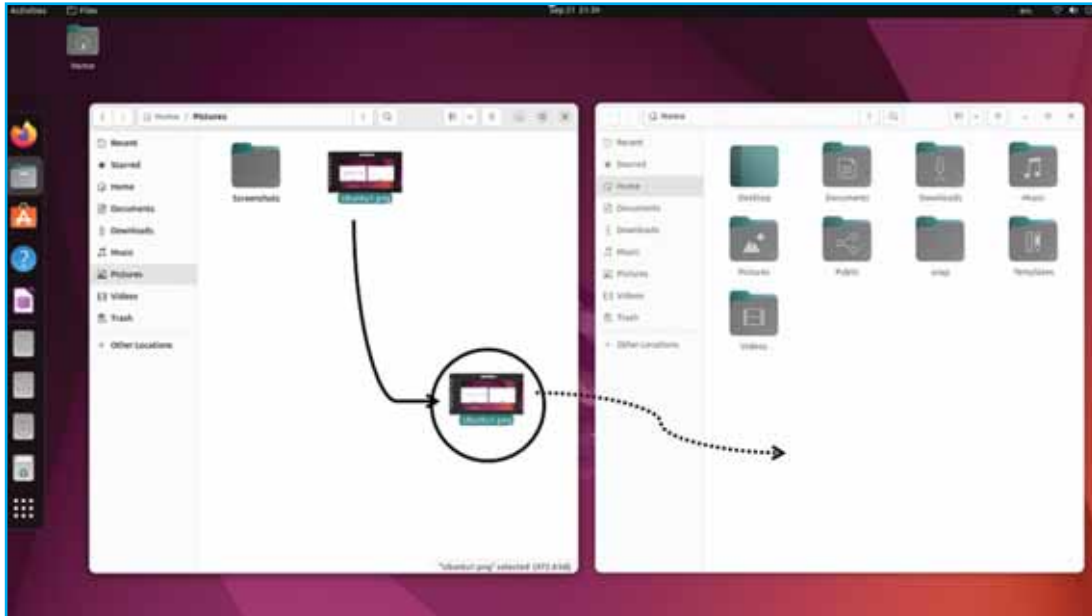


Figure 4.8 : Dragging the File from the Left Side Window

The file icon will also move along the mouse pointer. Once we reach the right side window (“Home directory”) we release the mouse and the file will be moved to the “Home directory” as shown in the figure 4.9.

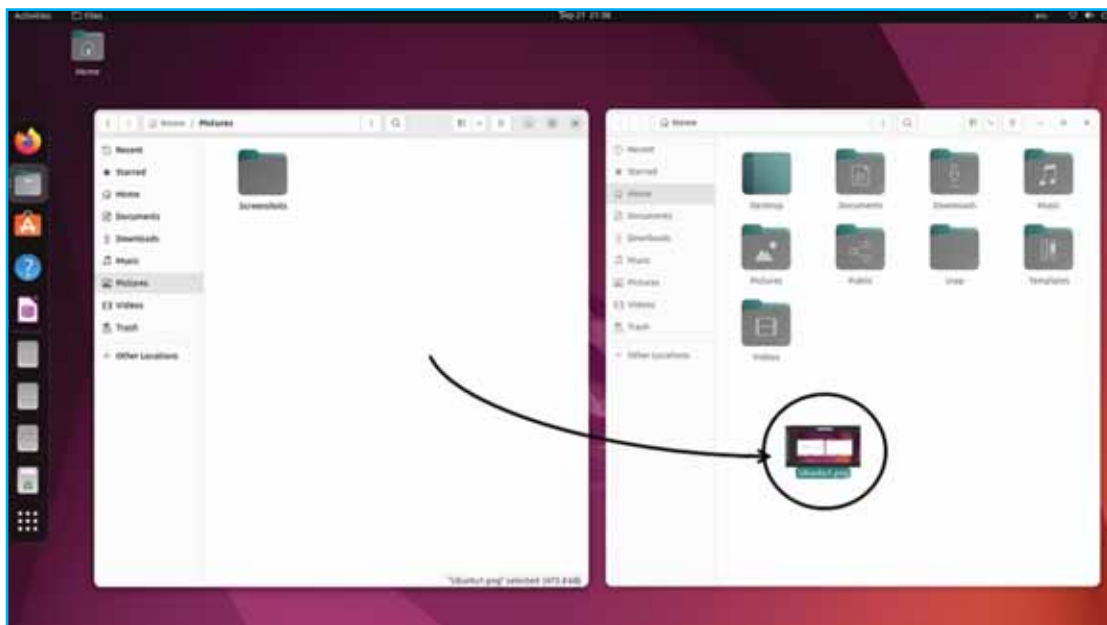


Figure 4.9 : Dropping the File in the Right Side Window

We will learn about GNOME file manager in more detail in the next chapter.

Command-Line Interface (Terminal)

We have seen how we can use Graphical Interface to perform various file operations, however the real power of Linux comes through its command line interface. Linux based operating systems are known for very powerful command line interfaces, and Ubuntu is not an exception. Almost all tasks which we can perform through Graphical Interface, can also be performed very efficiently through Command Line Interface (CLI).

The Ubuntu shell is a command line interface that allows users to interact with the operating system. It typically uses Bash (Bourne Again SHell) as the default shell. The terminal is the graphical application that provides access to the shell. Users can run commands to manage files, install software, configure the system, and automate tasks. The shell supports powerful scripting and text processing capabilities. It's essential for developers, system administrators, and advanced users. With tools like apt, grep, chmod, and more, the Ubuntu shell and terminal offer efficient control and customization beyond what graphical interfaces can provide.

We can access the shell by clicking on the terminal icon in the launcher. The CLI will appear as shown in the figure 4.10. Inside the terminal window, we see a text string ending with \$. It is known as the prompt. (The text before the \$ indicates user name followed by system information.) We can supply shell commands after \$. The command will be processed by the operating system and corresponding output will be generated.

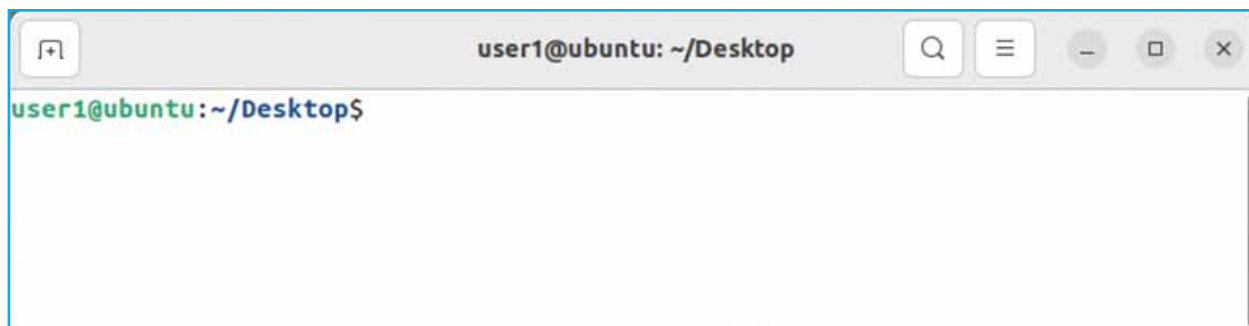


Figure 4.10 : Ubuntu Command Line Interface (Bash terminal)

File management Commands

ls: Listing files in a directory

The *ls* command in Ubuntu lists directory contents. It displays files and folders within the specified path. Common options include *-l* for detailed info, *-a* to show hidden files, and *-h* for human-readable sizes. It helps users navigate and manage files efficiently from the command line interface. Figure 4.11 shows the output of *ls* and *ls -l* commands. The *ls* command simply lists the file names, while *ls -l* command provides detailed information about the file.

```

user1@ubuntu: ~
user1@ubuntu:~$ ls
a.out      Documents  eclipse-workspace  IdeaProjects  Pictures  Templates
demo       dosprog    first.c            JaspersoftWorkspace  Public    test
Desktop    Downloads  hello              Music          snap      Videos
user1@ubuntu:~$ ls -l
total 96
-rwxrwxr-x 1 user1 user1 15960 Jul  4 12:10 a.out
drwxrwxr-x 2 user1 user1  4096 Jul  4 11:11 demo
drwxr-xr-x 5 user1 user1  4096 Jul  4 12:40 Desktop
drwxr-xr-x 3 user1 user1  4096 Jun 11 17:18 Documents
drwxrwxr-x 6 user1 user1  4096 Dec 12  2024 dosprog
drwxr-xr-x 3 user1 user1  4096 Jun 30 12:50 Downloads
drwxrwxr-x 4 user1 user1  4096 Dec  7  2024 eclipse-workspace
-rw-rw-r-- 1 user1 user1   186 Jul  4 12:10 first.c
-rwxrwxr-x 1 user1 user1 15960 Jul  4 12:04 hello
drwxrwxr-x 3 user1 user1  4096 Apr 24  2024 IdeaProjects
drwxrwxr-x 4 user1 user1  4096 Apr 25  2024 JaspersoftWorkspace
drwxr-xr-x 2 user1 user1  4096 Apr 23  2024 Music
drwxr-xr-x 4 user1 user1  4096 Jun 30 13:37 Pictures
drwxr-xr-x 3 user1 user1  4096 Feb 19 16:04 Public
drwx----- 13 user1 user1  4096 Jun 30 12:47 snap
drwxr-xr-x 2 user1 user1  4096 Apr 23  2024 Templates
drwxrwxr-x 2 user1 user1  4096 Jun 23 12:12 test
drwxr-xr-x 2 user1 user1  4096 Apr 23  2024 Videos
user1@ubuntu:~$

```

Figure 4.11 : ls and ls -l Command Output

The output structure of *ls -l* command is structured as shown in the table 4.4.

File Type and Permission	Number of hardlinks to the file	Owner Name	Group Name	File size	Date of modification	Name of the file
-rwxr-xr--	1	user	group	1234	Jun 9 12:00	filename

Table 4.4 : ls -l Command Output Structure

File type and permission is a 10 letter string. The first letter can be either '-' or 'd', d indicates directory and '-' indicates file. The next nine letters are 3 groups of 3 letters each, 'rwx'. Here, r = read, w=write, and x= execute. It indicates file permission. The first three letters 'rwx' indicate permission for the user, i.e. the user can read, write and execute the file. The second three letters 'r-x' indicate that the group can read and execute the file, but cannot write as 'w' is absent. The last three letters 'r - -' indicate that users other than the owner can read the file but cannot write or execute the file.

Number of hardlinks to the file indicates how many copies of the file exist on the hard disk. For every file created on the Ubuntu system there is a defined Owner and Group. The user who creates the file is the default owner of the file. The group which the owner belongs to, is the group of the file.

File size indicates how many bytes the file occupies on the hard disk.

Date of modification indicates the last modified date of the file.

touch: Creating a new file

The *touch* command in Ubuntu is used to create a new empty file or update the access and modification timestamps of existing files without changing their content on the terminal. We can type the following command to create a text file named *example.txt*.

```
$touch example.txt
```

mkdir: Creating a new directory

The *mkdir* command creates new directories. Users can specify the name and optional path, like *mkdir new_folder*. To create parent directories automatically, use *mkdir -p path/to/folder*. It's useful for organizing files and structuring projects within the filesystem directly from the command line.

For example the following command will create a new directory named *Projects* under the current directory,

```
$mkdir Projects
```

The following command will create a new directory named *Project1* under the parent directory *Projects*.

```
$mkdir -p Projects/Project1
```

The *mkdir* command is useful for organizing files and setting up folder structures.

cd: Changing the working directory

The *cd* (change directory) command in Ubuntu is used to navigate between directories in the terminal. It allows users to move to a different directory to access or manage files. For example,

```
$cd Documents
```

changes the current directory to the *Documents* folder within the user's home directory.

To move back one level, we can use,

```
$cd ..
```

and to return to the home directory, use

```
$cd ~
```

We can directly go to a specific directory (etc in the below example) by giving the following command.

```
$cd /etc
```

rm: Removing (Deleting) a file or directory

The *rm* command in Ubuntu is used to delete files and directories from the file system. For example, the following command will delete the file named *abc.txt*

```
$rm abc.txt
```

We can delete multiple files by writing their names sequentially. For example, the following command will delete two files named *file1.txt* and *file2.txt*

```
$rm file1.txt file2.txt
```

We can also delete a directory and all files and subdirectories under it as shown in the following command.

```
$rm -r mydir
```

In the above command, the option *'-r'* indicates that all subdirectories and files under the directory *'mydir'* will be deleted.

cp: Copy file from one location to another

The *cp* command is used to copy files and directories. It allows users to duplicate content from one location to another. For example, the following command copies a file named *file.txt* to a new file named *backup.txt*.

```
$cp file.txt backup.txt
```

To copy a file to a particular directory, we can supply the following command.

```
$cp file.txt /home/user/Documents/
```

The above command will create a copy of the file named *file.txt* under the directory */home/user/Documents/*

We can also copy the content of a directory to another directory by supplying the following command.

```
$cp -r folder1 folder2
```

mv: Moving a file from one location to another

The *mv* command is used to move or rename files and directories. For example, we can move a file name *abc.txt* to the directory */home/user/Documents/* by supplying the following command,

```
$mv file.txt /home/user/Documents/
```

Here note an important distinction between the *mv* and *cp* commands. As the name suggests, *cp* command creates a new copy of the file with the same content. On the other hand, the *mv* command moves the file from one directory to another. In other words, *cp* command is used to create multiple copies of the same file, while *mv* command is used to move files from one directory to another without creating multiple copies.

We can also move and rename a directory as shown in the following command.

```
$mv myfolder /home/user/Projects/newfolder
```

The above command will move the directory named *myfolder* to the directory */home/user/Projects* and rename it to *newfolder*.

Figure 4.12 shows output of the above commands on a linux terminal.



```
user1@ubuntu: ~/test
user1@ubuntu:~/Desktop$ cd
user1@ubuntu:~$ mkdir test
user1@ubuntu:~$ cd test
user1@ubuntu:~/test$ touch testfile
user1@ubuntu:~/test$ ls
testfile
user1@ubuntu:~/test$ touch testfile2
user1@ubuntu:~/test$ cp testfile testfile2
user1@ubuntu:~/test$ ls
testfile testfile2
user1@ubuntu:~/test$ mv testfile testfile1
user1@ubuntu:~/test$ ls
testfile1 testfile2
user1@ubuntu:~/test$ rm testfile1
user1@ubuntu:~/test$ ls
testfile2
user1@ubuntu:~/test$
```

Figure 4.12 : File Management Commands on Linux Terminal

Apart from the above file management commands, there are some other useful commands which will be useful in day to day working. These commands are summarized in table 4.5.

Comand	Use
<i>man</i>	opens the manual for a command. Example: <i>\$man ls</i>
<i>who</i>	displays information about users who are currently logged in to the system Example: <i>\$who</i>
<i>date</i>	display and set the system date and time. Example: <i>\$date</i>
<i>pwd</i>	Displays the current working directory. Example: <i>\$/home/user1</i>
<i>cat</i>	Displays the contents of a file. Example: <i>\$catfile.txt</i>
<i>chown</i>	Changes the owner and/or group of a file or directory. Example: <i>\$chown user:group filename</i>
<i>chmod</i>	Modifies the permissions (read, write, execute) for user, group, and others on a file or directory. Example: <i>\$chmod 755 filename</i>
<i>chgrp</i>	Changes the group ownership of a file or directory. Example: <i>\$chgrp groupname filename</i>

Table 4.5 : Useful Ubuntu Linux Commands

Summary

Ubuntu is a freely available operating system compatible with most of the modern day processors. Ubuntu is derived from Debian Linux and is widely used amongst students and researchers. Ubuntu provides a powerful command line interface along with Graphical user interface, which makes it very user friendly and provides full control to the end user. Ubuntu comes with a very powerful User Interface, GNOME, through which we can access various applications, create files and manage directories. Ubuntu also has a very strong Command Line Interface. The Ubuntu terminal provides access to bash shell, through which we can manage files and directories by applying commands.

EXERCISE

1. Explain the functionalities of Ubuntu File manager.
2. Compare Ubuntu with Windows operating system.
3. What makes Ubuntu a useful operating system for students and researchers?
4. Which functionalities can be accessed through the top bar in GNOME desktop IDE?
5. What is Shell? Which is the default shell available with Ubuntu?
6. Which Linux flavour is Ubuntu based on?
7. What is the use of ls command?
8. What is the role of root user in Ubuntu?
9. Which are the different types of users in Ubuntu?
10. Explain different ways to create a new directory in Ubuntu.
11. **State whether true or false.**
 - (1) Windows operating system is freely available.
 - (2) Ubuntu operating system is based on MacOS.
 - (3) Sudo command is used to perform administrative tasks in Ubuntu.
 - (4) Touch command is used to create a new file.
 - (5) Ubuntu does not allow root user login.
12. **Fill-in the blanks.**
 - (1) Ubuntu is _____ and _____ operating system.
 - (2) Ubuntu uses _____ kernel.
 - (3) The panel which gives quick access to frequently used applications is called _____.
 - (4) A server database where Ubuntu packages are stored is called _____.
 - (5) Every Ubuntu user belongs to a _____.
13. **Multi-choice questions. Choose the most correct answer.**
 - (1) Who is the developer of Ubuntu?
 - (a) RedHat
 - (b) Fedora
 - (c) Canonical
 - (d) Microsoft
 - (2) Which command is used to list files in Ubuntu?
 - (a) List
 - (b) Show
 - (c) ls
 - (d) dir

- (3) Which desktop environment does Ubuntu use by default?
(a) KDE (b) LXDE (c) XFCE (d) GNOME
- (4) Which Ubuntu command is used to change file permissions?
(a) chmod (b) Chown (c) Perm (d) access
- (5) Which command is used to copy files in Ubuntu?
(a) mv (b) cp (c) rm (d) copy
- (6) What does the sudo command do in Ubuntu?
(a) Runs commands as a guest user (b) Saves user data
(c) Runs commands with root privileges (d) Shuts down the system
- (7) What is GNOME primarily used for in Ubuntu?
(a) Server management (b) Desktop interface
(c) File compression (d) Package installation
- (8) What does the rm command do?
(a) Removes a file or directory (b) Renames a file
(c) Creates a new file (d) Reads a file
- (9) What does the touch command do?
(a) Displays file contents (b) Deletes a file
(c) Creates an empty file (d) Copies a file
- (10) Which user can perform administrative tasks in Ubuntu?
(a) Root (b) User
(c) System (d) Guest

Laboratory Exercise

- 1. Perform the following file operations through GNOME Desktop UI
 - a. Create a new text file with name test.txt and store it into the home directory.
 - b. Move the file from the home directory to the document directory.
- 2. Perform the following tasks using Ubuntu Shell commands
 - a. Create a new directory
 - b. Create a new file named 'abc'
 - c. Check permissions of the file
 - d. Rename the file 'abc' to 'xyz'
- 3. Perform the following tasks using Ubuntu Shell commands
 - a. Create a file named 'test.txt'
 - b. Create a copy of the 'test.txt' file under the directory 'Documents'
 - c. Create a new directory 'Project'
 - d. Move the file 'test.txt' under the directory 'Project'





Ubuntu Utilities

Introduction

As discussed in the previous chapter, Ubuntu is a very popular operating system which is available for free. Ubuntu offers a variety of software tailored for day-to-day users, providing a user-friendly and productive experience. For example, Ubuntu provides the Firefox web browser for accessing the internet. It has an office productivity suite named LibreOffice, which can be used to create documents, spreadsheets, and presentations. Thunderbird manages emails efficiently, and Rhythmbox offers music playback and audio library management. Shotwell helps organize and edit photos, while Totem handles video playback. Ubuntu Software Center allows users to explore and install additional apps like VLC, GIMP, or Spotify. These tools are free, open-source, and regularly updated, making Ubuntu a reliable choice for everyday computing tasks such as work, communication, and entertainment. In this chapter, we will study some useful Ubuntu utilities, i.e. application programs which can be useful in day to day tasks.

Calculator

The *Ubuntu Calculator*, commonly referred to as *GNOME Calculator*, is a built-in application included with Ubuntu and other Linux distributions using the GNOME desktop environment. It is a powerful, lightweight, and user-friendly utility designed to perform a wide variety of calculations. The Calculator provides a clean and intuitive interface suitable for

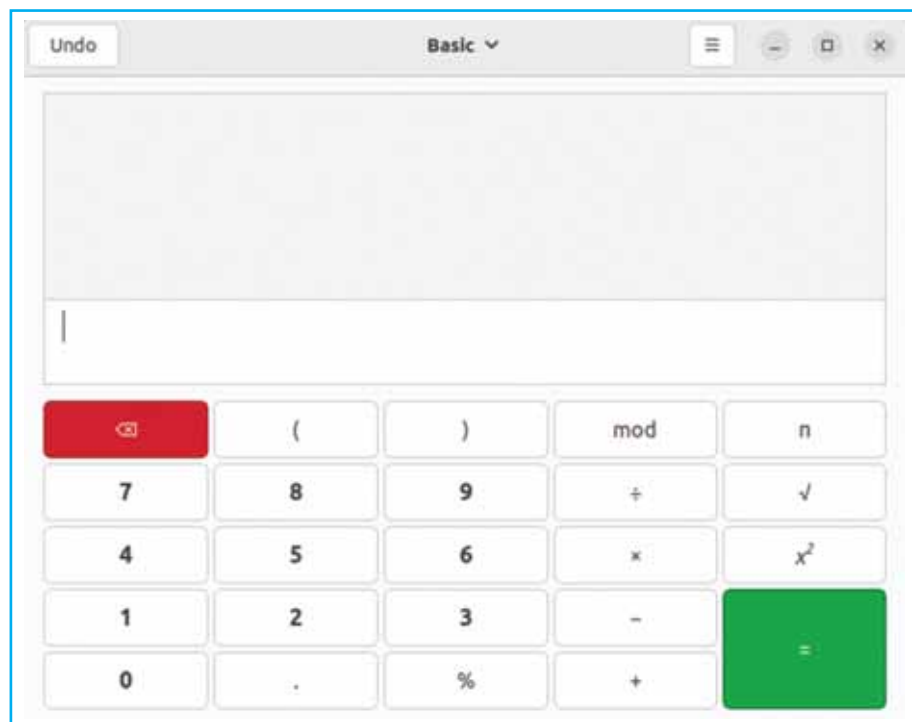


Figure 5.1 : Basic Calculator

both basic arithmetic and advanced mathematical operations. As shown in figure 5.1, the basic user interface of the calculator is similar to a physical calculator which makes it very easy to use. The calculator has a minimalist and modern user interface, designed for clarity and ease of use. Buttons are well-organized and labeled, making it accessible for users of all skill levels.

The basic calculator interface includes number keys, operator keys (addition, subtraction, multiplication, division, etc) and result key (=). You may press any key using the mouse or equivalently you may enter numbers from the keyboard to perform the desired operation.

Apart from the basic view shown in figure 5.1, *Ubuntu Calculator* also supports other task specific calculators. Following is the list of various modes available in *Ubuntu Calculator*.

- **Basic Mode** – Designed for everyday arithmetic operations such as addition, subtraction, multiplication, and division. This mode is ideal for quick and simple calculations.
- **Advanced Mode** – Includes scientific calculator functions like trigonometric operations (sine, cosine, tangent), logarithms, exponentiation, square roots, and more. It supports parentheses for complex expressions and provides precision suitable for engineering and science students or professionals.
- **Financial Mode** – Offers functions commonly used in financial calculations such as interest rate, loan payments, and investment returns. This is particularly helpful for individuals managing personal finances or professionals dealing with financial planning.
- **Programming Mode** – Provides features useful for developers and programmers, including support for binary, octal, decimal, and hexadecimal number systems. It also allows bitwise operations and conversion between different bases.
- **Keyboard Mode** – Enables full operation of the calculator using keyboard shortcuts, making it efficient for power users who prefer to work without a mouse.
- **Date Calculation Mode** – Allows users to calculate the difference between two dates or add/subtract days from a given date, which is useful in scheduling and planning tasks.

We can easily switch between modes through a drop-down menu or from the top bar. The application supports both mouse input and keyboard shortcuts, providing flexibility in how users interact with it. Here we will discuss two modes of Calculator, i.e. Advance mode and Financial mode, which will be useful for our day to day work.

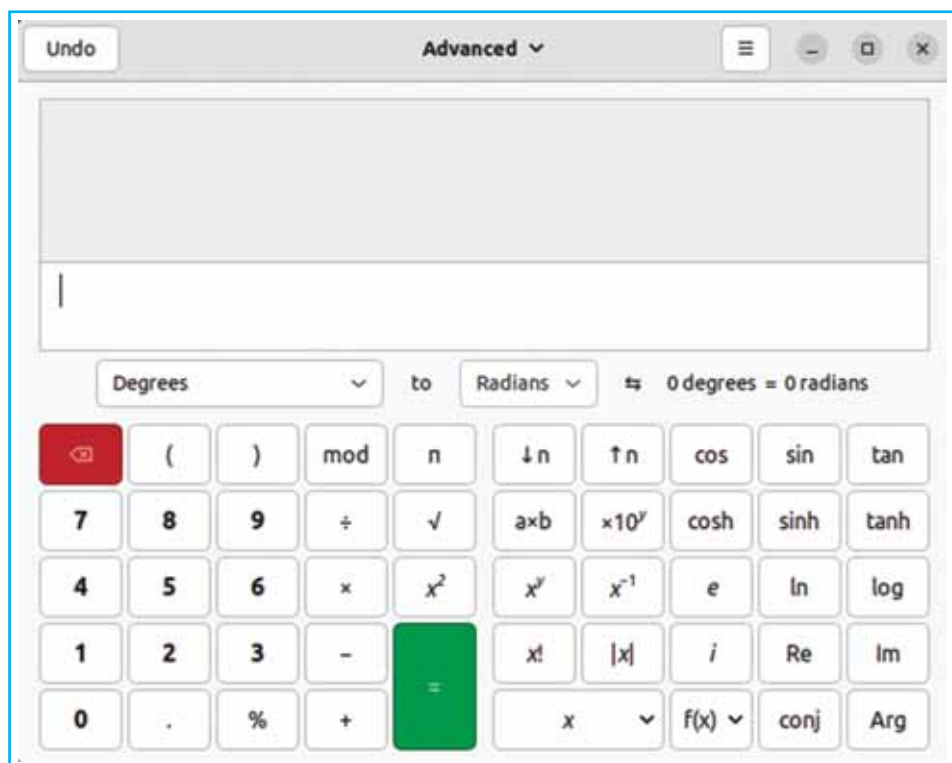


Figure 5.2 : Scientific Calculator (Advanced Mode)

Advanced Mode

Advanced mode, also known as scientific mode, provides access to more complex scientific functions. Figure 5.2 shows the Ubuntu Calculator interface for advanced mode.

As shown in figure 5.2, there are many more buttons on the right side panel compared to the basic mode of figure 5.1. These buttons refer to different scientific functions. For example, to calculate 2^3 , we first press the number key 2, then press the key X^y and then press the number key 3. Finally press the result key = and we will get 8 as the answer.

Financial Mode

Figure 5.3 shows the financial model of Ubuntu Calculator. Again on the right side panel you may see various keys required for advance financial calculations.

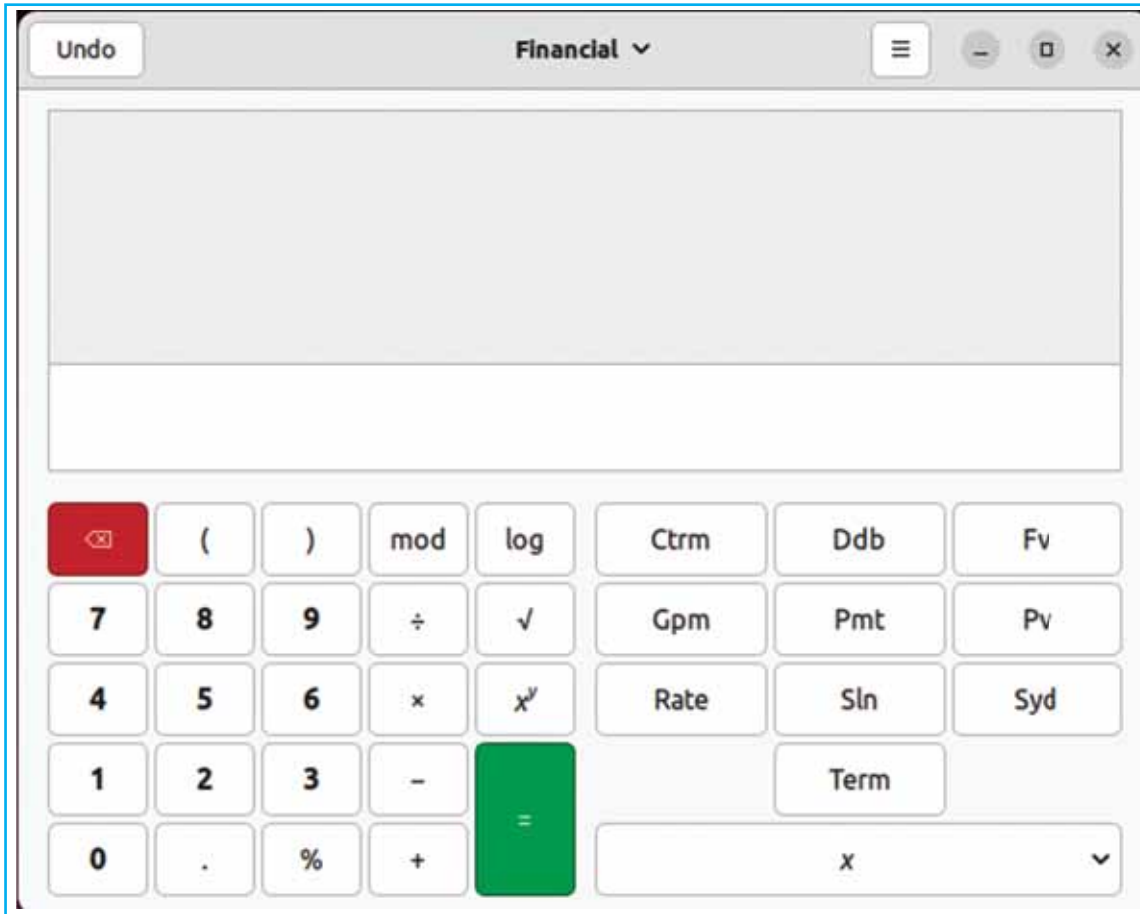


Figure 5.3 : Financial Calculator

To calculate the remaining terms for a borrowed loan, we use the *Term* key and enter four values, rate, payment, present value and future value. For example, 'If we borrow ₹10,000 at 8% annual interest, making monthly payments of ₹500. How many months will it take to repay the loan?' This can be easily calculated as follows, press the *Term* key and enter the following numbers: 0.0066667, -500, 10000, 0. Finally press = key and you will get the answer.

GEDIT-Text Editor

Gedit is a free and open-source text editor developed as part of the GNOME project. It is included by default in many Linux distributions, including Ubuntu. Gedit has a minimalist and intuitive user interface, making it easy for new users to get started quickly. The main window consists of a menu bar, toolbar, and a large central editing area. Tabs allow for multiple documents to be open at the same time, supporting multitasking and productivity. While it is primarily known for its simplicity, Gedit also supports a wide array of advanced features, such as syntax highlighting, auto indentation and remote file editing. Figure 5.4 shows the basic Gedit interface.



Figure 5.4 : Gedit Interface

As shown in the figure 5.4, the main window consists of a menu bar, toolbar, status bar and a large central editing area. The Menu bar at the top, allows us to open and save a file. The filename is displayed at the center of the top menu bar. The Status bar at the bottom shows file statistics, e.g. file type, number of lines, columns, etc.

While the basic interface looks very simple and easy to use, Gedit provides some interesting features like,

- **Tabbed Interface:** Open and manage multiple documents simultaneously.
- **Status Bar:** Displays useful information such as line number, column position, and syntax mode.
- **Font and Color Customization:** Allows users to choose themes and adjust font styles to improve readability and personal comfort.

We can access these features by clicking the *three line* icon located near the *Save* button. As shown in figure 5.5, clicking on the *Three line Icon* located next to the *Save* button opens the Options menu of Gedit. At the top you can see icons for *Refresh*, *Print* and to *Maximize* the window.

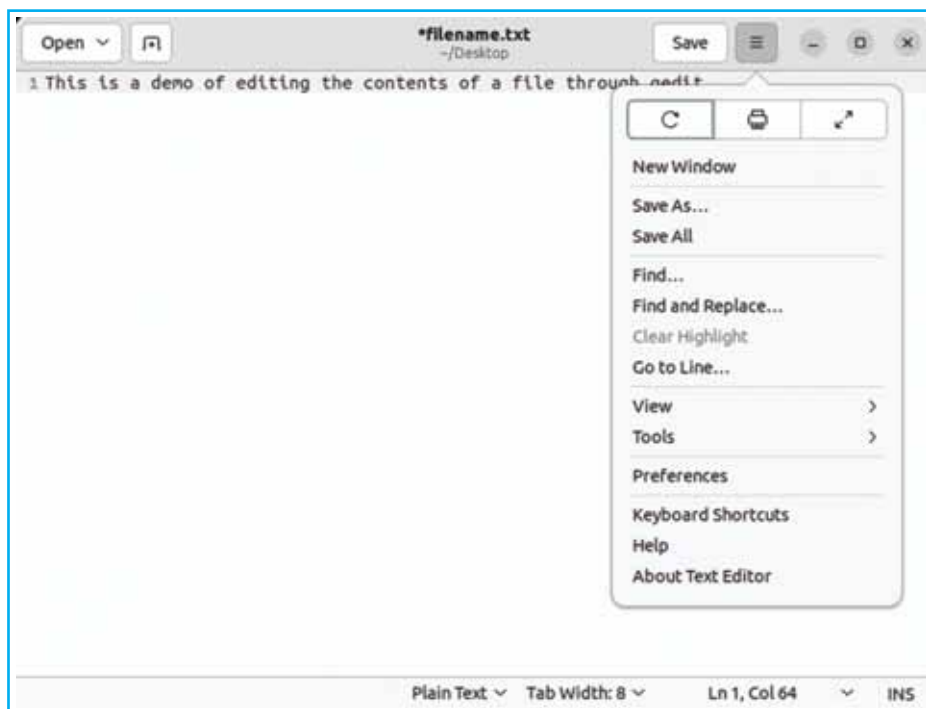


Figure 5.5 : Gedit Options

The other Menu options available are as follows.

New Window: We can open multiple instances of Gedit Window by clicking on *New Window* option. Also, in each window, we can create multiple tabs to open more than one file. The *Tab* icon is located next to the *Open* button at the top left corner.

Save and Save all: By clicking the *Save* button at the top right of the menu bar we can save the file in the hard disk. However, if we want to rename a file, we can use the *Save As...* option. Clicking on *Save As...* opens a dialog box, where we can specify a new name for the file. Also, we can specify a new location to store the file. If we have opened multiple files in different tabs, we can save all these files in one click by choosing the *Save All* option.

Find and Replace: *Find and Replace...* is a very useful option for text editing. If we want to check whether a file contains a specific text or phrase, we can use the *Find* option. If we have misspelled a word in the text file and want to correct the spelling, we can use the *Find and Replace* option and replace the incorrect spelling with the correct one.

Go to Line: Gedit maintains line numbers, which can be seen at the beginning of the text string. While editing a large text file, we can directly jump to a specific line number using the option *Go to Line...*

View and Preference: While the default Gedit information is very minimalistic and simple, we can customize it based on our liking. By choosing from various *View* options, we can change font, background, and other aspects of the appearance of the Gedit interface. *Preference* options allows us to modify the behavior of Gedit in a way that helps you in effectively performing the text editing tasks.

Tools: The *Tools* option will provide access to some advanced text editing options like spell checking, language selection, date and time insertion etc.

File Browser

Ubuntu comes with a file browser software called Nautilus. The Nautilus file browser (also known as Files) is the default file manager in Ubuntu and other GNOME-based Linux systems. It provides a graphical interface for managing files and directories. Whenever we open any directory location e.g. home directory, it actually opens in the Nautilus file browser. It allows us to browse files as well as directories. Figure 5.6 shows a sample Nautilus screen.

The main components of File browser shown in figure 5.6 are,

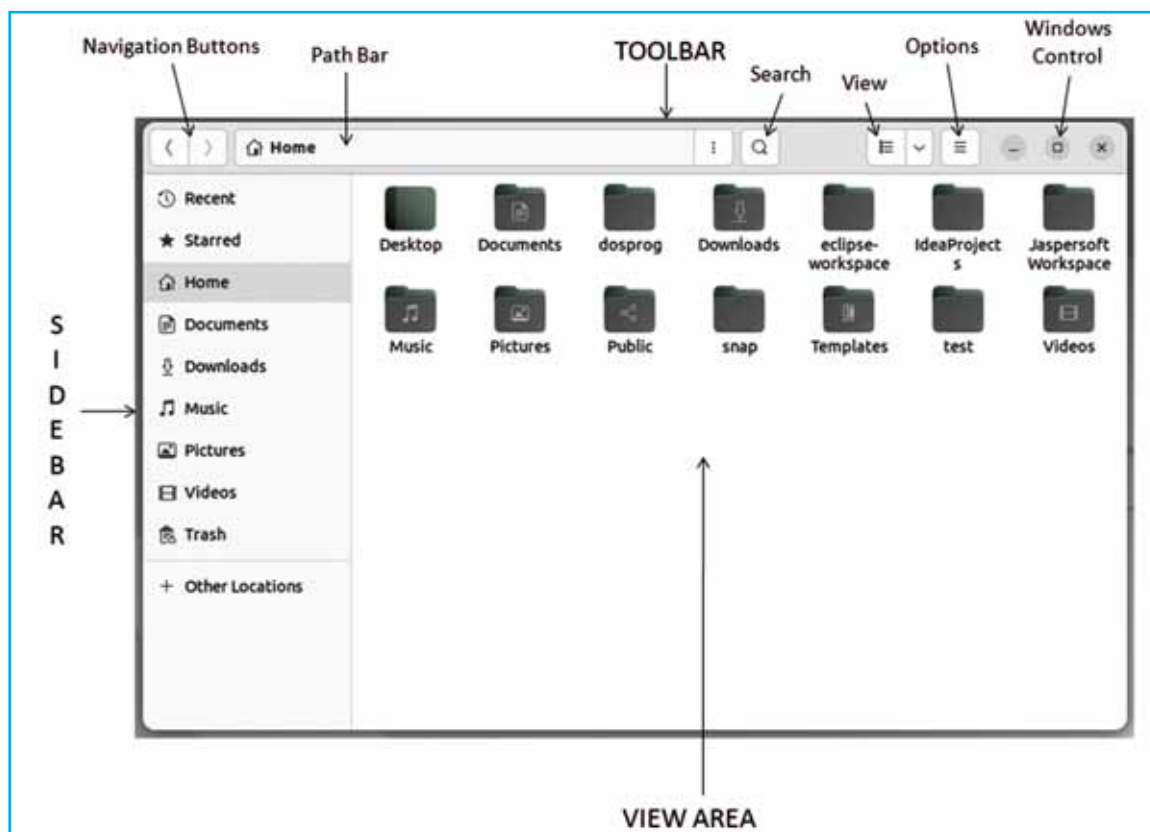
(1) Menu Bar / App Menu (Optional)

- Located at the top or integrated into the title bar (depending on your desktop environment).
- Provides access to *Preferences*, *Help*, *About*, and Keyboard Shortcuts.

(2) Toolbar / Header Bar

Located at the top of the window. It includes,

- Back and Forward *navigation buttons* to navigate through folder history
- Path bar which shows the current folder path and allows clicking to navigate.
- Search icon which opens a search bar to find files/folders.
- View options button which allows switching between list view, grid view, sort files, etc.
- New folder / Action buttons to create folders or access additional options.



5.6 : Ubuntu File Browser (Nautilus)

(3) Sidebar (Left Pane)

Located on the left side of the window, it provides quick access to:

- Home, Desktop, Documents, Downloads, etc.
- Mounted drives and network locations.
- Trash and Other locations.
- Allows drag-and-drop for copying or moving files.

(4) View Area (Right Pane)

- (a) It displays the contents of the current directory.
- (b) There are two main viewing modes: (1) Icon view which shows thumbnails or icons arranged in a grid. (2) List view which gives a detailed view with columns like Name, Size, Type, Date Modified.
- (c) Supports drag-and-drop, right-click menus, and keyboard shortcuts.

Opening Files and Directories

The file and folder shown in File viewer can be opened by simply double clicking the mouse over it. A folder opens in the same Nautilus window, replacing the current display of the content pane with the contents of that folder. When you double-click a file, Ubuntu tries to find out the most appropriate program for opening it. For example, text files open in the Gedit text editor, LibreOffice files open in their respective LibreOffice application, image files (pictures) open in the Eye of Gnome application, music files open with Rhythmbox music player and video files open with the Totem Movie Player. Right-clicking on a file gives us an option to choose the appropriate program to run or open that file.

Once we have opened multiple folders the forward/backward navigation button in the Nautilus file browser becomes enabled. We may use this button to go back to the previous folder. Once we go back, the forward button becomes enabled. This button can be used to return to the folder from where we 'went back'. Just above the content pane, you can see a list of directories that need to be traversed to reach the current directory from the root directory. You may click on any of these directories to directly open it. Even after you open a parent directory, Nautilus tries to retain the child directories in this list in case you may want to visit them again.

Different Views in Nautilus (GNOME Files)

Nautilus offers three different ways to look at the list of files and directories in the current directory. These are the icon view, the list view and the compact view. By default it opens an icon view similar to the one shown in figure 5.6. The view can be changed either by using the view selection tool near the right hand side of the toolbar, or the shortcut keys CTRL+1, CTRL+2 and CTRL+3 can be used.

In the icon view, each object is represented by an icon (depending on its type) and its name. For many types of objects, the icons may even provide a thumbnail (a small preview of the object's contents) also. The icons are arranged in a grid form.

In the compact view, the objects are represented by very small icons (no preview) and names and are arranged in a vertical list. The list view displays several other details about the files like its size, type and the date when the object was last modified (date of last modification). In this view, we may sort (arrange) the objects in the ascending or descending order of any of the displayed columns by clicking once or twice on the column heading. This is very useful to find, say, the largest file or the latest file. Figure 5.7 shows the list view of File browser.

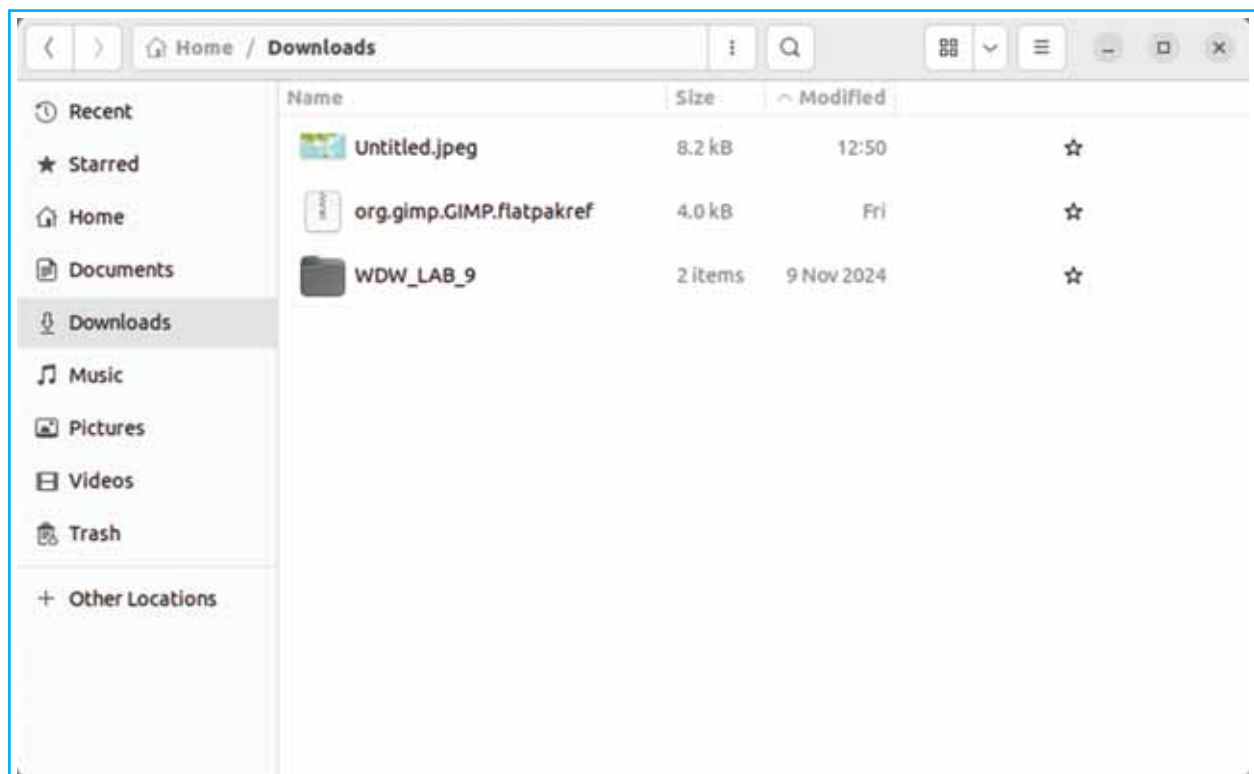


Figure 5.7 : Nautilus File Manager: List View

Performing File Operations

The right click of the mouse on any file opens a context menu, as shown in the figure 5.8, through which various file operations can be performed.

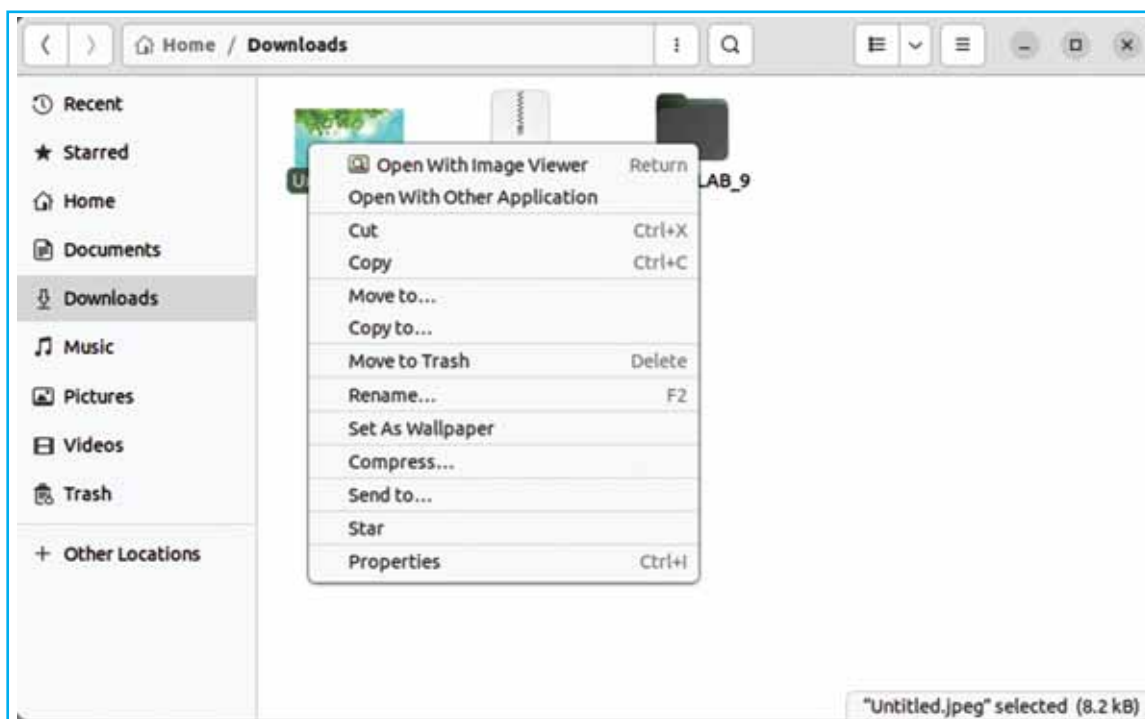


Figure 5.8 : Context Menu for a File

Figure 5.8 shows a context menu for an image file. Through this menu we can perform the following operations,

- **Open:** Open the file using a default program or choose the program which you want to use to open the file. In figure 5.8 the default program suggested is 'image viewer' and clicking on the string 'Open With other Application' allows the user to select a program to open the file.
- **Cut and Copy:** Clicking on *Cut* or *Copy* allows you to cut or copy the file which you may later paste in some other directory. Alternatively you may also use keyboard shortcuts *Ctrl+X* or *Ctrl+C* to perform the task. In the *Cut* operation file will be removed from the current directory.
- **Move to and Copy to:** If the destination folder is predefined then instead of *Cut* or *Copy*, we may directly use *Move to...* or *Copy to...* command to move files into a different directory.
- **Move to Trash:** Trash is a temporary location where the deleted files can be stored, if we do not want to permanently remove it from the hard drive.

GNU Image Manipulation Program (GIMP)

GIMP, short for GNU Image Manipulation Program, is one of the most powerful and versatile open-source image editing applications available for Ubuntu and other Linux-based operating systems. It serves as a free alternative to commercial tools like Adobe Photoshop, offering an extensive range of features for photo retouching, image composition, graphic design, and digital art. When we open the GIMP by double clicking on its icon, the GIMP home screen appears as shown in the figure 5.9.

The GIMP interface is very rich and highly customizable as shown in figure 5.9. The key components of GIMP Interface are as follows.

- **Menu Bar:** Located at the top, the menu bar houses core commands like File, Edit, Select, Image, Layer, Colors, Filters, etc.
- **Toolbox:** Located in the left panel of the window, the toolbox contains selection tools, brushes, pencils, and color tools
- **Image Window:** The center area of the screen is known as image window which displays the current canvas
- **Creative Control:** The right side of the panel provides access to Brushes, Patterns, etc.

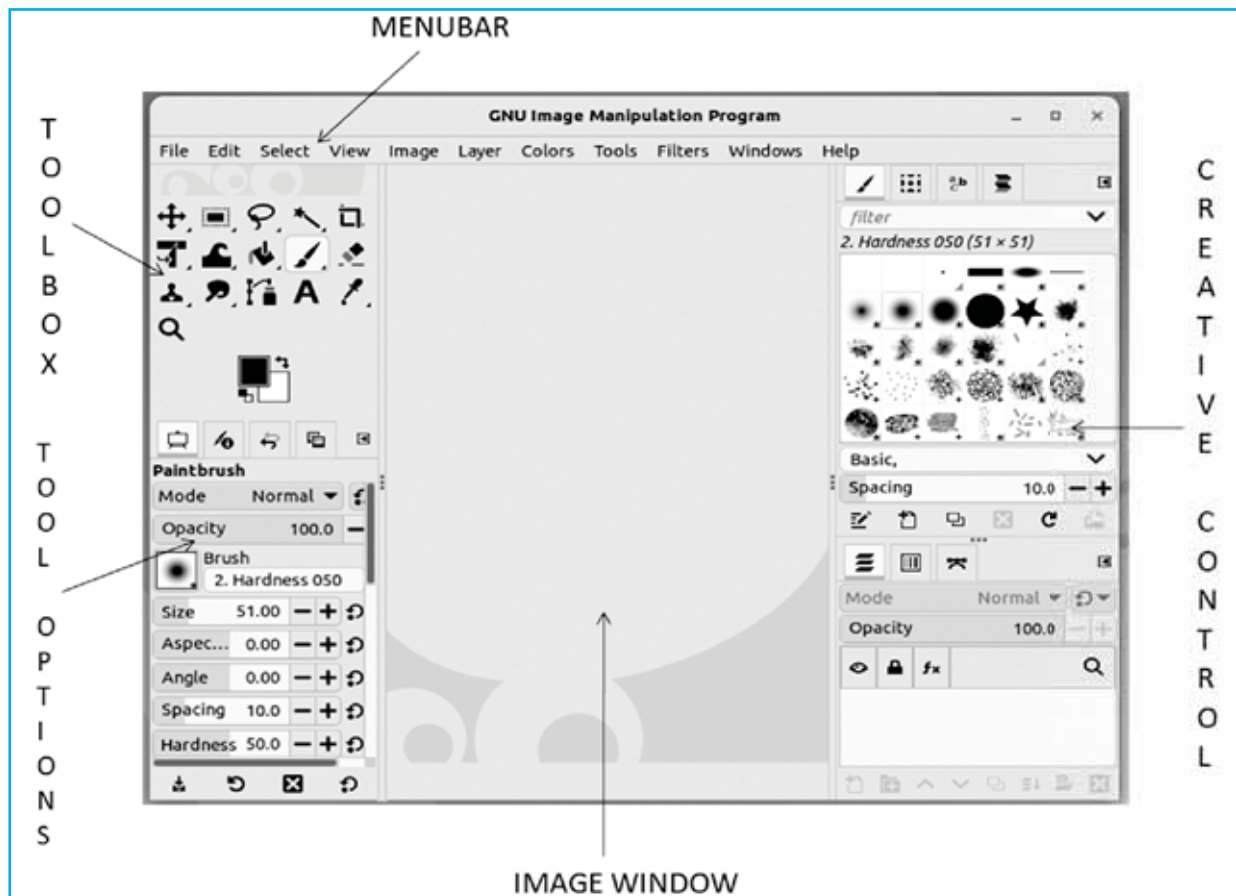


Figure 5.9 : GIMP (GNU Image Manipulation Program)

The figure 5.9 shows a default view of the GIMP interface, however the interface can be configured to suit different workflows. It provides a multi-window or single-window mode, with dockable panels and toolboxes that can be rearranged and saved as workspaces. Now, let's perform some image editing tasks on GIMP.

Opening and Creating Images

GIMP allows users to create a new image or to edit an existing image. It supports a wide range of image file formats, including JPEG (JPG), GIF, BMP, PNG and SVG. By clicking on the file menu (top left corner of figure 5.9), we can choose to open an existing image or create a new image. The

image will be displayed on a canvas placed in the central area of the image editor. We can specify the size of the canvas while creating an image. The usual preferred size of the canvas is 800 x 600 pixels. A pixel is the smallest dot that makes up a picture on a screen. On your computer, tablet, or phone screen everything you see, like photos, games, and videos, is made up of millions of these tiny dots.

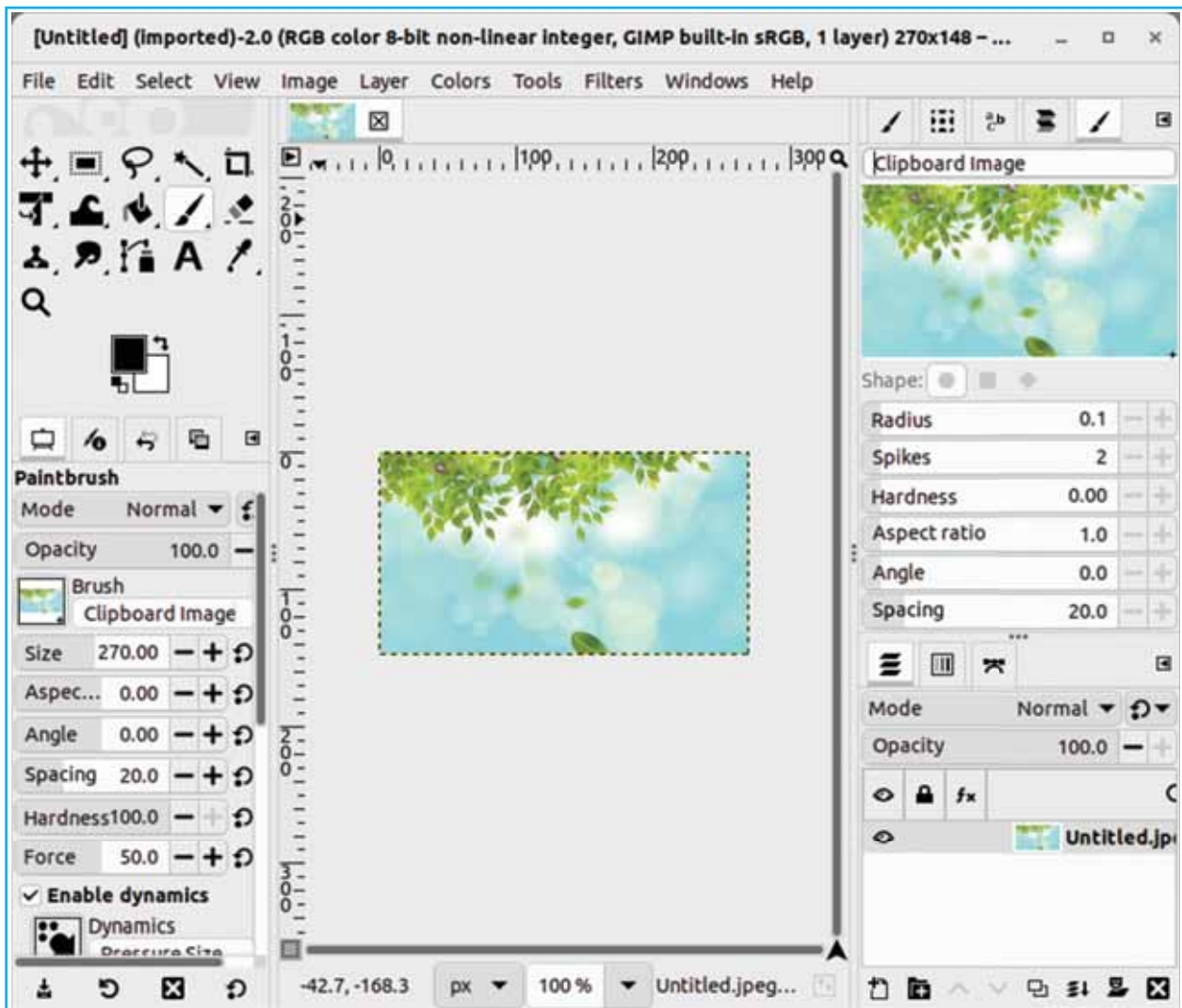


Figure 5.10 : Opening an Image

Basic Image Editing Tasks

Figure 5.10 shows an image loaded on the GIMP interface. Once the image is loaded, we can perform many editing tasks on the image. Some of the common image editing tasks are as discussed below.

Resizing: Resizing means changing the size of the whole image, making it bigger or smaller. Resizing is a very useful task as we often want to see an image on a different screen size. Also, when we want to print the image, we need to resize it to fit the size of the paper.

To resize an image, click on the image menu and choose the *scale* option. The *scale dialog box* will allow us to specify height and width to which we want to resize the image, as shown in the figure 5.11.

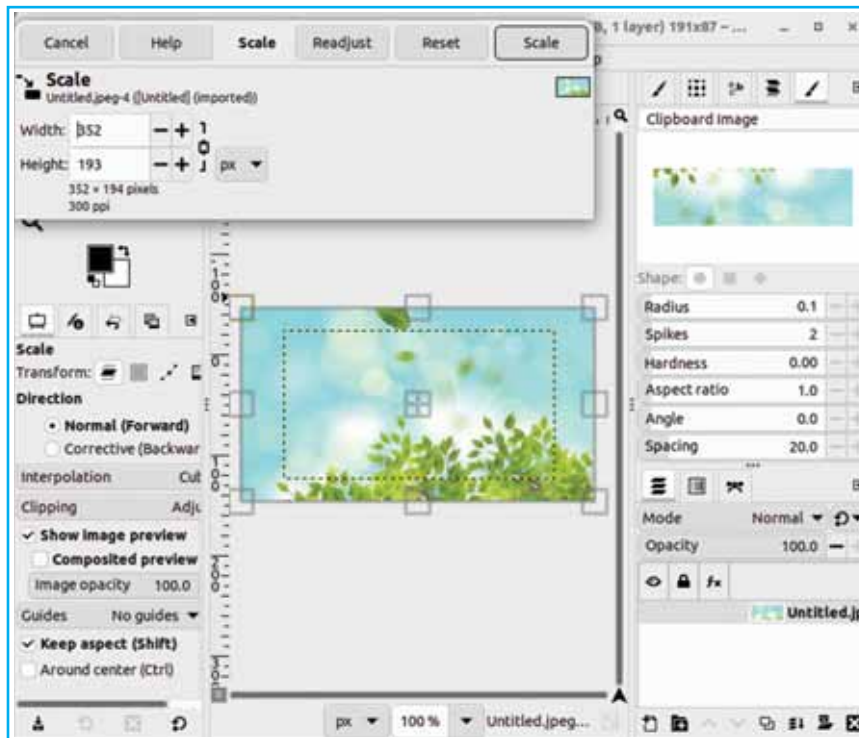


Figure 5.11 : Resizing an Image

Cropping: Cropping means cutting out parts of an image to keep only the area we want. For example, if we want to remove an unwanted background image, or we want to cut out a portrait from a landscape photo, we can use cropping.

To crop an image, we first select the *crop* tool from the toolbox available on the left panel. Once the crop tool is selected, we hover the mouse over the image and click and drag over the area we want to keep. Once the area is selected as shown in the figure 5.12, press *enter* to crop the image.

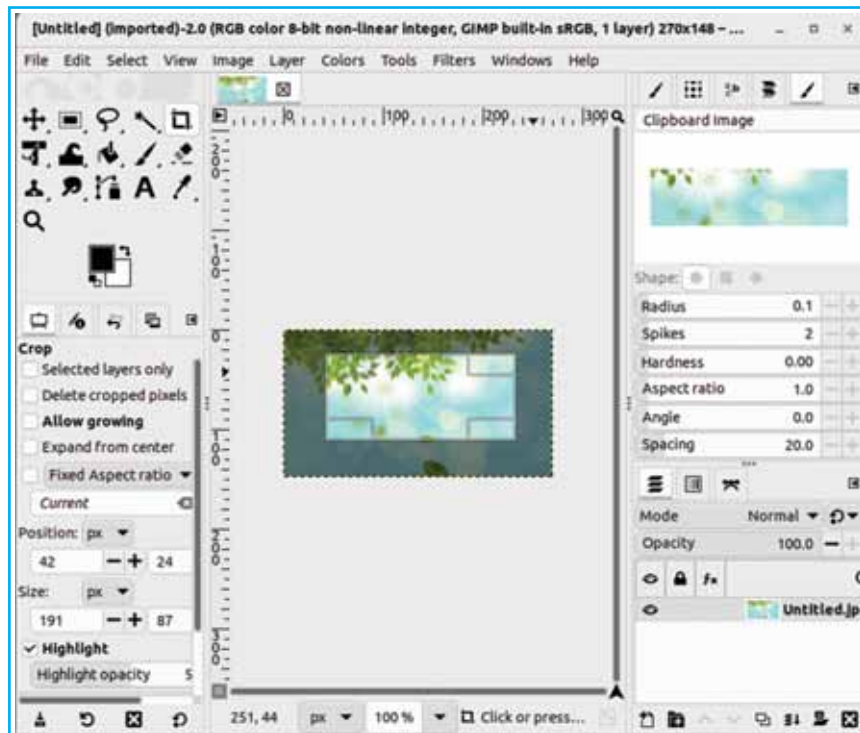


Figure 5.12 : Selecting an Area of the Image Using Crop Tool

As we can see in figure 5.12, the selected highlighted area will remain and the darker area will be cropped out. figure 5.13 shows the image after the crop operation.

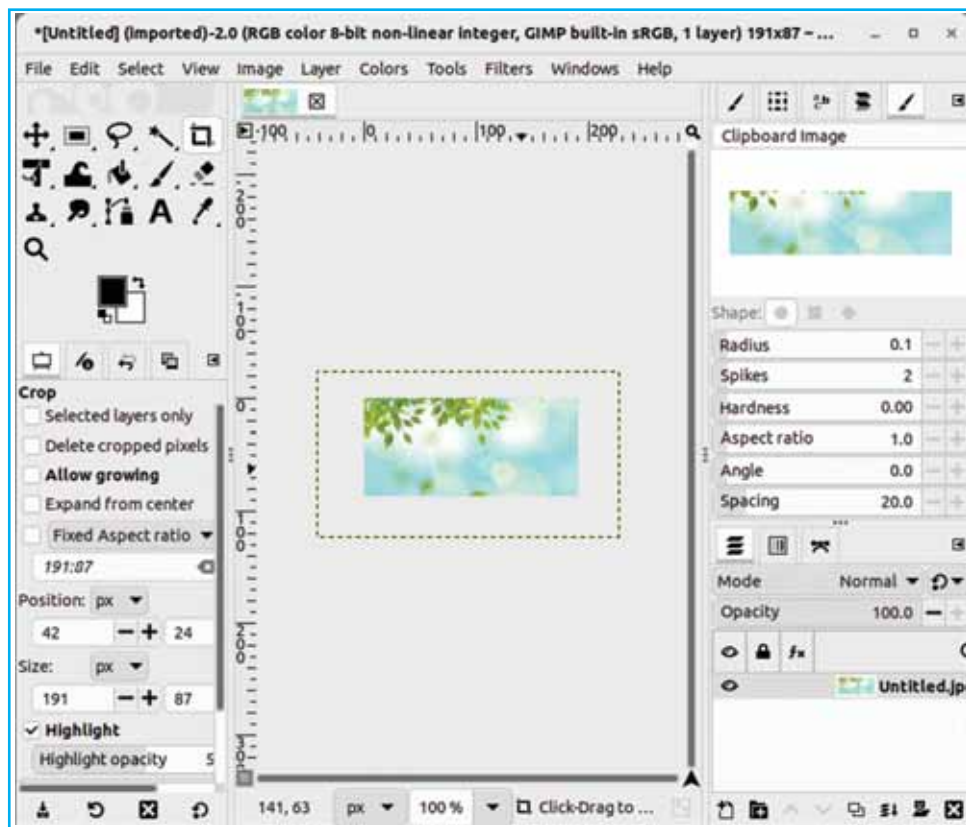


Figure 5.13 : Cropped Image

Rotating: Rotating means turning the image around at a specified angle. Sometimes when we click a photograph, we feel that the image is a bit slanted, or sometimes just for experiment we want to rotate the image to provide a better view angle. These tasks can be performed by choosing the transform option from the Image menu.

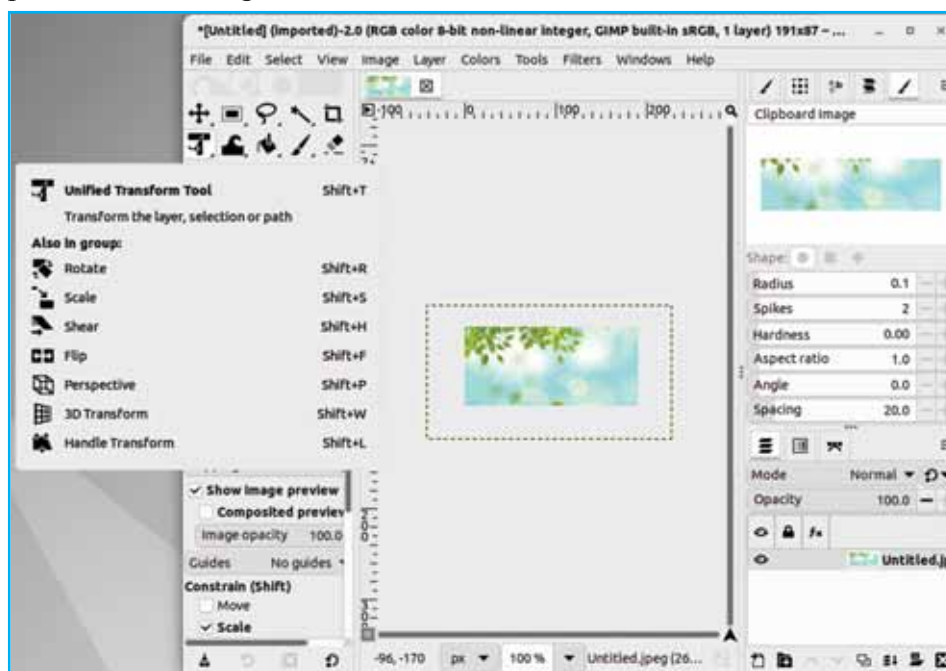


Figure 5.14 : Image Transform Menu Options

As shown in figure 5.14, GIMP provides many image transformation options, like rotate, scale, shear, flip, perspective, 3D transformation etc. Once, we choose *Rotate* option, a dialog box will open as shown in the figure 5.15

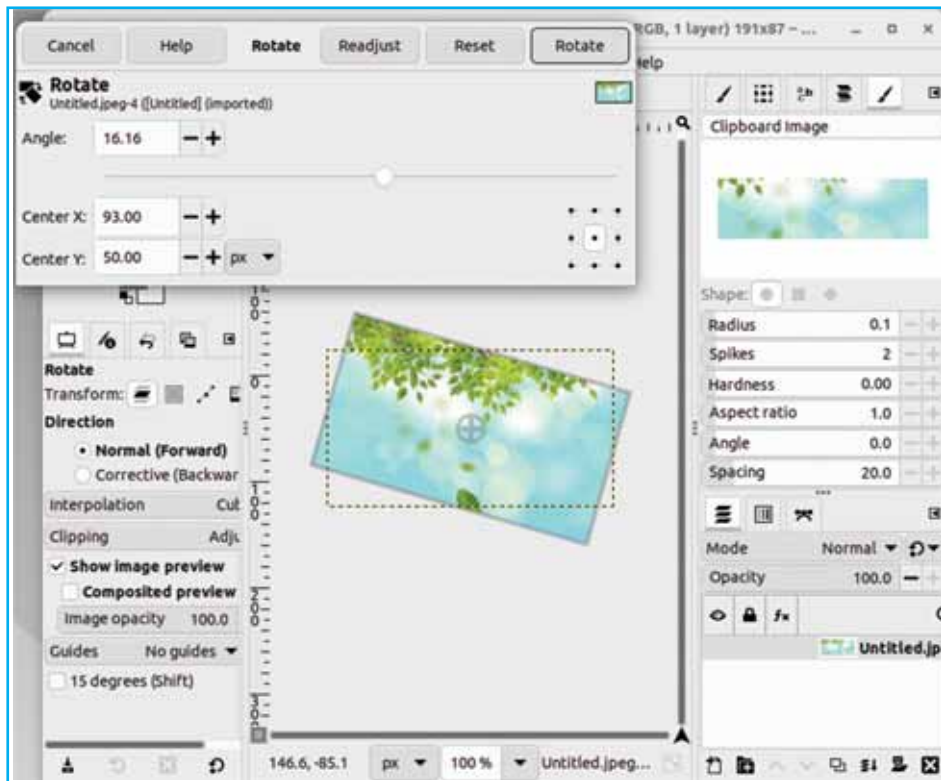


Figure 5.15 : Image Rotate Operation

Brightness, Contrast and Color Management: Often when we click a photo, due to low light we get a darker image. Also, if there is very bright sunlight behind the subject, we get darker faces of the subject. This kind of varying exposures in the photographs can be corrected by adjusting brightness and contrast of the image.

In the *Image* menu, the color option provides different methods for *brightness and contrast* adjustment. Alternatively, we can access the *brightness and contrast adjustment* function from the toolbox also. Figure 5.16 shows brightness and contrast adjustment dialog box.

By sliding the brightness and contrast bar shown in figure 5.16, we can check its effect on the image.

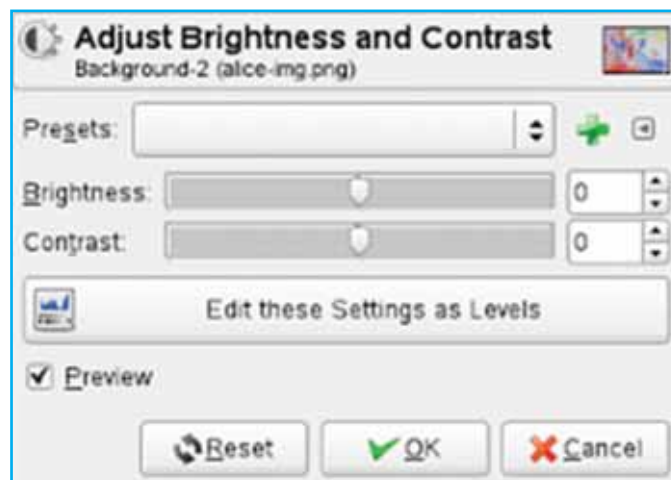


Figure 5.16 : Brightness and Contrast Adjustment Tool

There are various other options available to improve the overall visibility of the image. Some of the useful options are, hue and saturation adjustment tools, levels and curve tools, etc. All these options can be accessed through the image and tools menu.

Creating a new image: So far, we have seen how an existing image can be modified using GIMP. Now we will see how a new image can be created in GIMP. As we have discussed earlier, to create a new image, we first go to the file menu and click on 'New'. It will open a new image dialog box. Specify height and width of the pixel and click *OK* to open a blank canvas.

Once the canvas is open, we can use drawing tools to draw the image and then use painting tools to color the image. The right side panel of figure 5.9, shows various types of brushes available for drawing. Some of the popular drawing and painting tools available in GIMP are,

- **Paintbrush:** It is used for freehand drawing.
- **Pencil:** It is used for hard-edged strokes.
- **Bucket Fill:** It is used to fill an area of the image with the chosen color.
- **Gradient Tool:** It is used to create color transitions.
- **Eraser:** It is used to remove some parts of the image

Once the image is created, it can be saved in *.xcf* format. This file can again be used later for further editing. Once the image is finalized, it can be exported in standard image format like *.png* and *.jpeg*. Go to File menu and choose export option to make a jpeg or png file of the image.

Summary

An operating system provides many useful utilities which can be useful in our day to day office activities. In this chapter, we have seen some applications available on the Ubuntu system. Many day to day tasks like calculating, writing text files, and storing data in directories can be easily done by the tools that we have studied. We have also studied a powerful Image Manipulation Program GIMP which can be useful to photography and painting enthusiasts. All the software we have discussed are freely available and perform as good as their paid counterparts.

We have learned how to use Ubuntu systems to perform our daily tasks. Apart from the utilities or applications discussed in this chapter, there are other applications which can be equally useful, namely Totem movie player, LibreOffice productivity suite, Rhythmbox music player etc. Since the Ubuntu interface is consistent across the applications, we can easily explore and use these applications.

EXERCISE

1. Which are the different modes available in Ubuntu Calculator?
2. What are the key features of Gedit text editor?
3. Explain how we find and replace a word in Gedit.
4. Which are the different view modes available in Ubuntu File browser (Nautilus)?
5. What information do we get in the list view of Ubuntu files?
6. Suppose you want to become a graphic designer, which utility software you would use for your day to day job?
7. Describe the use of the Crop tool in GIMP image editor.
8. What are the different file formats supported by GIMP?

9. What is a pixel?

10. How do we set the size of an image in GIMP?

11. State whether true or false.

- (1) We cannot open multiple files in Gedit.
- (2) Ubuntu Calculator does not support financial mode.
- (3) A file moved to trash cannot be restored.
- (4) We can search a file by its partial name in the Nautilus file browser.
- (5) File browser allows us to sort files by the date of creation.

12. Fill-in the blanks.

- (1) We can create _____ files in Gedit.
- (2) _____ mode of calculator provides power function.
- (3) Total lines in a file is displayed in _____ of Gedit.
- (4) A .jpeg file can be opened in _____ program.
- (5) _____ is used for freehand drawing in GIMP.

13. Multi-choice questions. Choose the most correct answer.

- (1) Which of the following modes is NOT available in the Ubuntu Calculator by default?
(a) Basic Mode (b) Scientific Mode (c) Financial Mode (d) Graphing mode
- (2) What is the main purpose of the 'Financial' mode in the Ubuntu Calculator?
(a) To solve algebraic expressions
(b) To convert currencies
(c) To calculate interest, annuities, and other finance-related values
(d) To solve statistical problems
- (3) Which of these operations can be performed in the 'Scientific' mode of Ubuntu Calculator?
(a) Bitwise logical AND and OR
(b) Matrix multiplication
(c) Trigonometric calculations like sin, cos, tan
(d) Image rendering calculations
- (4) What is the primary purpose of Gedit in Ubuntu?
(a) Managing system files (b) Editing plain text files
(c) Browsing the internet (d) Playing multimedia files
- (5) Which of the following is not a feature of Gedit?
(a) Opening multiple files simultaneously
(b) Opening multiple windows of Gedit
(c) Finding and replacing a text string
(d) Creating tables and storing numbers in it

- (6) What is GIMP primarily used for?
- (a) Writing code
 - (b) Image editing and graphic design
 - (c) Audio mixing
 - (d) 3D modeling
- (7) Which file format is GIMP's native format used for saving projects with edits preserved?
- (a) .jpg
 - (b) .png
 - (c) .xcf
 - (d) .gif
- (8) Which of the following is TRUE about GIMP?
- (a) It is a paid software available only for Windows
 - (b) It does not support third-party plugins
 - (c) It is open-source and available for multiple platforms
 - (d) It only works with vector graphics
- (9) Which GIMP tool is best used to remove unwanted parts of an image by cutting them out?
- (a) Scale Tool
 - (b) Crop Tool
 - (c) Smudge Tool
 - (d) Paths Tool
- (10) Which GIMP tool is used to resize an image?
- (a) Scale Tool
 - (b) Crop Tool
 - (c) Paths Tool
 - (d) Smudge Tool

Laboratory Exercise

1. Perform the following file operations using Gedit
 - a. Create two text files named first.txt and second.txt
 - b. Open both files in separate tabs.
 - c. Write a paragraph about cricket in first.txt
 - d. Write a paragraph about football in second.txt
 - e. Count how many times the word 'cricket' occurs in the first.txt file.
 - f. Count how many times the word 'football' occurs in the second.txt file.
 - g. Find the word 'cricket' in the first.txt file and replace it with the word 'football'.
2. Using Ubuntu Calculator perform the following tasks
 - a. Calculate $(1200 \times 30) / 50 - 100$
 - b. Calculate hypotenuse of a triangle using Pythagoras formula.
 - c. Calculate area of a rectangle.
3. Perform the following tasks using GIMP
 - a. From an image which contains a group of people, extract the image of a single person.
 - b. Invert an image
 - c. Convert an color image into a grayscale image
 - d. Draw an image of your choice and fill colors in it. Export it as a jpeg file.





Fundamentals of Word Processing

Introduction

In today's digital world, word processing is an essential skill used for creating, editing, formatting, and managing text-based documents. This chapter introduces the fundamentals of word processing, beginning with the basic concept and characteristics of word processors that distinguish them from traditional typing methods. It also explores commonly used word processing software. Using LibreOffice Writer, we will learn how to create and save text documents, utilize templates, navigate through content, and other important features related to the word processor. By the end of this chapter, students will understand how to create text documents and carry out basic word processing tasks useful for school assignments and projects.

Introduction to Word Processing and Word Processor

Word processing refers to the activity of creating, editing, formatting, and printing text on a computer. It is useful for writing various documents such as letters, essays, reports, and more. With word processing, we can easily correct mistakes, change the appearance of text, and add elements like images or tables.

A word processor is a computer program designed for word processing. It allows users to type and manage text on their computers. This essential tool has replaced the traditional typewriter, making writing much more convenient. We can use a word processor to type, edit, format, save, and print text-based documents such as letters, reports, and school assignments. Some popular word processors include LibreOffice Writer, Microsoft Word, and Google Docs. These programs offer various features that enhance productivity and creativity. For example, they come equipped with spell checkers and grammar suggestions, helping to ensure that our writing is free of errors. Additionally, they provide a wide range of fonts and styles, allowing users to customize their documents to meet their personal or professional needs. In this chapter, we will use LibreOffice Writer software to learn the fundamentals of word processing.

Characteristics of Word Processor

A word processor offers a variety of helpful features that simplify the process of writing and editing documents. Let us explore some useful characteristics of word processors that make them valuable tools for students, teachers, and professionals.

- **Text Formatting:** We can change the look of the text using font style, size, and color. It also allows alignment, bold, italics, and underline. This makes our document more attractive and readable.
- **Spell Check and Auto Correct:** Word processors can check our spelling and highlight mistakes. They can also fix common typing errors automatically. This feature helps us to improve accuracy in the document and saves time.
- **Multimedia Elements:** We can add images, tables, symbols, and more multimedia elements into our document.

- **Templates and Styles:** We can use ready to use pre-formatted document templates to create professional documents very quickly.
- **Export as PDF or Print Options:** We can save our document as a PDF file or print it directly to the connected printers.
- **WYSIWYG Interface:** WYSIWYG stands for "What You See Is What You Get." The document on the screen looks the same when we print it. It helps users see the final output while editing the document.

Software for Word Processor

Word processor software can be broadly classified into three types based on the platforms they operate on and how they are accessed: Desktop Tools, Mobile Tools, and Online Tools. Table 6.1 shows summary table of various categories of Word Processor software with key properties and examples.

Type	Works On	Internet Needed	Software Installation	Example
Desktop Tool	Personal Computer / Laptop	Occasionally	Necessary	Writing a report in Libre Office Writer
Mobile Tool	Smartphone/Tablet	Frequently needed	Necessary (Apps)	Editing a resume on the go in mobile
Online Tool	Any device using web browser	Always needed	Not needed	Joint editing in Google Docs by many users

Table 6.1 Categories of Word Processor

Desktop Tools

These are software programs installed and run on personal computers or laptops. They offer full features, fast performance, and usually work offline. They are used for professional and academic work like document creation, coding, editing, etc. LibreOffice Writer, Microsoft Word, Excel, Adobe Photoshop, etc. are examples of desktop based tools.

Desktop tools like MS Word and LibreOffice Writer are traditional word processing applications that are installed directly on a computer's operating system. These tools are rich in features such as advanced formatting, printing, exporting documents into different formats, mail merge, templates, and integration with other software. They are commonly used in schools, colleges, and offices for creating detailed reports, letters, and professional documents. Since they work offline, they are highly reliable even without internet access.

Mobile Tools

These categories of tools are specialised mobile applications, also known as Mobile DTP (Desktop Publishing) Software. They are designed to run on smartphones or tablets. They are widely used for on-the-go use and optimized for touch screens. But they offer relatively fewer features than desktop versions of the same program. They are useful for quick edits or viewing during traveling. They enable us to create and design documents, brochures, flyers, posters, and various other printed or digital media directly from our mobile devices.

Google Docs App, WPS Office Mobile, Microsoft Office Mobile, etc., are widely used mobile-based word processors. They are designed specifically for touch screen based devices like smartphones and tablets. This category of word processor offers essential document processing features in a compact format, allowing users to create, view, and edit documents while on the go. They are convenient for quick edits, reading documents during travel, or making last-minute changes before a meeting. Many of them also support cloud storage and syncing across devices. It benefits students, small business owners, content creators, and professionals who need quick document management. Some of the key features of mobile-based tools are listed below:

- Ready-to-use templates are available for various print and social media content.
- Tools and features are available for inserting and editing text, images, and graphics.
- They can export designs in PDF, PNG, or JPG file formats.
- Cloud integration and easy sharing options are available directly from mobile devices.

Online Tools

These categories of software run in web browsers (Chrome, Firefox, etc.) without needing installation. They store data and documents in the cloud and often support real-time editing and collaboration. We need an internet connection to use these categories of software.

Google Docs, Microsoft 365 Word Online, WPS Office Word Online, Canva, etc. are widely used examples of online word processors.

These tools can be used using any web browser and do not require any software installation. These tools are excellent for collaborative work, as multiple users can edit the same document in real-time from different cities. In these categories of word processors, changes are automatically saved to the cloud, ensuring data safety and accessibility from any device with internet access. They are widely used for teamwork, classroom activities, and remote work environments.

An Overview of LibreOffice Suite

The LibreOffice suite is widely used Open Source Software, which is freely available for everyone to use. LibreOffice suite includes Writer for word processing, Calc for spreadsheets, Impress for presentations, Draw for graphics and flowcharts, Base for databases, and Math for formula editing. Key advantage of LibreOffice suite is no licensing fees and its cross platform usability. It can run on multiple operating systems, such as Microsoft Windows, macOS, Ubuntu and various Linux versions.

In next section, we will study widely used word processing software, the LibreOffice Writer. If it is not installed on your computer, then you can download it from following website: <https://www.libreoffice.org/>

Introduction to LibreOffice Writer

The Writer is a free and powerful word processing software that comes with the LibreOffice suite. It offers many features that can be used to create letters, books, project reports, and more. We can insert graphics like images from other sources into the Writer's document. Writer can export document files as HTML, XML and PDF. It can save files in many file formats, including Microsoft Word (.docx).

Let us understand how to open, create, and manage documents in LibreOffice Writer.

Opening LibreOffice Writer

We can open LibreOffice Writer software using following three options:

1. LibreOffice Suite Launcher (Refer figure 6.1)
2. Start Menu of Operating System (Like Ubuntu OS)
3. Desktop Shortcut Icon

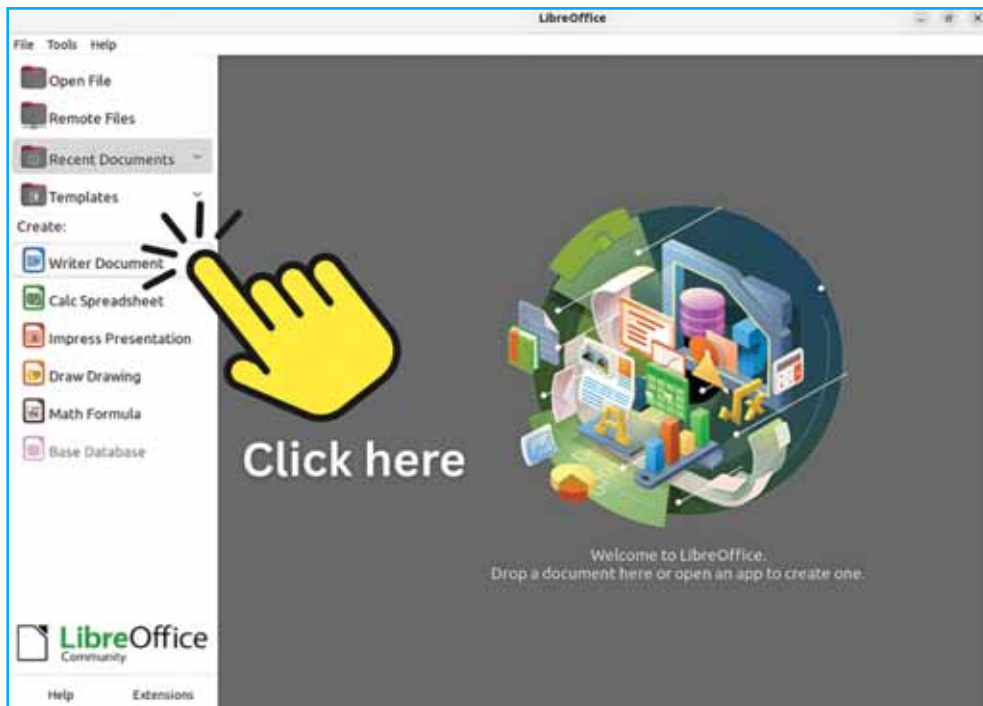


Figure 6.1 : Opening Writer from LibreOffice Suite Launcher

Parts of the Main Writer Window

The main screen (homepage) of the Writer software is shown in figure 6.2. Important sections of the Writer are as follows:

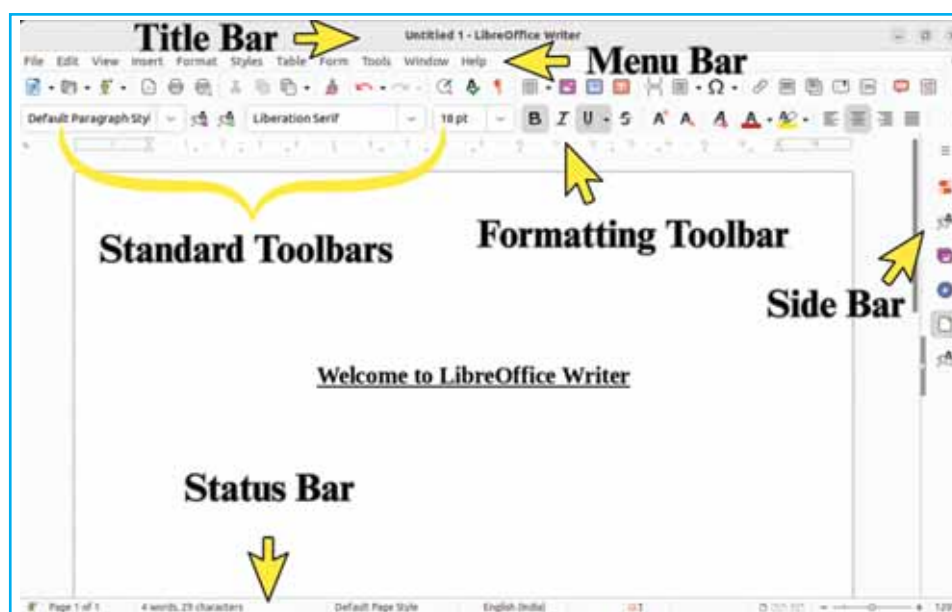


Figure 6.2 : Parts of the Writer Window

Title bar

It is located at the top of the Writer window. It shows current document's file name. When the document is not saved, the filename will appear as Untitled N, where N is a number. In our case it is visible as “Untitled 1” in the title bar. Untitled documents are numbered in the order in which they are created by user.

Menu bar

The Menu bar is located just below the Title bar. It provides access to all the main commands and features of the Writer application. They are organized into categories like File, Edit, View, Insert, Format, Style, Table, Form, Tools, Window and Help. It helps user to perform various tasks related to the editing and managing documents efficiently. When one of the menus is selected, a submenu drops down to show further available options. For example, observe Figure 6.3 related to the File Menu, when we click on File Menu, it will show all the features related to the File Management.

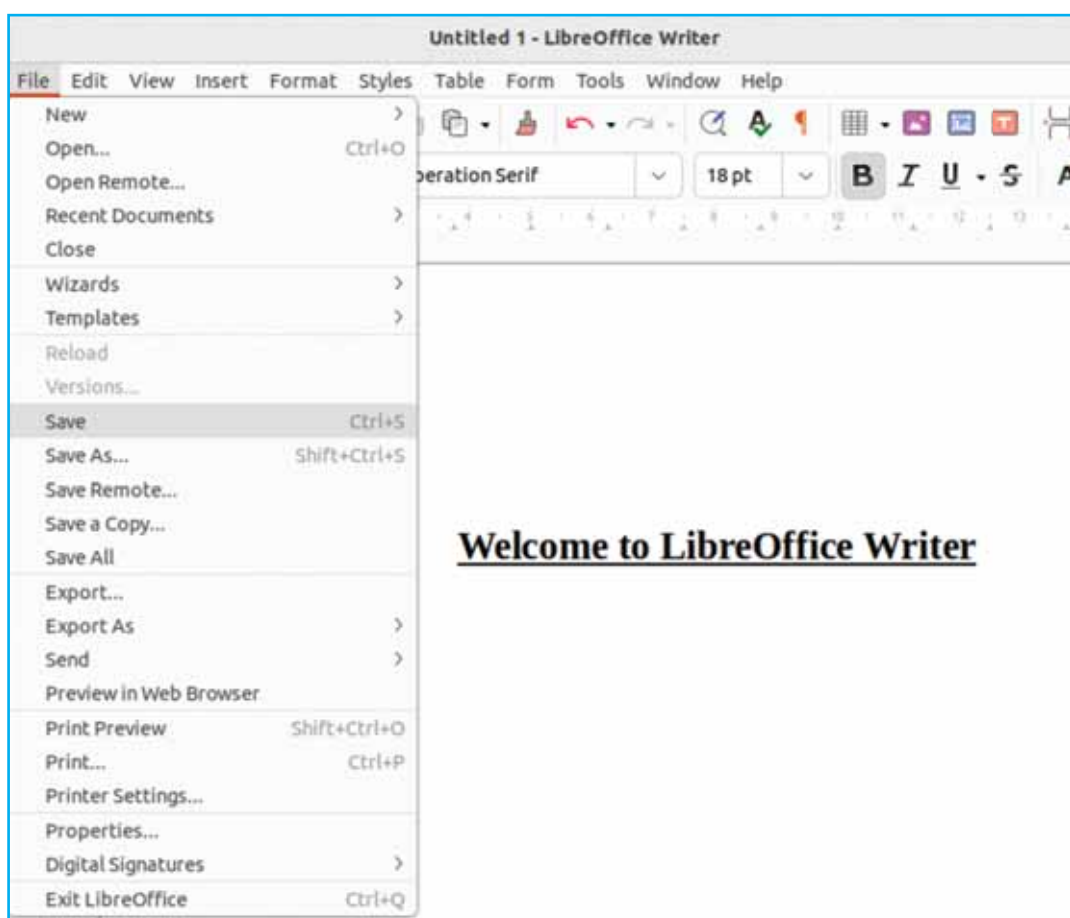


Figure 6.3 : File Menu

Standard Toolbars

In a default LibreOffice installation, the Standard toolbar is just located below the Menu bar (Figure 6.2). It contains commonly used tools and shortcuts for quick access to basic functions like creating a new file, saving a file, printing, copying, pasting, undo-redo actions, and many more useful features. It helps users perform frequent tasks without navigating through menus. This toolbar speeds up our document editing process, and save time. Such toolbars can be docked (fixed in place) or floating. Docked toolbars can be moved to different locations on the Writer's window as per our requirements.

- To display a new toolbar, go to *View*→*Toolbars* on the *Menu bar*, then click the name of a toolbar that you want to add from the list. An active toolbar shows a check mark along with its name.
- To hide a toolbar, go to *View*→*Toolbars* on the *Menu bar* and deselect the toolbar, or right-click in an empty space between the icons on a toolbar and select *Close Toolbar*.
- Locking and unlocking toolbars: We can lock all toolbars, or individual toolbars, into place so they cannot be moved. When all toolbars are locked, we cannot unlock individual ones. To lock all toolbars in place, go to *View*→*Toolbars* on the *Menu bar* and select *Lock Toolbars*. Restart LibreOffice for this change to take effect. To unlock all toolbars, click on *Lock Toolbars* again.

Formatting Toolbar

This toolbar provides quick access to various text formatting options. It helps us to change the appearance of text and paragraphs easily. It allows us to apply font styles, sizes, colors, bold, italics, underline, and alignment options like left, center, right, and justify. We can also set line spacing, bullets or numbering, and adjust indents directly from this toolbar. Figure 6.4 shows important features related to the formatting toolbar. It helps in enhancing the visual structure and readability of the document.



Figure 6.4 : Formatting Toolbar

Remember that the Formatting Toolbar displays only the most commonly used shortcuts for formatting the document. This toolbar does not show all the formatting features that LibreOffice Writer offers. To access the complete set of formatting tools we need to open the *Format Menu* from the *Menu bar*. Refer to figure 6.5, which highlights the *Format Menu* and shows how to use all available formatting features.

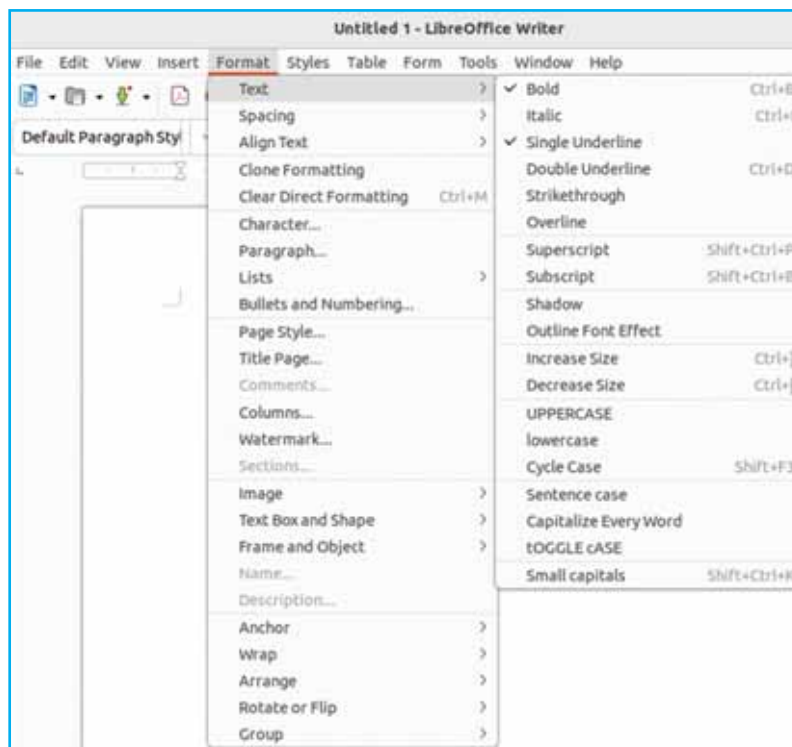


Figure 6.5 : Format Menu and Submenu

Sidebar

The Sidebar is a panel on the right side of the screen that gives quick access to useful tools and settings. It includes sections like Properties, Styles, Gallery, Navigator, Page, Find and more. Users can quickly change text formatting, apply styles, insert images from Gallery, or move around the document using the Sidebar. It saves time by reducing the need to go through menus. The Sidebar can be shown or hidden as per our requirements, hence it is helpful for both beginners and expert users. It is shown in figure 6.6.



Figure 6.6 : Side Bar

Status bar

The Status Bar provides quick information about the current document that we are processing. As shown in figure 6.7, it displays details like the page number, word and character count of the content in the document, language, and zoom level. It also shows the document's insertion mode (insert/overwrite) and selection mode. Users can easily adjust the zoom level of the document and switch between page views from here. This bar informs us about the document's current status without visiting various menu and submenu options.

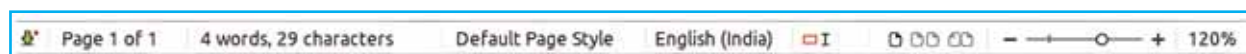


Figure 6.7 : Status Bar

The status bar shows more details when we click on its parts. For example, clicking “Words and Characters” shows more information about the document. In figure 6.8, two lines are written in the document, and the second line with 10 words is selected. Details for the selected part and the whole document are visible in the expanded Word Count window, as shown in figure 6.8.



Figure 6.8 : Status Bar – More Details

Other useful features of Writer

- **Rulers:** The Rulers helps us to set margins and indentations for the document. They provide a visual guide along the top and left edges of the document. This helps us in aligning text and objects precisely on the page. The *horizontal* ruler across the top of the document is visible by default but the *vertical* ruler on the left is hidden by default. To enable the *vertical* ruler, choose *View→Rulers→VerticalRuler* on the *Menubar*, or choose *Tools→Options→LibreOfficeWriter→View*, and then tick the *Verticalruler*.



Figure 6.9 : Rulers

- **Minimize, Maximize, Close:** Three buttons visible on the top-right corner of Writer software as shown in figure 6.10. They have the following uses:

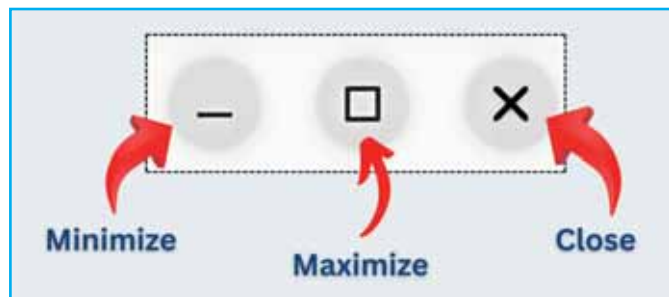


Figure 6.10 : Minimize, Maximize and Close

- Minimize: Hides the Writer window from view and places it on the taskbar.
 - Maximize: Enlarges the Writer window to fill the entire screen for better visibility.
 - Restore Down (when maximized): Returns the window to its previous smaller size.
 - Close: It will close the Writer application and ask to save document, if there are any unsaved changes.
- **Document views:** Writer has three ways to view and edit a document: *Normal*, *Web*, and *FullScreen*. To change the view, go to the *View* menu and select the required view.
 - **Normal view:** It is the default view in Writer. It shows how the document will look when printed or exported as a PDF. In this view, we can use the Zoom slider and the View Layout icons on the Status bar to change the magnification. We can also hide or show the headers and footers and the gap between pages.
 - **Web view:** It shows how the document will look if viewed in a Web browser; this is useful when creating HTML documents. In Web view, we can use only the Zoom slider.
 - **Full Screen view:** In Full Screen view, no toolbars or sidebar are displayed; the document is visible in the full screen area. To exit Full Screen view and return to the previous view, press the *Esc* key or click the Full Screen button. We can use **Ctrl+Shift+J** to enter or exit Full Screen view.

Let us understand steps to create, save, and close a new document using the LibreOffice Writer software.

Creating a New Document

We can start a new, blank document in Writer in different ways. If a document is already open in LibreOffice, the new document is created in a new window. To start a new document in LibreOffice Writer, we can follow any of the following steps:

- Open LibreOffice on your computer. We can do this by clicking on the LibreOffice icon or finding it in applications menu of the Ubuntu operating system.
- Once LibreOffice is open, we can see the LibreOffice Suite Start Center on screen. From here, click on “*Writer Document*” to open a new text document, as shown in figure 6.1 related to opening Writer from LibreOffice suite launcher.
- Alternatively, if we already have LibreOffice Writer open, we can create a new document by clicking on “*File*” in the menu bar at the top of the screen. Choose *File*→*New*→*Text Document*. A new, blank document will open, ready for us to begin typing. We can also use **Ctrl+N** command to open a new document when Writer is already open.

Saving a Document

Saving a document ensures that our document content is stored safely for future use in computer. By default, LibreOffice Writer saves documents in the **ODT** (Open Document Text) format. This format is open-standard, supported by many other word processors. A document can be saved using various

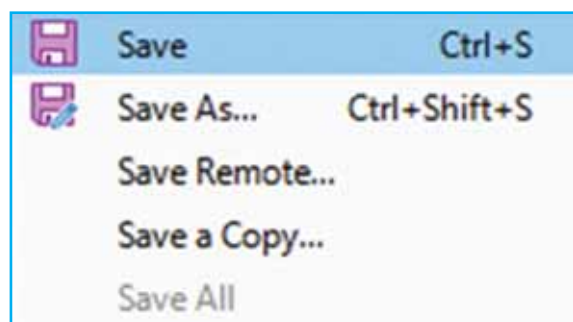


Figure 6.11 : Document Save Options

save options visible in the **File** menu as shown in figure 6.11.

We can save a document by clicking on the **Save** icon in the toolbar or using the command **Ctrl + S**. When we are saving a document first time, Writer will ask us to choose a file name and location. We can also use **Save As** to create a new copy of the document with a different name, format, or location.

We can use any of the following options to save document.

- **Save (Ctrl + S command):** It is used to save the content of the current document with its existing filename and location.
- **Save As (Ctrl + Shift + S command):** Save As option is used to create a new document with the same content as in current document. This option is also useful for changing the filename, selecting a different file format, or saving the same document in a new location on our computer.
- **Save Remote:** It is used when we want to store our document on a remote server or location, such as cloud storage.
- **Save a Copy:** This allows us to save an additional copy of existing document under a different name or in a different location, keeping the original file open for further editing.
- **Save All:** This option is used to save all the currently open documents, ensuring that no changes are lost in any of the files. Content of all the files will be saved in a single command.

Closing a Document

To close a document, go to *File*→*Close* in the Menu bar, or click the **x** located at the top of document's window. When we close the last document, the LibreOffice Suite Start Center will appear on the screen.

If the document has unsaved changes, Writer will prompt us to *Save*, *Don't Save*, or *Cancel* before closing as shown in figure 6.12. We need to decide whether to save or discard our document changes.

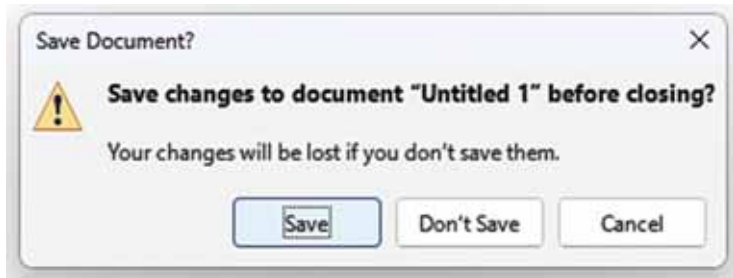


Figure 6.12 : Close Document

Exiting LibreOffice Writer

To close the LibreOffice Writer application completely (not just close a document), we can use any of the following methods:

- Click on *File*→*Exit* from the menu bar.
- Or, click the *Close* (**x**) button at the top-right corner of the Writer window.
- Or, use the keyboard shortcut *Alt + F4*.

If we have any unsaved documents open, Writer will ask us to save our work first before exiting the application.

Opening an Existing Document

There are different ways to open an existing document in a Writer. When no document is open, follow these steps:

- Start LibreOffice Writer from the OS Start menu or Desktop shortcut.
- Click on *File*→*Open* from the menu bar or Press *Ctrl + O* shortcut on keyboard. An Open dialog box will appear.
- Browse through your computer's folders and select the desired document.
- Click **Open** to load the document into Writer.

Alternatively, if the document was opened recently, we can go to *File*→*Recent Documents* and select it directly from the list. Note that renamed or relocated documents can still be listed in the Start Center. Selecting such document will give an error message that the file does not exist.

Writer allows us to open files of various formats, such as *.odt*, *.txt*, *.docx*, and *.doc*. It provides flexibility in handling different document types.

Using Templates

A template in Writer is a model document that is used to create other documents. They are pre-designed document layout that serves as a starting point for creating new documents. It contains predefined formatting, styles, fonts, text or images that help maintain consistency and save time.

Templates are useful when we need to create multiple documents with a similar structure, such as letters, resumes, reports, or bills. Instead of formatting each new document from the beginning, we can use a template and just fill in our required content in a new document.

We can create a template in Writer to save time and keep things consistent. For example, we might design a student progress report template that automatically includes our school's logo and address on the first page. Then, whenever we open that template to create a new student report, the logo and address will already be added in the new document, saving our time.

Similarly, if we are writing a letter, we can use a letter template that has the sender's and receiver's address blocks, date, subject line, and closing section already formatted as shown in figure 6.14. We just need to type our new message and fill in the specific details; the rest of the details are already available in the template. Hence we do not have to type or format a full document again, saving our document preparation time.

Creating a document from a template

There are many methods available to create a new document based on an existing template in Writer.

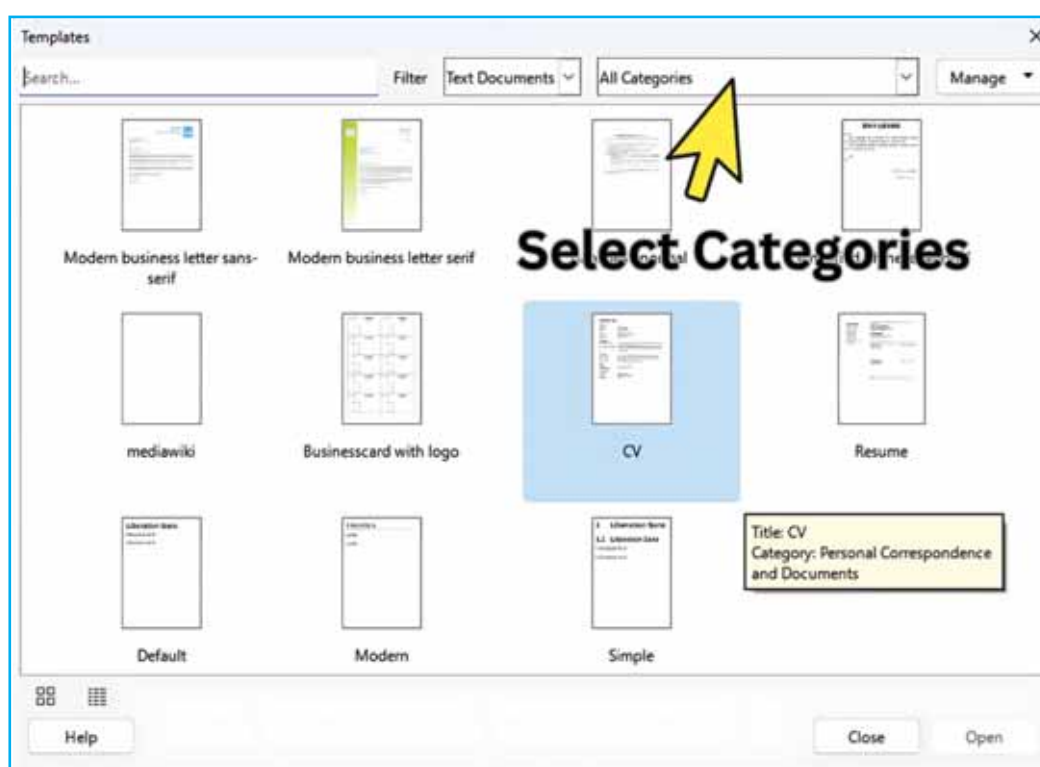


Figure 6.13 : Templates Window

Let us understand the quickest and most simple method of creating a document.

- Open LibreOffice Writer.
- Go to *File*→*New*→*Templates* or we can also use a shortcut **Ctrl+Shift+N**.
- The "Templates" dialog box will appear as shown in figure 6.13. In this dialogbox, we can see a list of available templates. Some of the templates come with the LibreOffice installation. We can filter the available templates using *Filter* drop-down list available on the top of the Template window.

- Categories: Templates are organized into categories like Business Correspondence, Personal Correspondence and Document (CV, Resume), etc. We can select the required category as per our need.
- My Templates: Custom-saved templates created by us are visible here.
- Select the template you want to use, and click "Open".

A new, unsaved document will open, pre-formatted with the content and styles as per the chosen template. We can now start typing our content in the document. Figure 6.14 shows the sample letter template opened when we select a category called a *Modern Business Letter*. You need to just add your details into this pre-formatted letter.

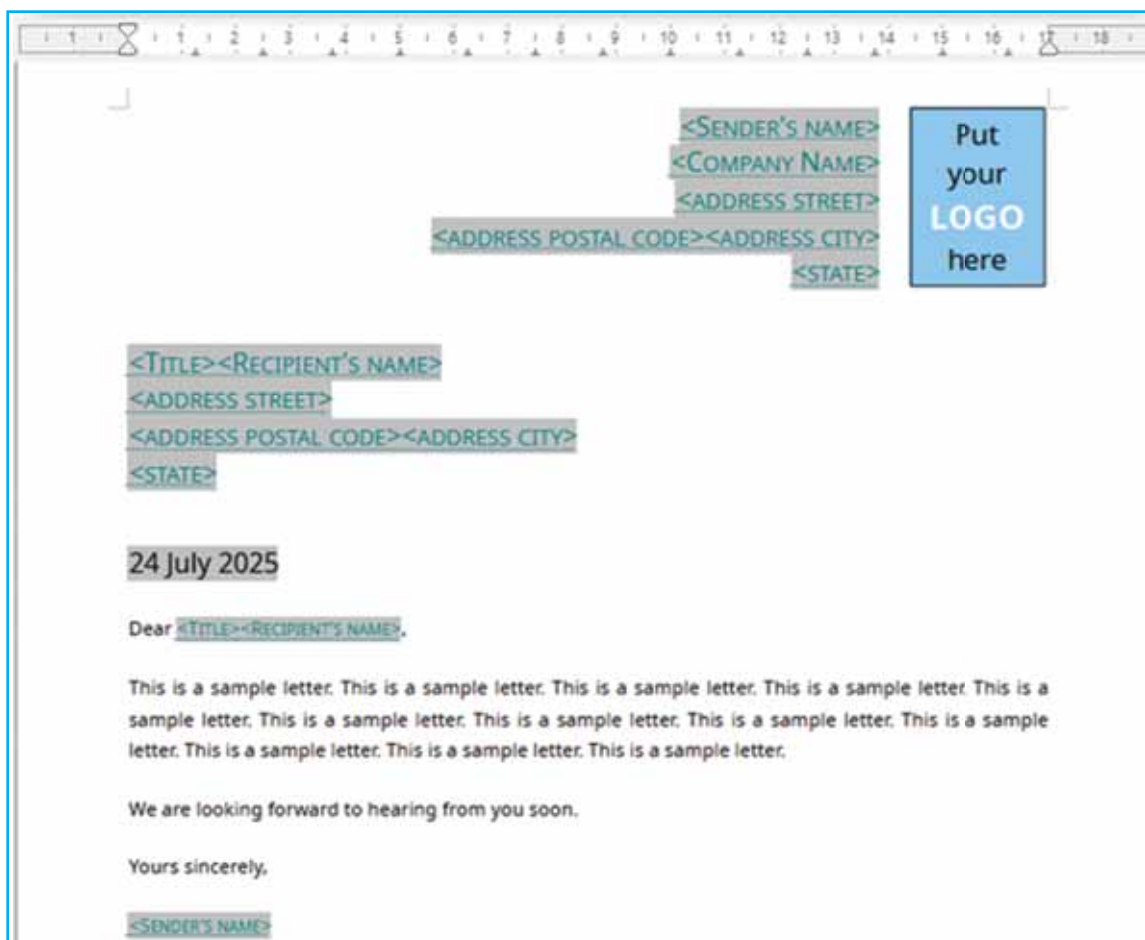


Figure 6.14 : Letter Template

Navigating Content of a Document

Navigation in Writer refers to the process of moving through the content of a document efficiently. It includes using tools like the Scroll Bar, Keyboard Shortcuts, Navigator, and Find and Replace features to quickly jump to different parts of the document. Navigator helps us in going to a specific page, heading, table, image, or section of a document. It is important to learn navigation techniques as it offers following important benefits:

- Saves time by allowing direct navigation to headings or specific pages.
- Improves efficiency by enabling quick access to elements like tables and comments.
- Helps in managing large documents like lengthy reports or books.

Let us understand important navigation features of the Writer.

Using Scroll Bars

Writer provides both vertical and horizontal scroll bars for easy navigation in the document.

- **Vertical Scroll Bar:** It allows us to move up and down through the pages of document. It is available near the Sidebar of the document.
- **Horizontal Scroll Bar:** Enables side-to-side navigation, which is especially useful for wide documents containing content like spreadsheets or tables. It is available just above the Status bar of the document. It is visible only when a document width is greater than the screen size of the Writer application.
- **Quick Navigation using Mouse:** We can click and drag the scroll bars or use the scroll wheel on our mouse for faster movement.

Keyboard Navigation

Keyboard shortcuts provides good control over the cursor position in the document:

- **Arrow Keys:** We can use the arrow keys of our keyboard to move the cursor character by character or line by line.
- **Page Up / Page Down:** We can jump up or down one page at a time using page-up or page down key of the keyboard.
- **Ctrl + Arrow Keys:** For faster navigation, hold the *Ctrl* key while pressing the arrow keys to move by words or paragraphs.

Document Navigator Tool

The Document Navigator is a powerful tool for quickly locating different elements within our document. The Navigator provides a structured overview of your document, showing headings, tables, images, bookmarks, and more, allowing for quick access to specific sections.

- To open and accessing the Navigator tool, Press **F5** or go to *View→Navigator*. This will open a navigator tool as shown in figure 6.15.

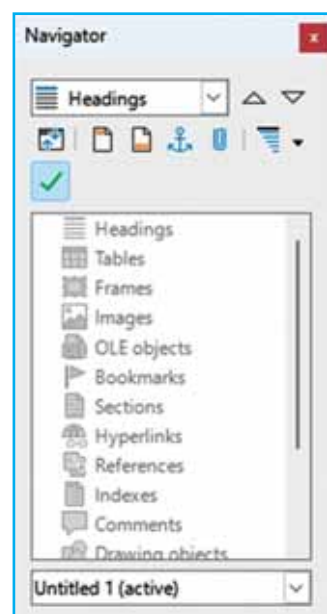


Figure 6.15 : Navigator Tool

Go To Page

Use following options for direct navigation to a specific page number of our document:

- **Go To Page:** To jump to specific page number, go to *Edit→Goto Page* or use shortcut **Ctrl + G**. This feature is very useful to save our time specifically while working with very lengthy documents like books or annual reports.

Zoom and View Modes

Adjusting the view size of document can make editing more comfortable. We can set document view size using a zoom tool.

- **Zoom In/Out:** Use the zoom slider on the toolbar or go to *View→Zoom* to change the size (magnification level) of a document. It is shown in figure 6.16.

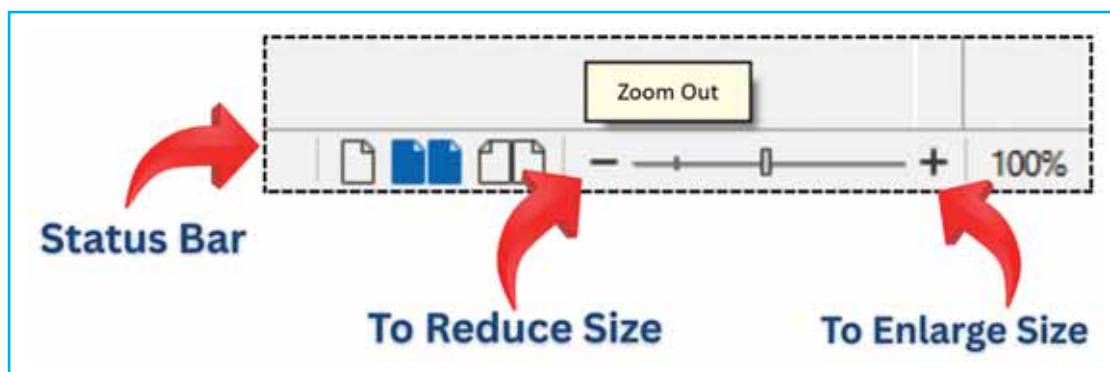


Figure 6.16 : Zoom Slider

- **View Options:** Choose from different viewing modes such as Normal, Web, or Full Screen to suit your task.

Page Preview and Print

Before printing, use the Page Preview option to see how document will look on paper. To see the print view, go to *File→Print Preview* or use shortcut **Ctrl + Shift + O**. To print the document on the connected printer, go to *File→Print* or use shortcut **Ctrl + P**.

Keyboard Shortcuts in Writer

Table 6.2 covers some keyboard shortcuts that can significantly enhance your document editing experience in Writer.

Sr. No.	Shortcut Key / Commands	Use of Command
1	Ctrl + N	Create a new document
2	Ctrl + O	Open an existing document
3	Ctrl + S	Save the current document
4	Ctrl + Shift + S	Save file with different name or at different location (Save As)
5	Ctrl + P	Print the current document
6	Ctrl + Z	Undo the last action
7	Ctrl + Y	Redo the last undone action
8	Ctrl + C	Copy selected text or object
9	Ctrl + V	Paste copied content at the cursor position
10	Ctrl + B	Apply or remove bold formatting to selected text

Table 6.2 : Useful Keyboard Shortcuts in Writer

For detailed information about the LibreOffice Writer, visit the official documentation at the following link: <https://documentation.libreoffice.org/en/english-documentation/>. From this webpage, you can download the LibreOffice Writer's Guide in PDF format.

Summary

In this chapter, we explored the fundamentals of word processing and the purpose of a word processor. We learned about the key characteristics that make word processors powerful tools for creating and editing documents. Different types of word processor software were discussed. The chapter introduced the LibreOffice Suite, with a special focus on LibreOffice Writer. The Writer's user-friendly interface and various components like the Menu Bar, Toolbars, Sidebar, and Status Bar are discussed. We also understood the use of important features such as rulers and document viewing options. During the chapter, tasks such as creating, saving, opening, and closing documents were explained in detail. We have also learned, how to use ready-made templates to simplify our document editing work. Finally, we covered how to navigate through a document effectively using different tools. In the upcoming chapter, we will thoroughly explore the tasks involved in document editing and formatting.

EXERCISE

1. What is a word processor, and how does it help in creating and editing documents efficiently?
2. List and describe at least four important characteristics of a word processor.
3. What are the different types of word processor software available, and how are they categorized?
4. What is LibreOffice Suite, and why is LibreOffice Writer very popular in educational institutions?
5. Briefly explain the various parts of the LibreOffice Writer main window. Briefly describe use of the Menu Bar, Toolbars, Sidebar and Status Bar.
6. What is the purpose of the rulers in LibreOffice Writer?
7. How can we minimize, maximize, and close a document in LibreOffice Writer?
8. Explain key steps involved in creating, saving and opening a document in LibreOffice Writer.
9. Explain the advantage of using pre-designed templates while working with a document.
10. What are the different ways to navigate through a long document in LibreOffice Writer?
11. **State whether true or false.**
 - (1) LibreOffice Writer is a spreadsheet software used for performing calculations.
 - (2) Word processors like LibreOffice Writer allow users to edit and format text easily.

- (3) The Status Bar in LibreOffice Writer shows information like page number, word and character count.
- (4) Minimize and Maximize buttons are used to control the size of the Writer window.
- (5) The Writer application can be used to open only .ODT type of files.

12. Fill-in the blanks.

- (1) A _____ is a software application from LibreOffice Suite used to create, edit, and format text documents.
- (2) A _____ provides a ready-made layout that can be used to create similar types of documents based on pre-defined formatting.
- (3) The _____ bar in LibreOffice Writer contains menus like File, Edit, View, Style, Format, Insert, etc.
- (4) To open an existing document in LibreOffice Writer, we can use the _____ option from the File menu.
- (5) The _____ shortcut key can be used to see the print preview of a document.

13. Multi-choice question. Choose the most correct answer.

- (1) Which of the following is an example of a word processor?
 - (a) MS Paint
 - (b) LibreOffice Writer
 - (c) VLC Player
 - (d) Google Chrome
- (2) What is the primary function of a word processor?
 - (a) Play audio files
 - (b) Create and edit text documents
 - (c) Design websites
 - (d) Browse the internet
- (3) Which of the following is NOT a characteristic of a word processor?
 - (a) Spell check
 - (b) Text formatting
 - (c) Video editing
 - (d) Copy and paste
- (4) LibreOffice Writer belongs to which category of software?
 - (a) Web browser
 - (b) Open-source office suite
 - (c) Image editor
 - (d) Database manager
- (5) Which component of LibreOffice Writer displays page number, word count, and language settings?
 - (a) Sidebar
 - (b) Formatting Toolbar
 - (c) Status Bar
 - (d) Menu Bar

- (6) What is the purpose of using a template in LibreOffice Writer?
- (a) To play music in background
 - (b) To get a pre-formatted document layout
 - (c) To increase font size
 - (d) To convert the file into PDF
- (7) Which option allows us to save a document with a different name or location in Writer?
- (a) Save (b) Close (c) Save As (d) Export
- (8) What does the Maximize button do in Libre Office Writer?
- (a) Closes the document (b) Minimizes the window
 - (c) Opens the help menu (d) Enlarges the window to full screen
- (9) Which of the following is used to move through the pages of a long document in Writer?
- (a) Title Bar (b) Search Bar (c) Status Bar (d) Scroll Bar
- (10) Which of the following shortcut can be used to open a Template window in Writer?
- (a) Ctrl+S (b) Ctrl + Shift + N (c) Ctrl + P (d) Ctrl + O

Laboratory Exercise

1. Create a document in LibreOffice Writer to maintain details related to your hobbies. Perform steps as mentioned below:
 - Make the heading “**My Hobbies**” on first page.
 - Write first paragraph about some of your hobbies.
 - Write a second paragraph about "My Favorite Hobby".
 - Use basic formatting: apply bold to the title, change font size and colour.
 - Save the document as **MyHobbies.odt** on the Desktop.
2. Create a document to maintain details about the courses which you are currently learning. Perform following steps:
 - Create a document and save it in your computer with the filename as “**MySubjects.odt**”.
 - Write name of at-least five subjects in it.
 - Apply appropriate formatting on the details written by you.
 - Save and close your file.

3. Open **MySubjects.odt** file from your computer, and perform following tasks:
 - Add one more paragraph with details about who is teaching which course.
 - Create a new document using **Save As** utility.
 - Save this new file as “**MySubjects-and-Teachers.odt**” file name in your computer.
4. Create a new document to save details related to your School Magazine. Try to create more than 3 pages in this document to save details like Science Day Celebration, Annual Sports Day, Winners of the Dance Event. Perform following tasks:
 - Save your file with “**SchoolMagazine.odt**” filename.
 - Write School name and address on the first page of magazine.
 - On the second page, write details about yourself (Roll number, Name and Address).
 - On the next page, write a short paragraphs about various events.
 - Create a multi-page document with appropriate formatting.
5. Create a document in Writer using built-in template. Perform following tasks.
 - Click **File**→**Templates**→**Manage Templates**.
 - Choose a template such as "Resume" or "Business Letter".
 - Fill in the some sample details. You may consider to write a sample letter to your friend.
 - Save the document as “**MyLetter.odt**”.





Working with a Document

Introduction

In the previous chapter we learned the importance of a word processor and saw how to create a word document using LibreOffice Writer. In this chapter we will look into how to perform operations on the text used in the document. We will learn to perform operations like selecting a text, deleting a text, moving text from one place to another using operations like cut, copy and paste. We will also learn to undo and redo the changes made in the document. We will further work with attributes of fonts like size, style, color, effects and more. Lastly we will learn how to format a page, create headers and footers, and use bullets and numbering in the document.

Operations on Text

With the help of word processors, we can produce, edit, and present information clearly and professionally. Text operations like selecting, deleting, cutting, copying, and pasting are crucial for effectively organizing and improving a document. These steps ensure that our material is correct, consistent, and well-structured. These operations also help us to save time and prevent duplication. In this section we will see how to perform all the said operations in a document.

Selecting Text

Once a document is created we might need to make changes in it. The most basic operation to do changes in the document is to select a text that needs to be changed. There are multiple ways of selecting a desired text from a document. We can use a mouse, arrow keys on the keyboard to do the text selection. Depending on our need we can select a character, a word, a sentence or an entire document. The consecutively selected text content is usually referred to as a block. It is also possible to select multiple blocks across the document.

Selecting a Character or Set of Characters: To select a character or set of characters we first need to position the cursor to the left of the start character. This can be achieved by left clicking the mouse in front of the initial character. Once the cursor is at the desired position, keep the left mouse button pressed and drag the mouse until the last character of the text that we want to select and release the mouse button. The text on which this operation was performed will now be highlighted with orange colour. Figure 7.1 shows the selection of a set of characters.

Selecting a Character or Set of Characters: To select a character or set of characters we first need to position the cursor to the left of the start character. This can be achieved by left clicking the mouse in front of the initial character. Once the cursor is at the desired position, keep the left mouse button pressed and drag the mouse until the last character of the text that we want to select and release the mouse button. The text on which this operation was performed will now be highlighted with orange colour. Figure 8.1 shows the selection of a set of characters.

Figure 7.1 : Text Selection

Alternatively we may use the keyboard to select the text. Once the initial position of the text is selected, press Shift key, holding the Shift key down, use the right arrow keys to take the cursor to the last character of the text we want to select and release the Shift key.

The selection operation can be performed from both directions left or right. The above process will select the text from left to right. To select the text from right to left, we need to place the cursor at the end of the text to be selected and move towards the left side of text until we reach the initial text.

Selecting a Word: To select a word we may simply double click (click two times in quick succession) anywhere on the word. The word will immediately get highlighted. Alternatively we can position the cursor to the left or right side of the word and press Shift, Ctrl and Arrow Key (Left if at the beginning of word. Right if at the end of word) together.

Selecting a Sentence: To select a sentence we have to triple click (click three times in quick succession) on any of the words in the sentence. The sentence will immediately get highlighted.

Selecting a Document: To select the entire document from anywhere within the document we can press Ctrl and A keys together. The entire document will get highlighted.

It is also possible to select a partial document from the current cursor position. We can press the Shift, Ctrl and Home keys together to select the upper half of the document from a cursor position. To select the lower half press the Shift, Ctrl and End keys together.

Selecting Multiple Non-consecutive Blocks: LibreOffice Writer allows us to select text of multiple non-consecutive blocks also. The operation can be performed as follows:

1. Select the first block using any of the techniques mentioned earlier.
2. Press and hold the Ctrl key.
3. Select the next block.

If more blocks need to be selected, keep the Ctrl key pressed and go on selecting the desired blocks. Once all the desired blocks have been selected release the Ctrl key.

We can also use the keyboard to select multiple non-consecutive blocks. The operation can be performed as follows:

1. Select the first block using any of the techniques mentioned earlier.
2. Press Shift and F8 keys together.
3. Move to the desired second text block using arrow keys.
4. Select the next block.

If more blocks need to be selected, simply go to the next desired block and select it. Figure 7.2 shows the view of multiple text block selections.

Selecting a Document: To select the entire document from anywhere within the document we can press Ctrl and A keys together. The entire document will get highlighted.

It is also possible to select a partial document from the current cursor position. We can press the Shift, Ctrl and Home keys together to select the upper half of the document from a cursor position. To select the lower half press the Shift, Ctrl and End keys together.

Selecting multiple non-consecutive blocks: LibreOffice Writer allows us to select text of multiple non-consecutive blocks also. The operation can be performed as mentioned:

1. Select the first block using any of the techniques mentioned earlier.
2. Press and hold the Ctrl key.
3. Select the next block.

If more blocks need to be selected, keep the Ctrl key press and go on selecting the desired blocks. Once all the desired blocks have been selected release the Ctrl key.

We can also use the keyboard to select multiple non-consecutive blocks. The operation can be performed as mentioned:

Figure 7.2 : Multiple Text Block Selection

Selecting Vertical Blocks: LibreOffice Writer allows us to select vertical blocks of text. Such a selection might come handy when we want to select data in a columnar manner. The operation can be performed as follows:

1. Click on the *Edit* menu of the LibreOffice Writer window.
2. On the drop down menu move the mouse pointer on the *Selection Mode* option. This will further open other options. By default the *Standard* option would be selected.
3. Select the *Block Area* option.
4. Select the desired block using any of the techniques mentioned earlier.

We need to select the *Edit* → *Selection Mode* → *Standard* option again to switch back to our original selection mode. Figure 7.3 shows a sample of vertical block selection.

Selecting vertical blocks: LibreOffice Writer allows us to select vertical blocks of text. Such a selection might come handy when we want to select data in a columnar manner. The operation can be performed as mentioned:

1. Click on the Edit menu of the LibreOffice Writer window.
2. On the drop down menu move the mouse pointer on the *Selection Mode* option. This will further open other options. By default the *Standard* option would be selected.
3. Select the *Block Area* option.
4. Select the desired block using any of the techniques mentioned earlier.

Figure 7.3 : Vertical Block Selection

We can also use the keyboard to select vertical blocks. The operation can be performed as follows:

1. Press Shift, Alt and F8 keys together.
2. Move to the desired vertical block and select it using either mouse or arrow keys.

Press Shift, Alt and F8 keys again to switch back to the standard selection mode. Table 7.1 lists down all the shortcut keys (all the keys are required to be pressed together) that can be used to perform the selection operation.

Shortcut Keys	Description of the contents selected
Shift + ←	Selects a single character to the left of the current cursor position.
Shift + →	Selects a single character to the right of the current cursor position.
Shift + ↑	Selects all the contents to the left side of cursor position and all the right side contents of one line above till exactly the top of cursor position.
Shift + ↓	Selects all the contents to the right side of cursor position and all the left side contents of one line below till exactly the top of cursor position.
Shift + Ctrl + ←	Selects a word to the left of the current cursor position.
Shift + Ctrl + →	Selects a word to the right of the current cursor position.
Shift + Ctrl + ↑	Selects all the contents to the left side of cursor position and entire paragraph above.
Shift + Ctrl + ↓	Selects all the contents to the right side of cursor position and entire paragraph below.
Shift + Home	Selects all the contents to the left side of the cursor position till the beginning of the line.
Shift + End	Selects all the contents to the right side of the cursor position till the end of the line.
Shift + Ctrl + Home	Selects all the contents to the left side of the cursor position till the beginning of the document.
Shift + Ctrl + End	Selects all the contents to the right side of the cursor position till the end of the document.
Ctrl + A	Selects all contents of the document.

Table 7.1 : Shortcut Keys for Selection Operation

Deleting Text

One of the ways of correcting the errors made in the document is to delete the contents. The simplest delete operation can be performed by placing the cursor on the rightmost side of the content to be deleted and pressing Backspace key. Using this method we can delete a single character or set of characters.

Alternatively it is possible to delete a text block horizontally or vertically using the Delete key. To perform this operation we need to first select the desired text block and simply press the Delete key. Table 7.2 lists down the shortcut keys that can be used to perform the delete operation.

Shortcut Keys	Action on the contents
Delete	Deletes the character to the right of the cursor position.
Backspace	Deletes the character to the left of the cursor position.
Ctrl + Delete	Deletes a word to the right of the cursor position.
Ctrl + Backspace	Deletes a word to the left of the cursor position.

Table 7.2 : Shortcut Keys for Delete Operation

Cutting, Copying and Pasting Text

Many times we need to reorganize the content of the document. We might need to move a word, heading, paragraph or objects like image or table from one section of a document to another or may be to an entirely new document. The cut, copy and paste operations come in handy in such cases. Let us first understand what these operations do.

Cut: The cut operation moves the chosen object (text, image, table etc) from its original location to the clipboard. It is frequently used to move contents from one place to another. After the cut operation is performed the object selected will be removed from the document and will no longer be visible in its original position.

Copy: The copy action copies the objects and puts it on the clipboard, leaving the original object in place. This operation is helpful when we want to replicate an object across several places. After the copy operation is performed the original object remains intact and we get its duplicate at a new place.

Paste: The paste operation inserts the content from the clipboard at the current cursor location within a document. We can paste objects that we have either cut or copied. For example, after cutting or copying a paragraph, we can paste it into a different part of the same document or into another document altogether.

The operations of moving or copying an object can be done in multiple ways as follows:

Using Shortcut Keys: The simplest method to move or copy a selected text is to use the predefined keyboard shortcut keys. The steps are as follows:

1. Select the text (Consecutive, Non-consecutive or Vertical) to be moved or copied using the selection techniques learned earlier.
2. To cut the text, press Ctrl and X keys together or to copy the text, press Ctrl and C keys together.
3. Move the cursor to the location where the selected text is to be moved or copied.
4. Press Ctrl and V keys together.

Using Icons: Another method to move or copy a selected text is to use the icons shown in figure 7.4 on LibreOffice Writer Window.

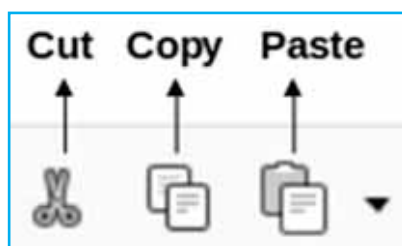


Figure 7.4 : Cut-Copy-Paste Icons

The steps to perform the operation are as follows:

1. Select the text (Consecutive, Non-consecutive or Vertical) to be moved or copied using the selection techniques learned earlier.
2. To move the text click on the cut icon (scissor) or to copy the text click on the copy icon (double notepad).
3. Move the cursor to the location where the selected text is to be moved or copied.
4. Click on the paste icon (writing pad support and notepad).

Using a Menu: To move or copy a selected text using the menu perform the steps follows:

1. Select the text (Consecutive, Non-consecutive or Vertical) to be moved or copied using the selection techniques learned earlier.
2. Click on the *Edit* menu of the LibreOffice Writer window.
3. From the drop down menu choose the *Cut* option to move the selected text or choose the *Copy* option to create a duplicate.
4. Move the cursor to the location where the selected text is to be moved or copied.
5. Click on the *Edit* menu of the LibreOffice Writer window once again. Choose the *Paste* option from the drop down menu.

Using a Mouse: To move or copy a selected text using the mouse perform the steps follows:

1. Select the text (Consecutive, Non-consecutive or Vertical) to be moved or copied using the selection techniques learned earlier.
2. Keep the mouse pointer anywhere on the selected text and right click the mouse button. This will open a context menu as shown in figure 7.5.
3. From the submenu choose the *Cut* option to move the selected text or choose the *Copy* option to create a duplicate.
4. Move the cursor to the location where the selected text is to be moved or copied.
5. Right click the mouse button and a context menu will appear again. Choose the *Paste* option from the context menu. Observe that the *Cut* and *Copy* options are not visible now.

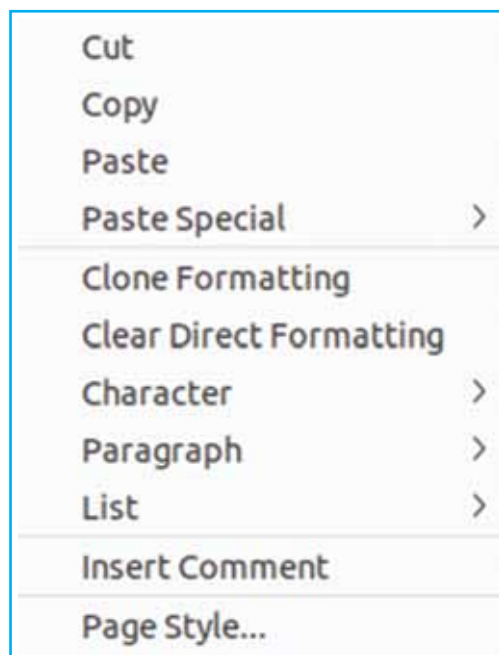


Figure 7.5 : Context menu after Text Selection

Undo and Redo Changes

Errors often happen when working with a document, the undo and redo operations allow us to correct errors or go back to earlier versions of the document. The undo and redo operations can be done only while the document is open.

Undo Operation: To reverse the most recent modifications that have been done in the document we can use any of the methods as follows:

- Use keyboard shortcut Ctrl+Z (pressing Ctrl and Z key together).
- Click on the Undo button on the Standard toolbar as seen in figure 7.6.
- Go to the *Edit* menu and from drop down choose the *Undo* option.

LibreOffice Writer by default allows 100 undo operations in one session. This means that we can revert our document to any of the last 100 changes we have made. To see a list of every change that can be undone, click the tiny triangle to the right of the Undo button seen in figure 7.6. We may select multiple changes together and undo them all at once.

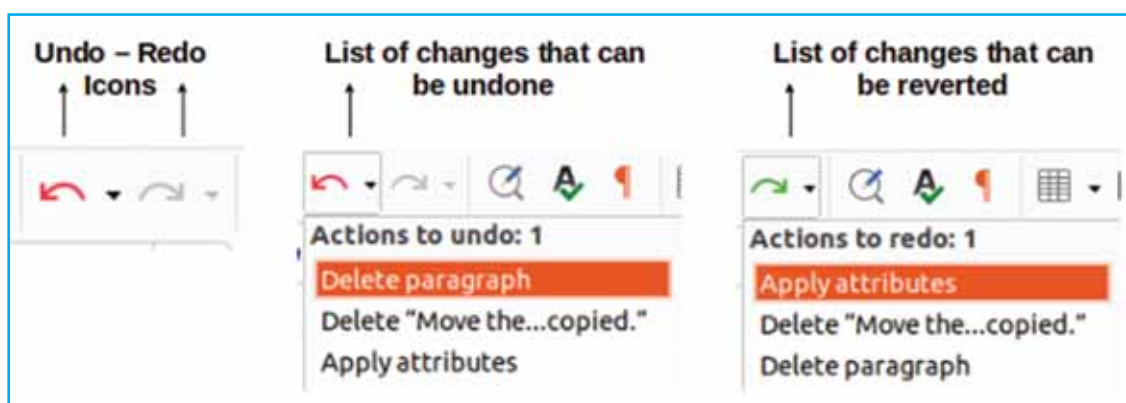


Figure 7.6 : Use of Undo and Redo Operation

Redo Operation: The changes can be reversed once they have been applied using the methods follows:

- Use keyboard shortcut Ctrl+Y (pressing Ctrl and Y key together).
- Click on the Redo button on the Standard toolbar as seen in figure 7.6.
- Go to the *Edit* menu and from drop down choose the *Redo* option.

Just like with Undo to obtain a list of the changes that can be made, click on the triangle to the right of the Redo icon seen in figure 7.6.

Finding the Text within a Document

At times we need to look for a particular text within the document. One of the options is to look into the entire document by making use of scroll bar, arrow, PgUp or PgDn keys. This method of searching needs the user to be alert. To ensure that we are finding correct text we can directly use the *Find* option from the *Edit* menu.

Assume that we want to find the text “Document” within our chapter. Then we need to open the file and perform operations as follows:

1. Click on the *Edit* menu of the LibreOffice Writer window.
2. In the drop down menu click on the *Find...* option. This will further open a Find bar as shown in figure 7.7 above the task bar window.

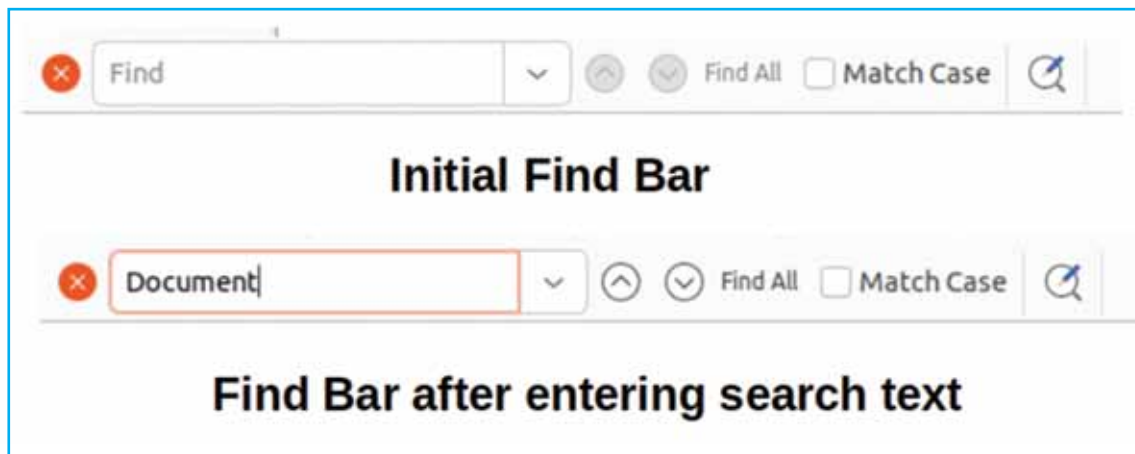


Figure 7.7 : Find Bar

3. Type the word “Document” in the text box, this will enable the up and down arrows along with the *Find All* option.
4. Click on the up or down arrow or the *Find All* option and the word “document” in the file will be highlighted as shown in figure 7.8.

If we click on the up or down arrow the LibreOffice Writer will start searching the file, from the current cursor position and will move the cursor to the first matching place where it finds the text and highlights it. In this case, we have clicked on the *Find All* option, hence all the occurrences are highlighted. The find operation can also be performed using the shortcut key Ctrl + F.

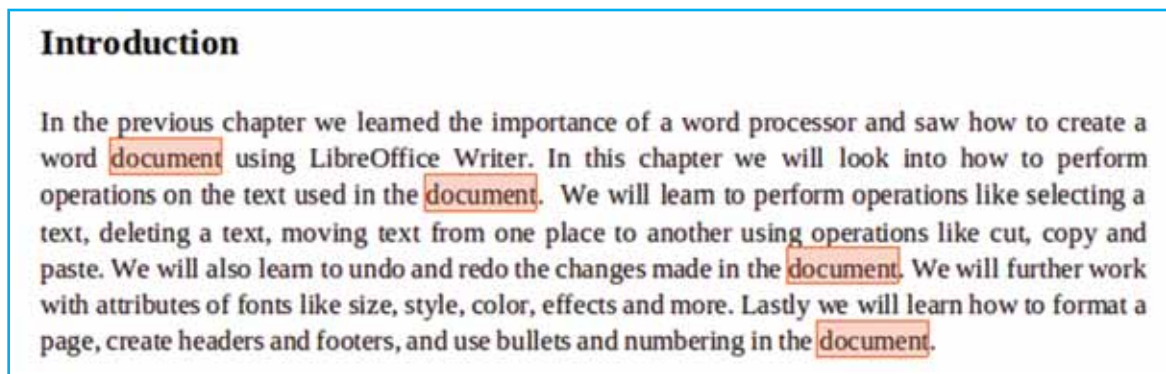


Figure 7.8 : Finding All Occurrence of Word “Document”

Observe that even though the text to be searched was “Document” we can see the word “document” as highlighted. This happens as LibreOffice Writer by default ignores the letter cases. If we want an exact match of the text being searched then we need to select the check box in front of the *Match Case* option visible in figure 7.7.

Finding and Replacing the Text

The *Find..* option allows us to search for occurrences of a text or a phrase within a document. We at times would like to replace every occurrence of a text or phrase in a document. The *Find and Replace...* option of the *Edit* menu allows us to find as well as replace desired or all occurrences of the text or phrase.

For examples, to find all the occurrences of the word “document” and replace it with word “file” perform the steps follows:

1. Click on the *Edit* menu of the LibreOffice Writer window.
2. In the drop down menu click on the *Find and Replace...* option. This will open a Find and Replace dialog box as shown in figure 7.9.
3. Type “document” in the text box having label *Find:*, now all the buttons under the text box with label *Replace:* will be enabled.
4. Ensure that the check box in front of the *Whole words only* option is checked, this will search for the text as a complete entity. For example when we try to find “port”, the word “port” within the word “important” will not be highlighted.
5. Type “file” in the text box having label *Replace:*,
6. Click on the *Replace* button we will find the first instance of the matching word in the document replaced with “file” and then the next matching word in highlight mode.
7. Repeat step 6 till all the replacements are completed. A red circle with white minus sign will be visible if all the instances have been replaced. Alternatively we can click on the *Replace All* button to replace all instances together.

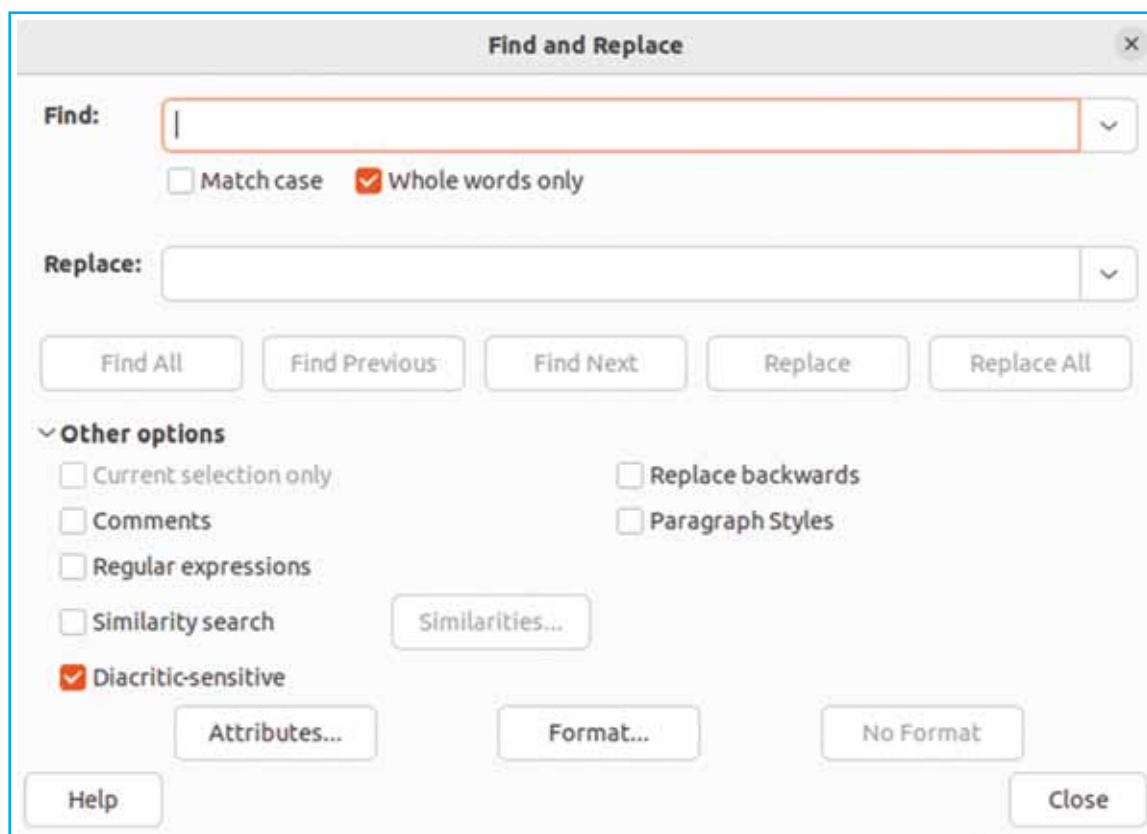


Figure 7.9 : Find and Replace Dialog Box

One needs to be cautious when using the *Replace All* option as at times words not needed to be changed may get replaced. The find and replace operation can also be performed using the shortcut key Ctrl + H or by clicking on the  button on the standard toolbar.

Using Wildcard Characters

We can also use some special character sequences known as wildcard characters to find words that have similar patterns. To ignore any single character we can use a dot “.”, for example, if we type

expression .at, we can find different three lettered words that end with “at” irrespective of the first letter like cat, bat, sat and mat if they are present in the document. The square brackets [] can be used to find text that includes the character at the specified position in the bracket. For example, the expression [cs]at will find words like cat and sat but it will not find the word bat or mat.

We can use [a-z] to specify a character range. For example, [k-n]ill will find words like kill, lill, mill and nill if they occur in the document. To omit a letter from a search we can use a caret (^) sign. For example, [^b]at will find words like cat, sat, mat but not bat. If a wildcard character is part of the text to be searched, type a backslash (\) before the character. For example, to find the text 99.00, we can use the regular expression 99\.00 (Note that “.” is considered as a wildcard character). To use wildcards and regular expressions when searching perform the steps follows:

1. In the *Find and Replace* dialog box shown in figure 7.9 under the label *Other options*, select the check box in front of the *Regular expressions* label.
2. Type the search text, including the wildcards, in the *Find:* text box, add a text in *Replace:* text box if it needs to be changed.
3. Click on *Find All*, *Find Previous* or *Find Next* button as required. In case we want to change the text then click on *Replace* or *Replace All* button.

Using Spelling Checker

Observe that when we create a document in LibreOffice Writer at times we get a curvy red line under a few words. This denotes that there is some spelling error in the text that we have typed. LibreOffice Writer matches each word we type in the document with the words in its default dictionary. It treats a word as misspelled if it is not part of its dictionary. LibreOffice Writer will automatically check for spelling mistakes as we type unless we disable this option. To disable the automatic spelling checking we need to go to *Tools* → *Automatic Spell Checking* option and click on it. Alternatively, we can press Shift + F7 keys to enable or disable it.

To manually check the spellings within the document go to *Tools* → *Automatic Spelling...* option or

press F7 key or click on the spelling checker icon  on the toolbar. A *Spelling* dialog box as shown in figure 7.10 will appear.

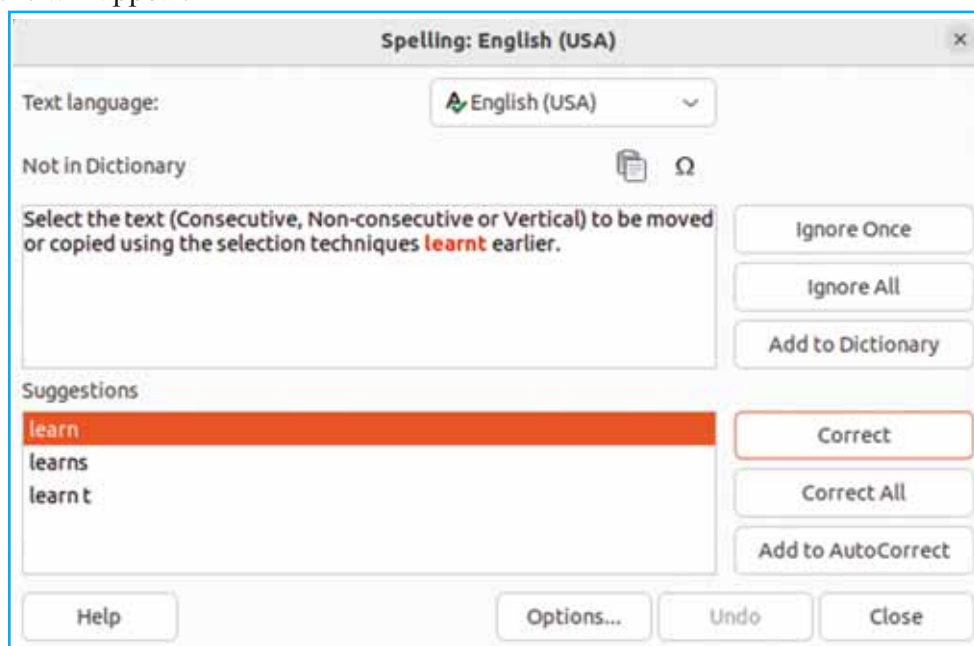


Figure 7.10 : Spelling Dialog Box

LibreOffice Writer will then start comparing each word in the document with the words in its dictionary. It will stop at each curly red line and display possible reasons for the error along with the suggestions as can be seen in the figure 7.10.

We can take multiple actions here, if the word is spelled correctly as per our requirement. For example, if it is our name then we can click on the *Ignore Once* or *Ignore All* (in case of multiple occurrences) button. Alternatively we can also add it to the LibreOffice Writer dictionary by clicking on *Add to Dictionary* button. If the word is spelled incorrectly, we can choose any one suggested spellings under the *Suggestions* list and click on the *Correct* or *Correct All* button. We will be able to continue to correct other spellings until we click on the *Close* button.

To fix individual spelling errors quickly, right click on the underlined incorrect word, a short cut menu similar to the one shown in the figure 7.11 will be displayed. The menu consists of possible correct spellings as well as a list of some actions.

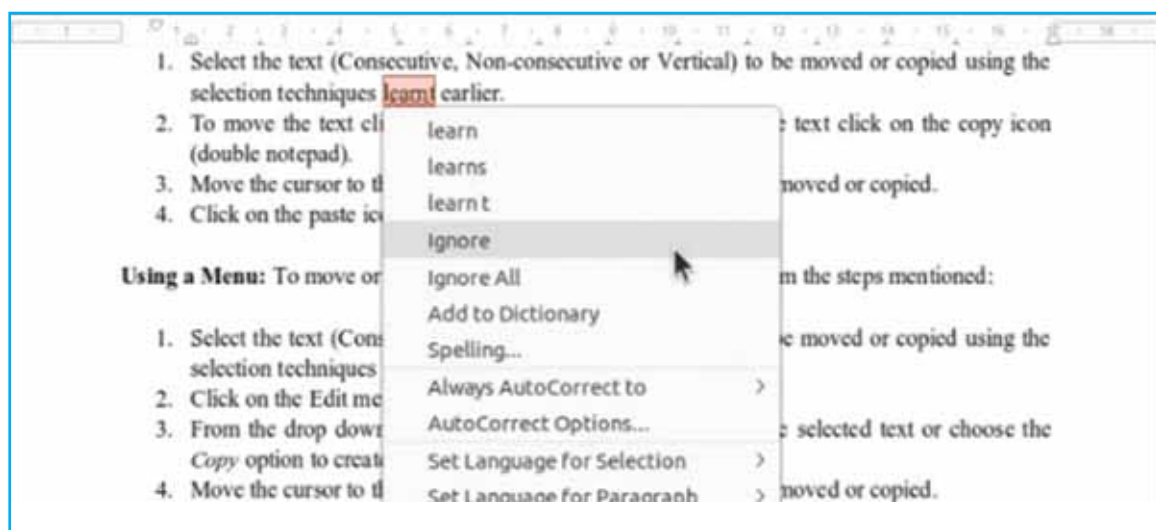


Figure 7.11 : Spelling Context Menu

Select the most suitable option and the curly red underline will be removed as the error will be corrected. Note that the contents of the menu shown in figure 7.11 will change as per the word selected.

Synonyms and Thesaurus

Synonyms provide different ways to express the same idea, while a thesaurus is a reference resource that lists a word's synonyms and sometimes its antonyms. Both these features are very useful when we want to improve the vocabulary used in the document. To replace a word with its synonym perform the steps follows:

1. Select the word whose alternative meaning is to be obtained.
2. Right click on it, from the context menu select Synonyms option.
3. An additional submenu of alternative words will be displayed click on a word by which we want the selected text to be replaced.

This will replace the highlighted word with the new selected word. In step 3 we can also select the *Thesaurus...* option, it will give us a more extensive list of alternative words. Alternatively we can select *Tools* → *Thesaurus...* option.

Working with Font and its Attributes

We usually create a document to present our thoughts in a proper way like a chapter, an essay or may be a report. All the mentioned documents require formatting of a certain kind. We might need to use headings, tables of contents, and emphasis techniques like bold or italics type.

When we create documents in LibreOffice Writer, we can control how our text looks. Just like choosing different clothes for different occasions, we can choose different fonts to make our writing more interesting, easier to read, or more professional. Font attributes are the different characteristics that we can change about our text, such as its size, style, color, and special effects.

Fonts can be considered as the personality of our text. A fancy script font might be perfect for a creative story, while a clean, simple font works better for a school report. Learning to work with font attributes will help us create documents that not only contain great content but also look professional and engaging.

Formatting Tool Bar

The Formatting Toolbar in LibreOffice Writer is usually located just below the standard tool bar. It contains all the tools we need to change how our text looks. The toolbar contains several important sections: font selection, font size, and formatting buttons. We will get drop down menus for choosing fonts and sizes, as well as buttons with symbols like **B** for bold, *I* for italics, and U for underline. Figure 7.12 shows the options of formatting toolbar.

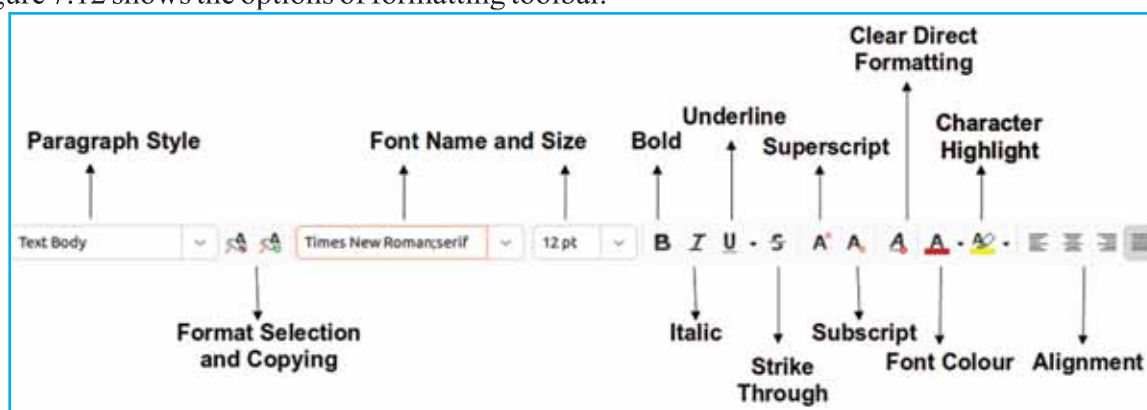


Figure 7.12 : Components of Formatting Toolbar

Changing Font Styles

Font style refers to the actual design of the letters themselves. LibreOffice Writer comes with many built-in fonts. Some fonts are sans-serif fonts, which have clean, straight edges, while others are serif fonts, which have small decorative lines at the ends of letters. When choosing fonts, we need to consider the audience and purpose. Academic papers or books often require specific font styles like Times New Roman or Arial. Creative projects might look good with decorative fonts. To change font style perform the steps follows:

1. Select a character or entire text whose font style is to be modified.
2. Click on the drop down arrow next to the font style box in the Formatting Toolbar, a drop down menu will appear.
3. Select the desired font style.

The font style of the text will now change as per the selection that we did. Note that if we change the font style from an empty cursor position, then all the characters from that cursor position will be typed with the updated font style.

Changing Font Size

Font size determines how big or small your text appears on the page. In LibreOffice Writer, font sizes are measured in points, with larger numbers creating bigger text. A typical document uses a 12-point font for body text, which is comfortable to read without being too large or too small. For headings and titles, we may choose larger sizes like 16, 18, or even 24 points. For footnotes or small details, we can use 8 or 10 points. Different fonts can look different even at the same size, so always check how our text looks after making changes. To change font size perform the steps follows:

1. Select a character or entire text whose font size is to be modified.
2. Click on the drop down arrow next to the font size box in the Formatting Toolbar, a drop down menu with numbers will appear.
3. Select the desired font size, or simply type in the exact size that we want.

The text will now change as per the selection that we did. If we change the font size from an empty cursor position, then all the characters from that cursor position will be typed with the updated font size.

Adding Colour to Text

Colour can make our text more engaging and help organize information, but it should be used thoughtfully. When using colour, make sure that the text remains easy to read. Dark colours like black, dark blue, or dark green work well on white backgrounds. Bright colours can be used for headings or special emphasis. To change text colour perform the steps follows:

1. Select a character or entire text whose colour is to be modified.
2. Click on the colour button in the Formatting Toolbar (Letter “A” with a coloured bar underneath it). The colour of the bar indicates the current colour being used. If we want to use a different colour, click on the drop down arrow next to the colour button. This will open a colour palette as shown in figure 7.13. We can select any basic colour or use a custom colour.

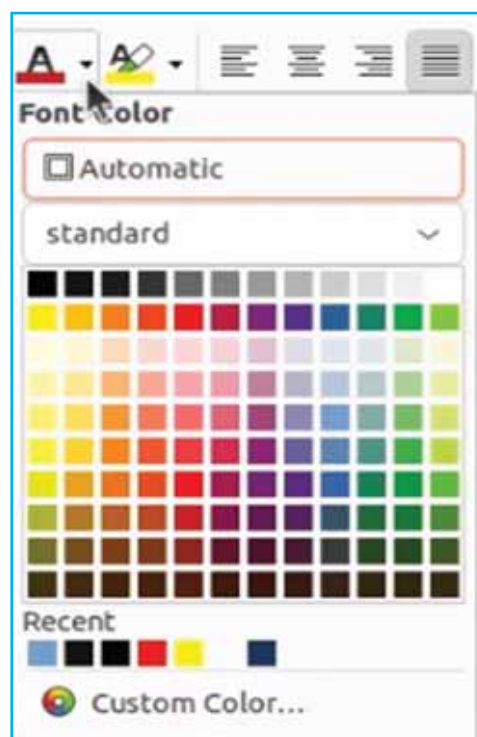


Figure 7.13 : Colour Palette

We can also highlight a character or text with colour similar to applying a font colour. We need to select a character or entire text that is to be highlighted and click on the character highlight button in the Formatting Toolbar (Letter “A” with a chalk and coloured bar underneath it).

Making Text Bold, Italics or Underlined

Bold, italics, and underline are the three most common text formatting options. The bold text draws attention and is perfect for headings, important points, or key terms. Italic text is often used for emphasis, book titles, or foreign words. Underlined text can also highlight important information. These formatting options can be combined, so that we can have a text that is both bold and italic, or bold and underlined or bold, italic and underlined.

To apply these formats, select a character or the text and click on the appropriate button in the Formatting Toolbar as shown in figure 7.12. The bold button looks like a **B**, the italics button looks like an *I*, and the underline button looks like a U. We can use different types of underlines like single, double, bold, dashed and others. We can also use keyboard shortcuts Ctrl + B, Ctrl + I or Ctrl + U to apply the bold, italics and underline effect on a character or a text.

Working with Font Effects

LibreOffice Writer offers several special font effects that can add visual impact to our documents. These effects include options like strikethrough, superscript, subscript, and shadow effects. While these are not used as frequently as the bold or italics, they can be very useful in some specific situations.

Strikethrough text has a line through the middle and is useful for showing deleted or changed information. Superscript (**A^B** button) makes text smaller and raises it above the normal line. Subscript (**A_B** button) makes the text smaller and lowers it below the normal line. It is mostly used in mathematical expressions, footnote numbers, or chemical formulas.

To apply these effects and the ones discussed so far, we can use the menu and select the *Format* → *Character...* option, which will open a *Character* dialog box as shown in figure 7.14.

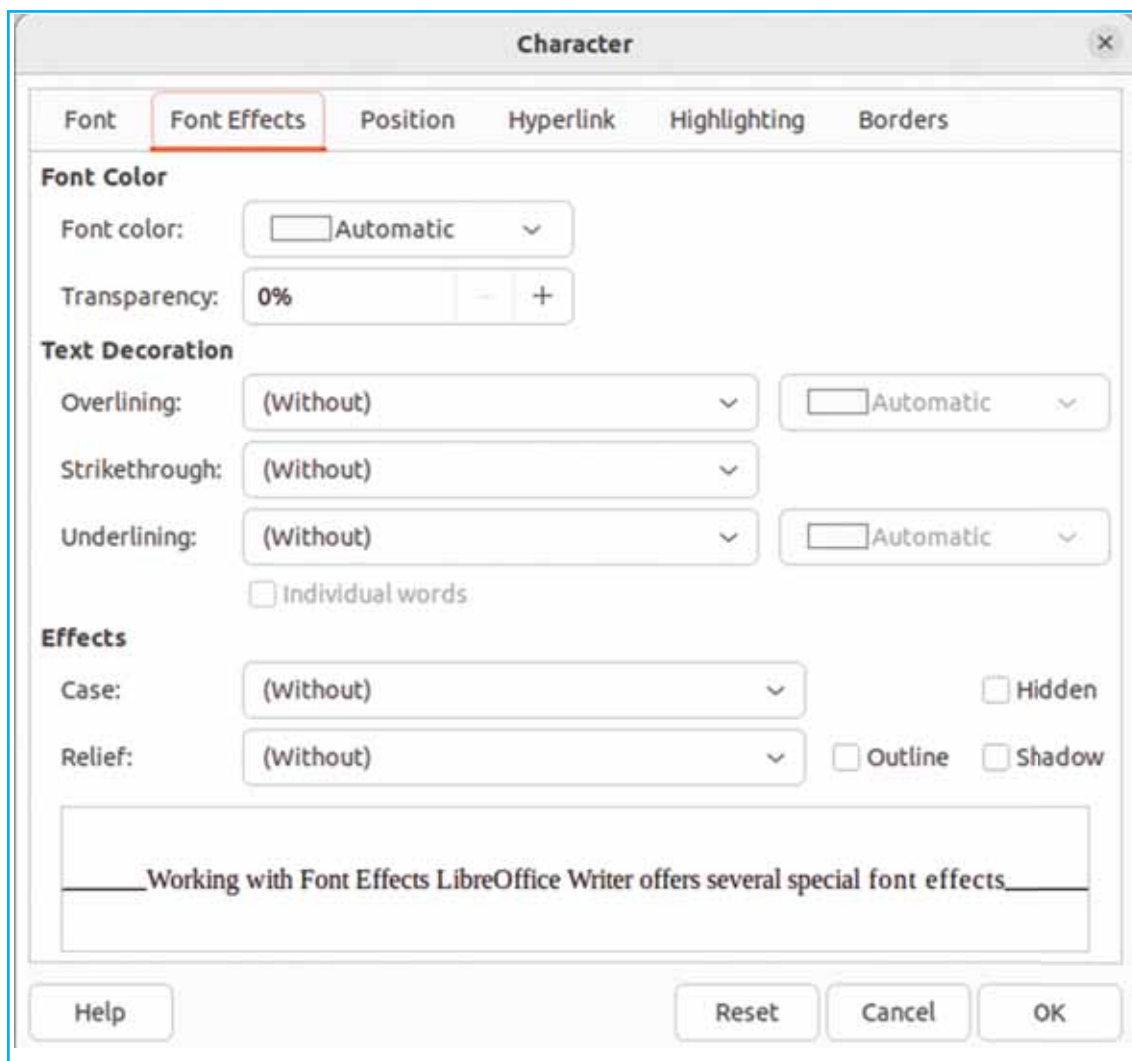


Figure 7.14 : Character Dialog Box

As can be seen in the Character dialog box, we have different tabs like Font, Font Effects, Position, Hyperlink, Highlighting and Borders. Currently the *Font Effects* tab is selected. It has many formatting options than what are visible on the formatting toolbar. Try some of these effects when you work on a document. All the above operations can also be performed using the *Format* → *Text* option. Table 7.3 lists some commonly used shortcuts for formatting a character or text.

Shortcut Keys	Action on the contents
Ctrl + B	Apply or remove bold formatting
Ctrl + I	Apply or remove <i>italic</i> formatting
Ctrl + U	Apply or remove underline formatting
Ctrl + D	Apply or remove double underline formatting
Ctrl + Shift + P	Apply superscript formatting
Ctrl + Shift + B	Apply subscript formatting
Ctrl +]	Increase font size
Ctrl + [	Decrease font size
Ctrl + Shift + K	APPLY SMALL CAPITAL FORMATTING

Table 7.3 : Shortcut Keys for Formatting Text

Aligning the Text

Text alignment is one of the most basic formatting used in LibreOffice Writer. It allows us to position our text in different ways on the page. It is one of the important aspects of page formatting. LibreOffice Writer provides four alignment options : left, right, center and justified that can be accessed through the Formatting Toolbar.

By default, the document is left aligned, where the text lines up along the left margin. It creates a straight left edge while the right edge remains uneven. Right alignment moves the text to the right margin, its effect is exactly opposite of the left alignment. It creates a straight right edge while the left edge remains uneven. The center alignment places text in the middle of the page. It is a good option for titles or headings. Finally, the justify alignment makes both the left and right edges of the text perfectly straight by adding white spaces between words.

To change alignment, select the text whose alignment is to be modified and click on desired alignment buttons in the Formatting Toolbar shown in figure 7.12. It is also possible to align the text using keyboard shortcuts; we can use Ctrl+L for left, Ctrl+E for center, Ctrl+R for right, and Ctrl+J for justify.

Changing the Case of Selected Text

It is possible to change the case of the text that we have typed in the document. To change the case of text perform the steps follows:

1. Select the text whose case is to be changed.
2. From the menu select *Format* → *Text* option, a submenu with many text formatting options will open.
3. From the second half of the menu select the desired case option.

We are presented with various options for changing the case. The UPPERCASE option converts all the characters of selected text to upper case characters. The lowercase option converts all the characters to lower case. The Cycle Case or Capitalize Each Word options convert the first character of each word of a sentence into upper case. The Sentence case option converts the first character of the first word and the first character of any proper noun to upper case. The tOGGLE cASE option will convert all upper case characters in a selected text to lower case and vice versa. The Small capitals option allows us to emphasize a sentence. For example, THIS SENTENCE IS AN EXAMPLE OF SMALL CAPITALS CASE.

Page Formatting

In LibreOffice Writer, when we open a blank document we see a blank white area for entering our text. This page has particular dimensions, margins, orientation, and other features that affect the look of our finished document. Understanding page formatting is crucial for creating professional looking documents. Page formatting affects not just how the document looks on screen, but also how it appears when printed or shared electronically. In this section we will have a look at different aspects of page formatting.

Page Layout

The basic elements that make up a page layout are size, orientation and margins.

Page size: The page size determines the overall dimensions of the document. The most common page sizes used are Letter (21.59 by 27.94 cm), A4 (21.00 by 29.70 cm), or Legal (21.59 by 35.56 cm).

Page orientation: It refers to how the page is positioned. We have two orientations, portrait and landscape that we can use. The portrait document is taller than it is wide; while the landscape document is wider than it is tall. Most documents use portrait orientation because it is easier to read text in this format.

Margins: The blank areas surrounding the borders of the page content are known as margins. The margins prevent text from being truncated during printing, they also offer space for hole punching or binding.

Using the Formatting Toolbar for Page Setup

The Formatting Toolbar in LibreOffice Writer provides quick access to several page formatting options. One of the most useful features is the zoom control. It can be accessed through the Status bar area. It allows us to change how large or small our document will appear on the screen. While the actual size of our document does not change when printed, it helps us to analyze how our page formatting looks at different viewing levels. We can zoom in to work on details or zoom out to see how the overall page layout appears. Figure 7.15 shows a sample view of the Writer screen when zoom level is set to 152%.

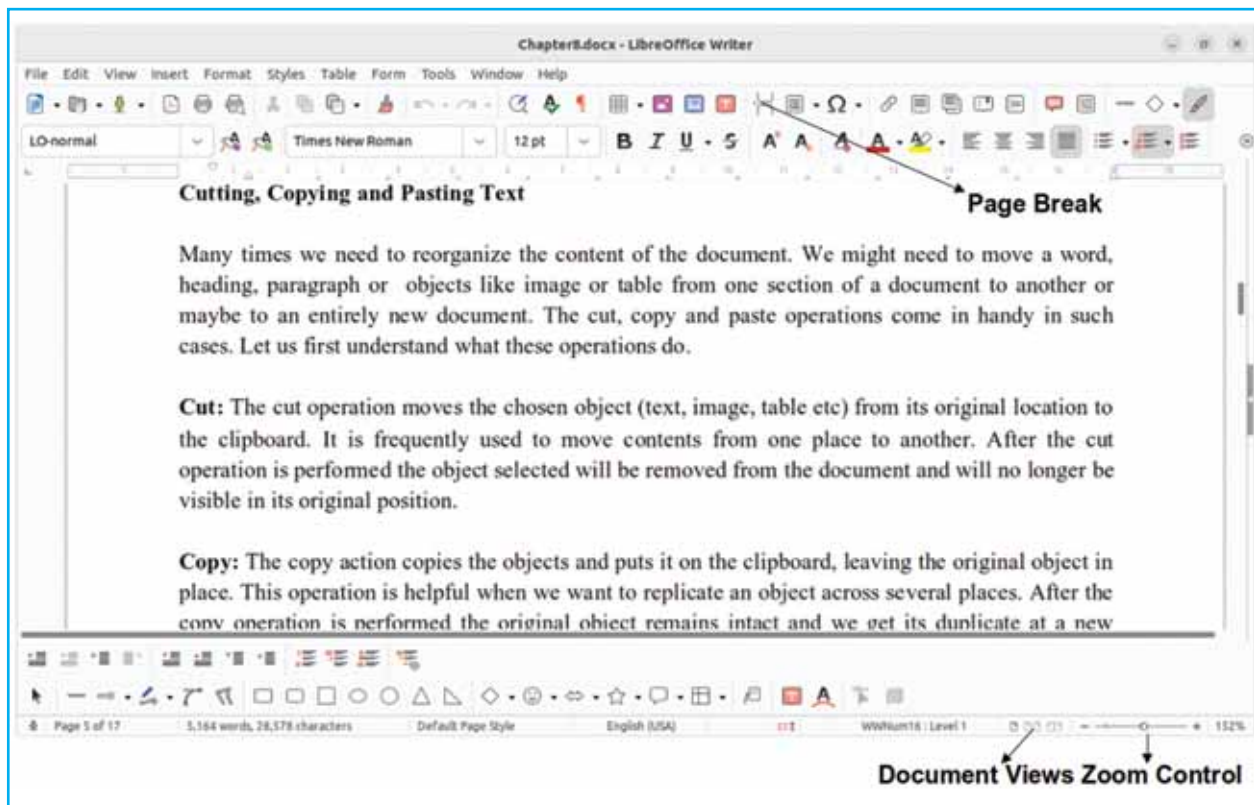


Figure 7.15 : Effect of Using Zoom Control

The status bar also provides us an option of using different views like single page, multiple page or book view to work with. The standard toolbar provides access to the page break button (the shortcut key for which is Ctrl + Enter). This button is very useful and allows us to control exactly where one page ends and another begins.

Page Size and Other Settings

Choosing the correct page size is essential to ensure that our document is printed correctly. LibreOffice Writer provides numerous predefined page sizes, it also allows us to create a custom sized document if needed. To set paper size we need to use the *Format* → *Page Style...* option. When we click on the *Page Style...* option we get a dialog box as shown in figure 7.16.

Observe that in figure 7.16 the *Page* tab is currently selected, using this tab we can select the Paper format, orientation, margins, paper source and gutter position. Here we can see that the paper format A4 is selected, we can change it by clicking on the drop down arrow button. The orientation here is portrait. Changing orientation from portrait to landscape can be useful for specific types of content. Landscape orientation works well for wide tables, charts, timelines, or documents that need to display information horizontally. Note that it is also possible to set different orientations for different sections of the same document.

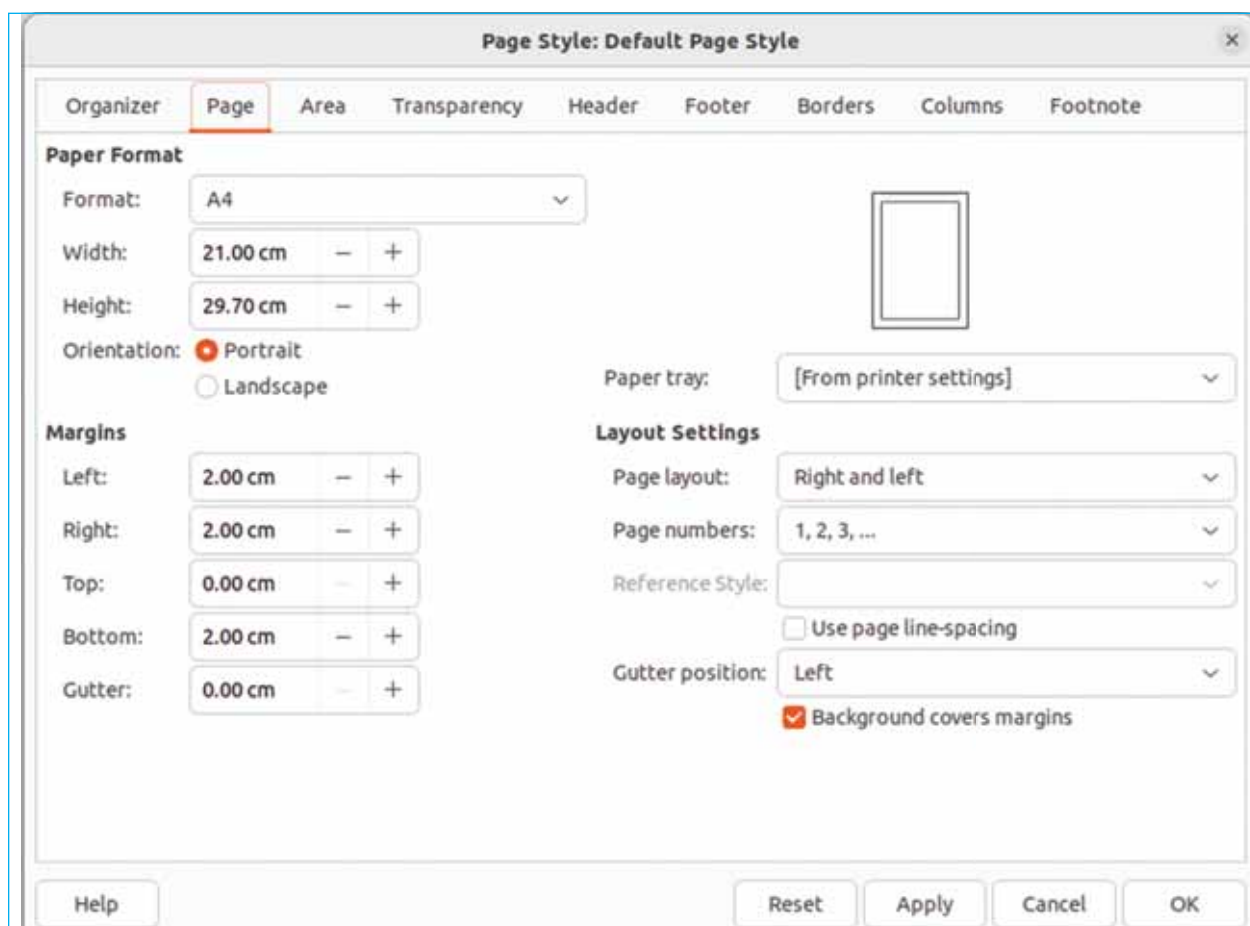


Figure 7.16 : Page Style Dialog Box

When setting margins, we have options like top, bottom, left, and right margins. Most documents use one inch margins on all sides. Here we have used different margins. A gutter margin is an extra margin added to a page layout. It is specifically added on the side where the document is to be bound. The margin settings may affect how much text fits on each page. Smaller margins mean more text per page while larger margins create more white space and may require more pages to contain the same amount of content.

The page style dialog box also allows us to set margins for header and footer. One of the important tabs here is the *Columns* tab. It allows our document to be converted into a set of columns. Figure 7.17 shows a two columnar look of our chapter.



Figure 7.17 : Two Columnar Look of the Chapter

Page Breaks and Section Formatting

Automatic page breaks happen naturally when our text reaches the bottom margin of a page. However, sometimes we need to force a page break at a specific location, such as starting a new chapter on a fresh page. The normal page breaks can be added at any cursor position by pressing Ctrl + Enter key.

LibreOffice Writer allows us to add more advanced page breaks known as section breaks. These page breaks allow us to change the formatting settings of different parts of the document. For example, we might want most of the document in portrait orientation but need one section in landscape orientation for a wide table. Section breaks make this possible by treating different parts of the document as separate formatting zones. To apply section breaks from the menu select *Insert* → *More Breaks* → *Manual Break...* option, this will open a dialog box as shown in figure 7.18.

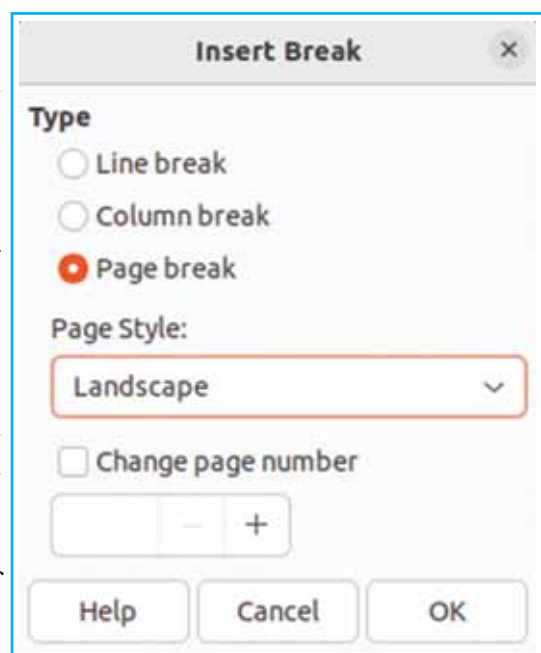


Figure 7.18 : Insert Break Dialog Box

To convert the section break to landscape orientation, select Page break under the *Type* label and under *Page Style:* label select *Landscape* option and click on *OK* button. This will make the orientation of the new page as landscape. Explore other options when working with documents.

Headers, Footers and Page Numbers

Headers and footers are special areas at the top and bottom of each page. It can contain information like page numbers, document titles, author name, date or any other relevant information required.

The header and footers become particularly important when we have a long document.

To add headers and footers, go to the menu and select *Insert* → *Header and Footer* option. It will allow us to add a header or a footer. Move the mouse pointer on the *Header* option and choose *Default Page Style*, our cursor will move to the header portion of the page, we can type directly into these areas and format the text just like regular document text. Footers can be added in a similar manner. The header and footer once added will automatically appear on every page of the document.

Page number is one of the most common elements that is added to the headers or footers. LibreOffice Writer can automatically number the pages. We can use different numbering formats like regular numbers (1, 2, 3, 4), roman numerals (i, ii, iii, iv), or letters (a, b, c, d). We can also align the page numbers to the left, center, or right side of the header or footer. LibreOffice Writer allows us to create different headers and footers for first pages, odd pages, and even pages. To add page number put the cursor in the header or footer section and then from the menu select the *Insert* → *Page Number* option.

Bullets and Numbering

LibreOffice Writer makes it easy to organize text using bullets and numbered lists. Bullets are small dots, squares, or symbols that appear before each item in a list. Bullets are usually used when the order of items does not matter. For example, we can list our favorite hobbies using bullets.

Numbered lists show a specific order or sequence, using numbers like 1, 2, 3 or letters like A, B, C. The numbered list is used when we are writing step-by-step instructions, ranking our favorite books, or showing the order of events. LibreOffice Writer automatically continues the numbers as we go on adding new items. We can also create multi level lists, where the main topics use numbers and subtopics use letters or different bullet styles.

To create a bulleted or numbered list, click on the desired button in the formatting toolbar. We can change the bullet shape or number format by clicking on the drop down arrow and selecting the desired shape or number format. Figure 7.19 shows the combined view of both bullets and numbering.

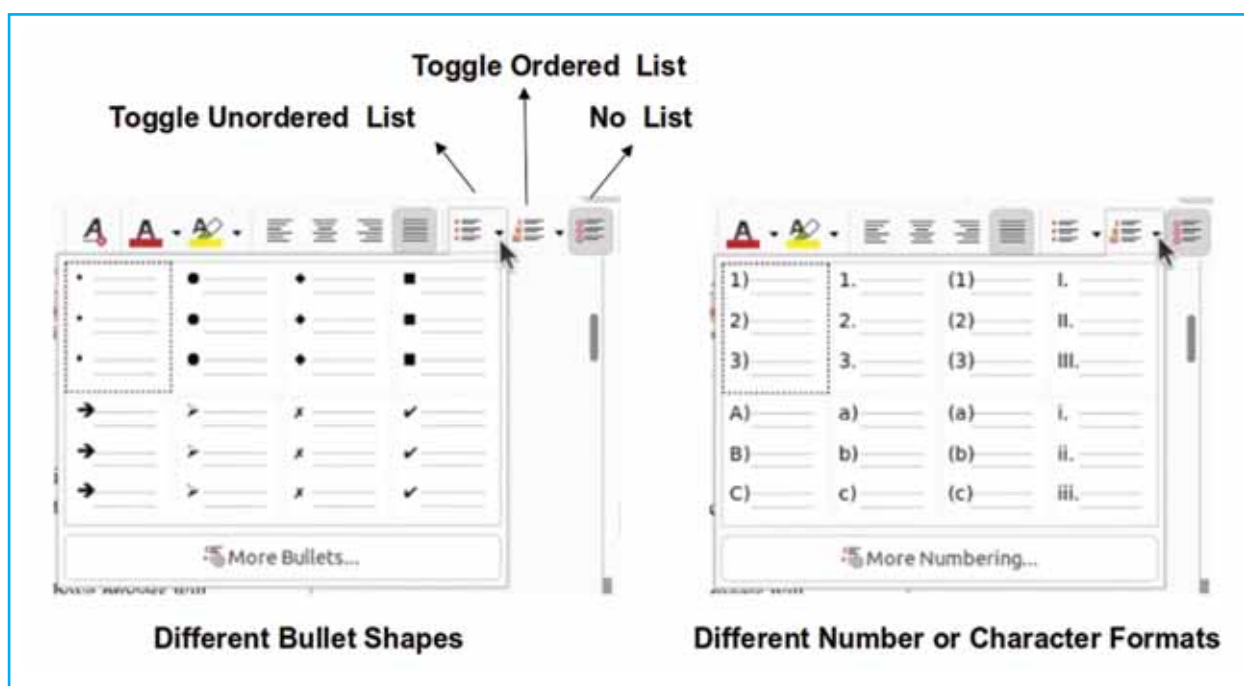


Figure 7.19 : Bullets and Numbering Formats

We can also use the menu and choose *Format → Bullets and Numbering...* option to access more bullet styles. It is also possible to customize the bullets by choosing different shapes, colors, or even using pictures as bullet points.

We are now ready to create a professional looking document with the features that we have learned in this chapter. There are many more features of formatting that can be looked into but are out of scope of this chapter.

Summary

In this chapter we learned how to edit and format a document. We saw how to select consecutive or non-consecutive blocks of text. Further we looked at the mechanism of how to perform operations like delete, cut, copy and paste using shortcut keys as well as standard toolbar. We saw how the changes in the document can be reverted using undo and redo operations. Further we looked at the mechanism available to find as well as find and replace a word or a phrase. Then we worked with font and its attributes like, type, size, colour, highlight, effects like bold, italics, underline and text alignment. Finally we learned different page formatting techniques that could be used to make our document more readable and presentable like setting page size, orientation, page breaks, adding header and footer, creating bulleted or numbered text.

EXERCISE

1. What is the purpose of text selection? Write the steps used to select a non-consecutive text.
2. Write the steps used to select a vertical block in LibreOffice Writer.
3. Discuss different ways in which text can be deleted from the document.
4. What is the difference between Cut and Copy operation of the text?
5. Write the steps used to move a paragraph from one place to another in a document.
6. Explain the use of Undo and Redo features.
7. Write the steps used to search a text from the document.
8. Explain how incorrect spellings can be corrected.
9. What is the significance of header and footer?
10. What is the significance of ordered and unordered lists?
11. **State whether true or false.**
 - (1) LibreOffice Writer does not permit us to select vertical blocks of text in a document.
 - (2) LibreOffice Writer permits us to cut a selected text from one document and paste it into another document.
 - (3) The Small capitals option converts all the characters of the selected text to lower case.
 - (4) An incorrect spelling in LibreOffice Writer is indicated by a curvy green line under the word.
 - (5) Bullets are used when we need to show some kind of sequential information.

12. Fill-in the blanks.

- (1) The _____ shortcut key is used to select the contents of the entire document.
- (2) A sentence can be selected by clicking _____ on any of the sentence contents.
- (3) The _____ feature of the Edit menu is used to find and replace a word or phrase in a document.
- (4) The _____ wildcard character is used to ignore a character when finding text in a document.
- (5) The _____ operation makes text smaller and raises it above the normal line.

13. Multi-choice questions. Choose the most correct answer.

- (1) Which of the following techniques is used to select a word in LibreOffice Writer?
(a) Single click (b) Double Click
(c) Triple Click (d) Right click
- (2) Which of the following is a shortcut key for Undo operation?
(a) Ctrl + X (b) Ctrl + Y (c) Ctrl + Z (d) Ctrl + R
- (3) Which of the following is a shortcut key to increase the font size?
(a) Ctrl + Shift + P (b) Ctrl + Shift + B (c) Ctrl +] (d) Ctrl + [
- (4) Which of the following features allows the spellings to be corrected automatically?
(a) Autocomplete (b) Autocorrect (c) Autotex (d) Autofill
- (5) Which of the following wildcard characters is used to omit a letter from a search?
(a) # (b) : (c) ^ (d) \$
- (6) Which of the following is usually the default page setting in LibreOffice Writer?
(a) Legal (b) A4 (c) Letter (d) A3
- (7) In which of the following orientations a document is wider than it is tall?
(a) Portrait (b) Landscape (c) Window (d) Block
- (8) Which of the following shortcut keys is used to center align the text?
(a) Ctrl + L (b) Ctrl + E (c) Ctrl + R (d) Ctrl + J
- (9) Which of the following is a margin added to a page layout specifically on the side where the document is to be bound?
(a) Left (b) Right (c) Bottom (d) Gutter
- (10) Which of the following is usually used when the order of items does not matter?
(a) Alignment (b) Unordered Bullets
(c) Ordered Bullets (d) Images

Laboratory Exercise

1. Create a document with name MyDreamVacation and perform the given operations:
 - (a) Type two paragraphs (five sentences each) about your dream vacation destination.
 - (b) Select the second paragraph and cut it using Ctrl+X.
 - (c) Paste it at the beginning of the document using Ctrl+V
 - (d) Copy the name of your destination and paste it five more times in the document.
 - (e) Use Undo (Ctrl+Z) to remove two of the pasted destination names.
 - (f) Use Redo (Ctrl+Y) to bring back one of them.
 - (g) Practice selecting different portions of text using click-and-drag and double-clicking on words.
 - (h) Save the document.
2. Create a document with name MyStory and perform the given operations:
 - (a) Type the given text with some errors in the spelling: “Arun sat on the mat. He was very happy. Ramesh and Arun liked to play with the basket bal.”
 - (b) Continue and create a ten sentence story from the above paragraph.
 - (c) Use Find (Ctrl+F) to locate the words “arun” and “run” in your document.
 - (d) Use Find and Replace (Ctrl+H) to replace all instances of “Arun” with “Akash”
 - (e) Run Spell Check (F7) to find and correct all the misspelled words.
 - (f) Add two more sentences with errors to your story and repeat the spell check process.
 - (g) Save the document.
3. Create a document with name MyFavMovie and perform the given operations:
 - (a) Write a short review of four or five sentences pertaining to your favorite movie.
 - (b) Make the movie title Bold and increase its font size to 18.
 - (c) Change the font style of the entire review to Arial Black or Calibri. (You may choose any other font style if the two mentioned are not visible)
 - (d) Add rating (out of 5 stars) to your review. Make it Bold and Italic.
 - (e) Underline all the actor names mentioned in your review. Use different underline formats.
 - (f) Change the colour of positive words like “amazing”, “great”, “fantastic” and others to green.
 - (g) Change the colour of all negative words to red.
 - (h) Apply a shadow effect to the movie title.
4. Perform the given operations for document created in exercise 3:
 - (a) Change the page orientation to Landscape.
 - (b) Set all margins to 2 cm.

- (c) Change the paper size to Legal.
- (d) Switch back to Portrait orientation and adjust your content accordingly.
- (e) Experiment with different margin settings and observe the changes.
- (f) Set the final margins to 0.75 inches on all sides and save the document.
- (g) Insert a header that contains: “Student Name - Movie Review” (use your actual name)
- (h) Center align the header text and make it bold.
- (i) Insert a footer with page numbers on the right side.

5. Create a document with name MyActivities and perform the given operations:

- (a) Make a numbered list of five main activities you would do for example 1. Wake up, 2. Eat breakfast, etc.
- (b) Under activity number two (Eat breakfast), create a bulleted sub-list of three dishes you would like to eat.
- (c) Under activity number four, create another bulleted sub-list of items you would need as per the activity defined.
- (d) Change the bullet style to squares instead of dots.
- (e) Create a numbered list using Roman numerals (I, II, III) for your top 3 favorite subjects.
- (f) Add a bulleted list of reasons why each subject is your favorite.
- (g) Experiment with different numbering formats (A, B, C or a, b, c).
- (h) Save the document.





Working with Tables, Pictures and Mail Merge

Introduction

This chapter expands on your basic LibreOffice Writer skills by focusing on tables. We will learn how to create, position, and resize tables, as well as how to add, modify, and format data within them using built-in styles.

Beyond tables, we will also discover how to insert and manipulate pictures in our documents. We will explore the process of printing documents. Finally, we will master Mail Merge, a powerful Writer feature for creating documents for multiple recipients.

Creating a Table

In word processing software such as LibreOffice Writer, a **table** is a structured grid designed to organize information. It is made up of **rows**, which run horizontally, and **columns**, which run vertically. The point where a row and a column intersect is called a **cell**, and each cell is where we place a specific piece of data relevant to both its row and column. A sample table is shown below:

Student Data					
Gr. No.	Name of Student	Class	Medium	Gender	Date of Birth
123	Kavya Patel	5	Gujarati	F	5-9-2015
234	Ilias Mansuri	10	English	M	7-7-2010
345	Blessy George	7	Gujarati	F	6-12-2013
456	Kartar Sing	8	Hindi	M	1-7-2012
567	Prapti Shah	5	English	F	24-6-2015

Table 8.1 : A table with Sample Data

For certain types of information, a **tabular format** is much better than simply presenting data in paragraphs for the following reasons:

- Tables offer a clearer visual structure, making it easier for users to scan and quickly find specific data.
- Tables make complex data more manageable and understandable by breaking it down into organized rows and columns.
- Tables let us present data concisely.
- Tables give us a better view when we need to compare data.
- Consistent formatting in tables boosts readability and helps prevent mistakes.

Now, let us create Table 8.1, consisting of 7 rows and 6 columns, to a new Writer document. Follow the steps:

- Open a new (blank) document in Writer.

- We can insert a table by clicking the *Table* menu and then selecting *Table* from the *Insert* submenu. This will open the *Insert Table* dialog box. We can also find the *Table* option directly in the *Insert* menu.
- Enter 'SchoolTable' as the table label, with 6 columns and 7 rows as shown in figure 8.1.

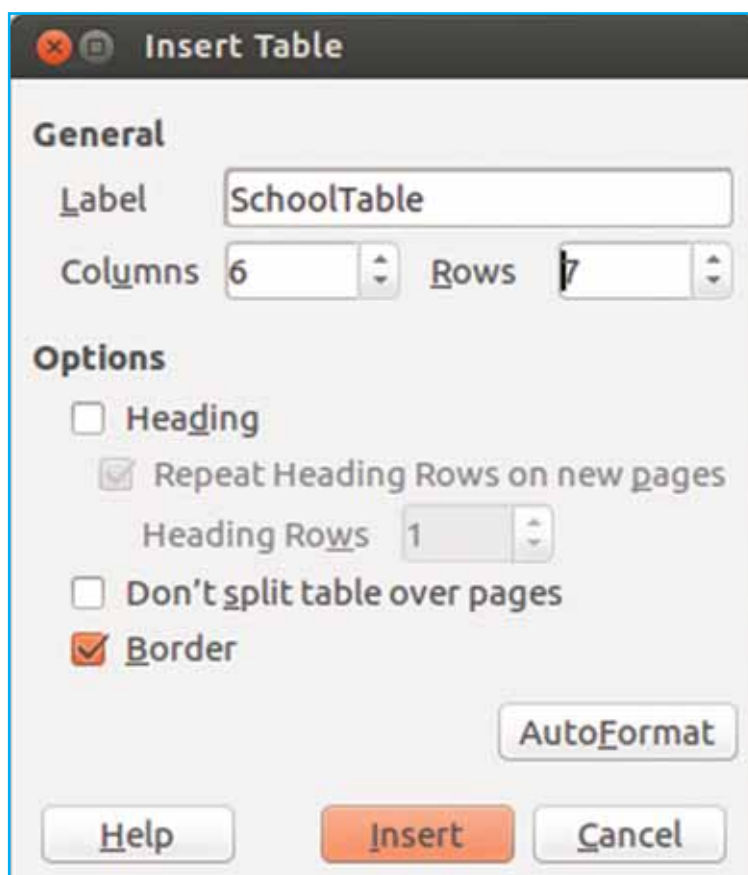


Figure 8.1 : Inserting Table in Document

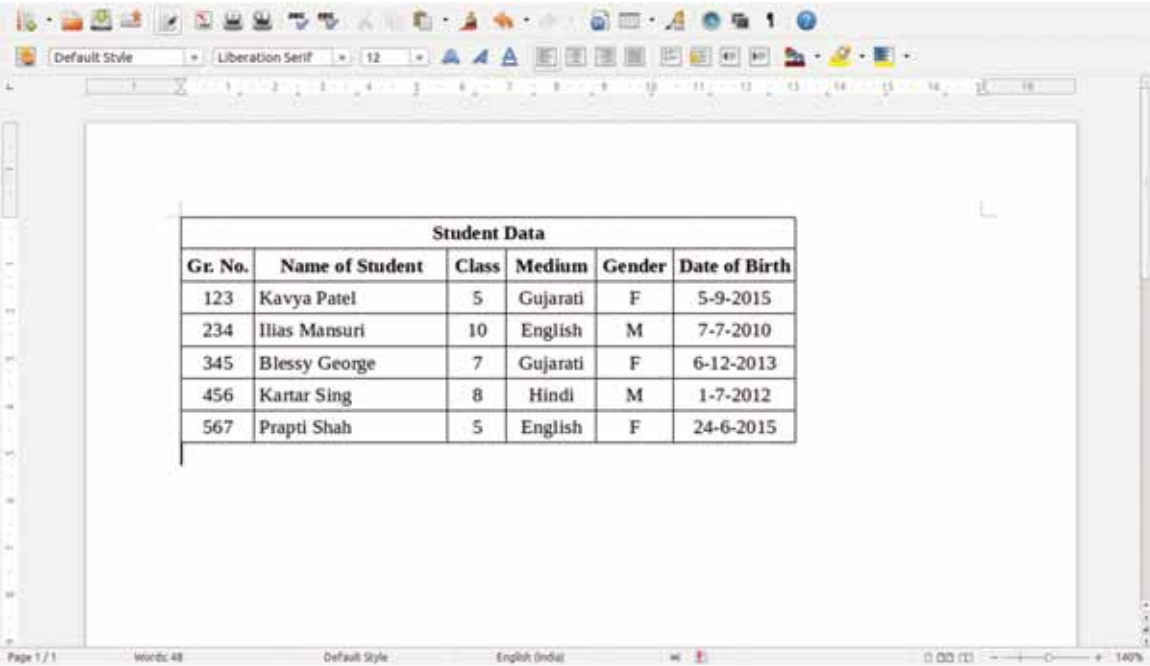
- Once we have set the table's name, columns, and rows, click the *Insert* button to add the table to our document. Now we can populate it with the data as presented in Table 8.1. Our table will then appear similar to the example shown in figure 8.2.

Ge. No.	Name of Student	Class	Medium	Gender	Date of Birth
123	Kavya Patel	5	Gujarati	F	5-9-2015
234	Rishu Mansuri	10	English	M	7-7-2010
345	Bhensy George	7	Gujarati	F	6-12-2013
456	Karasee Sing	8	Hindi	M	1-7-2012
567	Pragati Shah	3	English	F	24-6-2011

Figure 8.2 : Inserting Data in Table

Now, we will format the table to improve its look.

- Merge the cells in the first row by selecting them and choosing *Merge Cells* from the *Table* menu.
- Select the first two rows, apply center alignment, and bold the text using *Ctrl + B* or the toolbar.
- To better arrange the data, resize the columns by dragging the double-headed arrow that appears when you hover between columns. We can also adjust row height similarly. The formatted table is shown in figure 8.3.

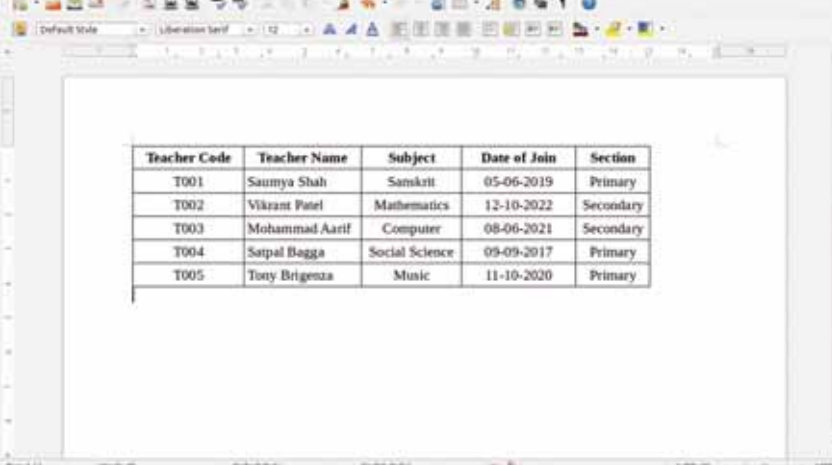


Student Data					
Gr. No.	Name of Student	Class	Medium	Gender	Date of Birth
123	Kavya Patel	5	Gujarati	F	5-9-2015
234	Ilias Mansuri	10	English	M	7-7-2010
345	Blessy George	7	Gujarati	F	6-12-2013
456	Kartar Sing	8	Hindi	M	1-7-2012
567	Prapti Shah	5	English	F	24-6-2015

Figure 8.3 : Text Formation in Table

Operations on Table

Let us explore more table manipulation options by creating another table. Set up a new document in Writer and create a table specifically for teacher information, like the one shown in figure 8.4.



Teacher Code	Teacher Name	Subject	Date of Join	Section
T001	Saumya Shah	Sanskrit	05-06-2019	Primary
T002	Vikrant Patel	Mathematics	12-10-2022	Secondary
T003	Mohammad Aarif	Computer	08-06-2021	Secondary
T004	Satpal Bagga	Social Science	09-09-2017	Primary
T005	Tony Brigenza	Music	11-10-2020	Primary

Figure 8.4 : Table for Teachers

Selecting Row/Column

To format or delete content within a table, we must first select the cells. The conventional way to select neighbouring cells in a table is by dragging your mouse. Often, we will need to work with the content of an entire row or column. Fortunately, LibreOffice Writer offers more efficient methods for selecting an entire row or column.

- Move the mouse pointer to the immediate left of the desired row. When our mouse pointer transforms into a small black right arrow, simply click to select the entire table row.
- Similarly, to select an entire table column, position the mouse pointer directly above the desired column. It will transform into a small black downward-pointing arrow. Simply click to select the entire column.

We can also select specific parts of a table—a row, column, cell, or the entire table—by using the menu options. Navigate to the *Table* menu, then choose the *Select* submenu. Within this submenu, we will find four options: *Table*, *Rows*, *Columns*, and *Cell*.

Here is what each option does:

- **Table:** Selects the entire table.
- **Rows:** Selects the row where our pointer is located.
- **Columns:** Selects the column where our pointer is located.
- **Cell:** Selects the individual cell where our pointer is located.

We can also select a row or column by right-clicking on the table to open the context menu as shown in figure 8.5. From there, hover over either the *Row* or *Column* submenu, and then choose the *Select* option to select the current row or column, respectively.

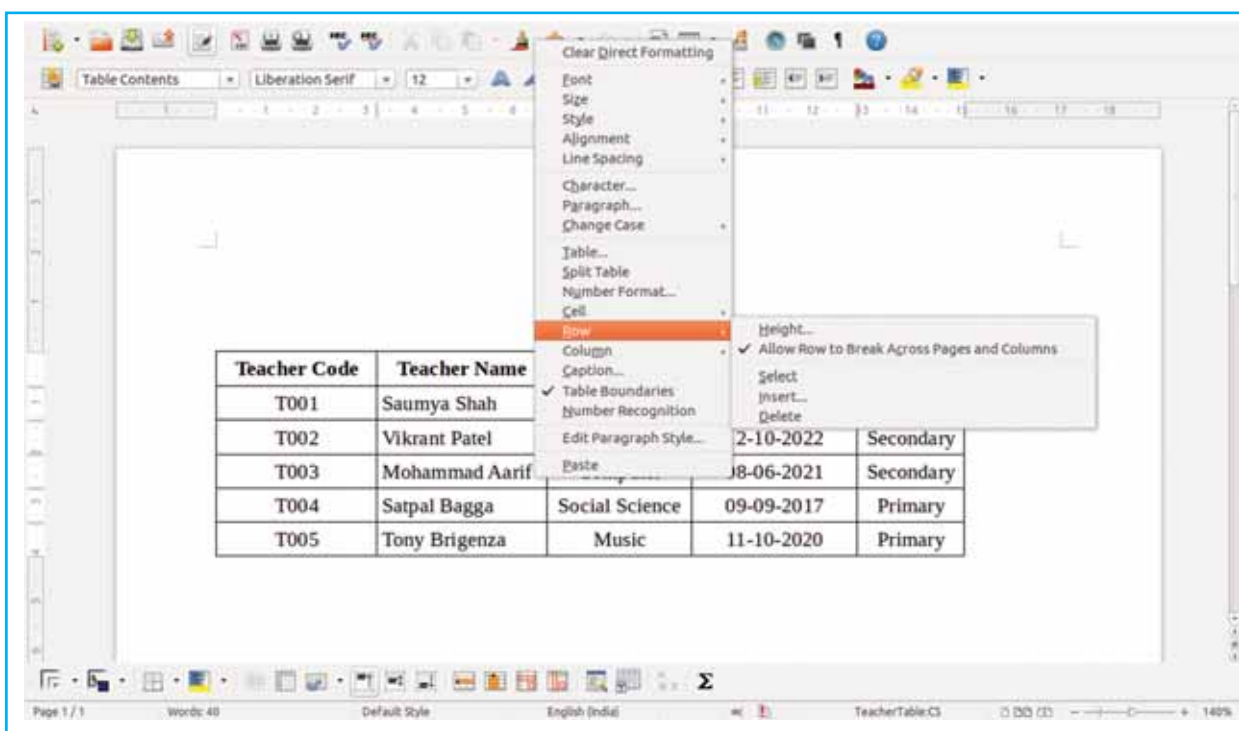


Figure 8.5 : Selecting Row Using Context Menu

Inserting Rows, Columns and Tables

After setting up our table, we will often need to add more rows or columns. Writer makes it easy to insert them into our existing table. Here is how we can insert a new row:

- To insert a new row, first, place the cursor in the table where we want the row to appear. Then, go to the *Table* menu, select *Insert*, and choose the *Rows...* option.
- Alternatively, we can right-click on the table.

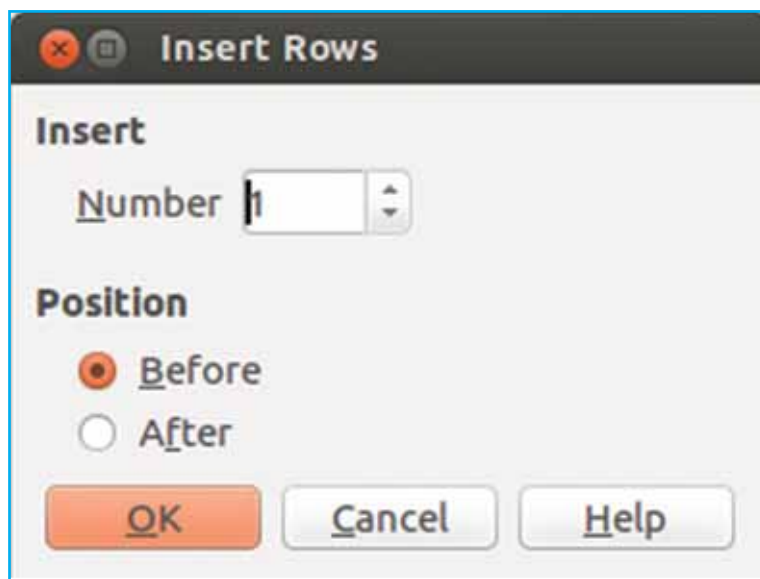


Figure 8.6 : Insert Rows Dialog Box

From the context menu that appears, hover over the *Row* submenu, and then select the *Insert...* option.

Any of above action will open *Insert Rows* dialog box as shown in figure 8.6.

- Once the *Insert Rows* dialog box appears, specify the desired number of rows in the *Number* field. Then, choose whether we want to insert these new rows *Before* or *After* the current cursor position.
- After we have set our preferences, click the *OK* button. The new rows will then be inserted into our table.

Similarly, we can insert a new column into our existing table by following the same steps.

- To insert a new column, first place the cursor in the table where we would like the column to appear. Then, go to the *Table* menu, select *Insert*, and choose the *Columns...* option.

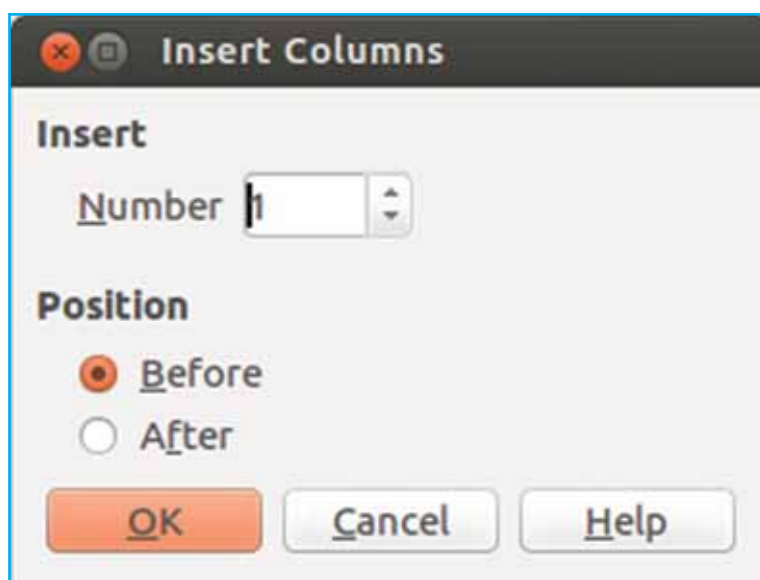
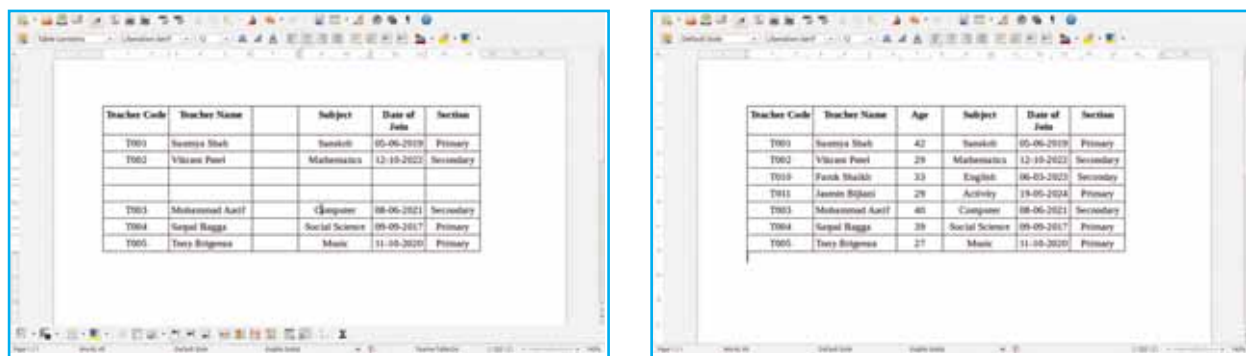


Figure 8.7 : Insert Columns Dialog Box

- Alternatively, we can right-click on the table, then hover over the *Column* submenu and select the *Insert...* option. (Refer figure 8.5). Either of these actions will open the *Insert Columns* dialog box as shown in figure 8.7.

- In the *Number* box, enter how many columns we want to add. Then, choose whether we would like them inserted *Before* or *After* the current column position.
- After we have made our selections, click the *OK* button. The new columns will then be added to our table.
- We have successfully inserted two rows and one column into our Teachers table. It should now look like a table shown in figure 8.8.



The left screenshot shows a table with 5 columns: Teacher Code, Teacher Name, Subject, Date of Join, and Section. The right screenshot shows the same table after inserting a new column 'Age' and two new rows.

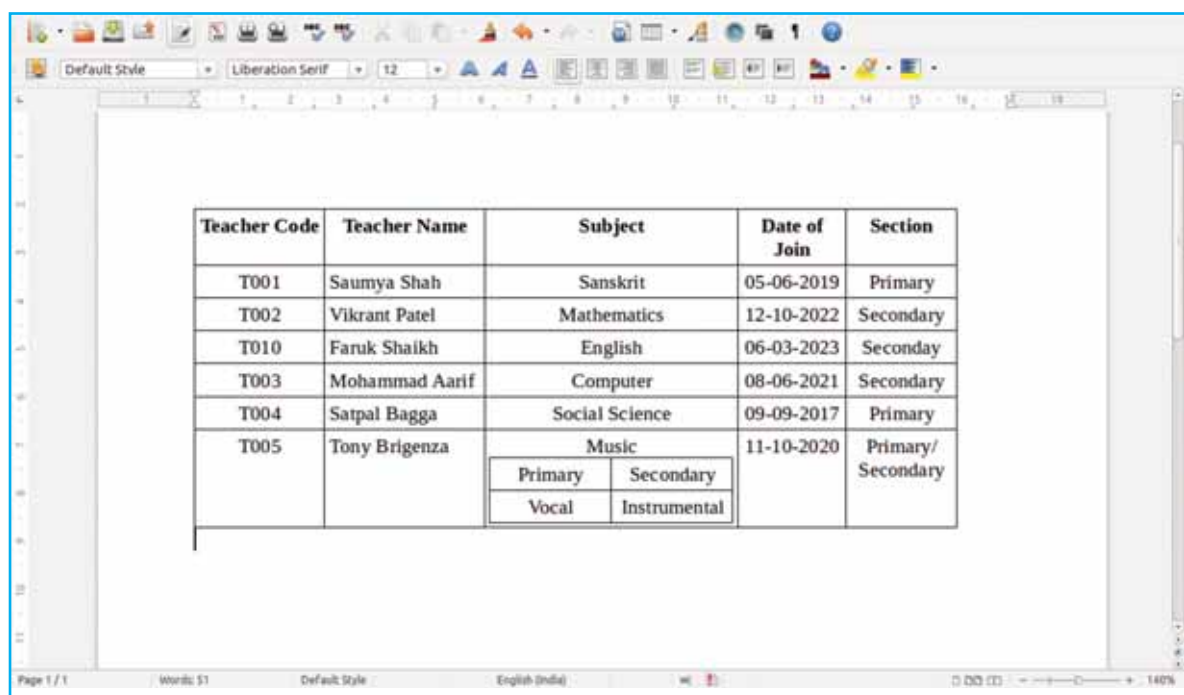
Teacher Code	Teacher Name	Age	Subject	Date of Join	Section
T001	Saumya Shah	42	Sanskrit	05-06-2019	Primary
T002	Vikram Patel	29	Mathematics	12-10-2022	Secondary
T010	Faruk Shaikh	33	English	06-03-2023	Secondary
T011	Jasmin Bhalani	28	Arts	19-05-2024	Primary
T003	Mohammad Aarif	40	Computer	08-06-2021	Secondary
T004	Satpal Bagga	39	Social Science	09-09-2017	Primary
T005	Tony Brigenza	27	Music	11-10-2020	Primary

Figure 8.8 : Table with new Data in Inserted Rows and Columns

Inserting a table within an existing table, often called a nested table, allows for more complex and organized data arrangements. Here is how we can insert a new table inside an existing teacher's table:

- Place the cursor inside the cell where we want the new table to appear.
- Go to the *Table* menu, select *Insert*, and then choose *Table* to open the *Insert Table* dialog box.
- Choose the desired number of rows and columns, then click *OK*.
- Enter the data into the newly added table.

The figure 8.9 illustrates a nested table:



The screenshot shows a table with 5 columns: Teacher Code, Teacher Name, Subject, Date of Join, and Section. The cell for Teacher T005 (Tony Brigenza) contains a nested table with 2 columns: Primary and Secondary.

Teacher Code	Teacher Name	Subject	Date of Join	Section
T001	Saumya Shah	Sanskrit	05-06-2019	Primary
T002	Vikrant Patel	Mathematics	12-10-2022	Secondary
T010	Faruk Shaikh	English	06-03-2023	Secondary
T003	Mohammad Aarif	Computer	08-06-2021	Secondary
T004	Satpal Bagga	Social Science	09-09-2017	Primary
T005	Tony Brigenza	Music	11-10-2020	Primary/Secondary

Figure 8.9 : Nested Table

Deleting Rows, Columns and Tables

We can easily remove unneeded tables from the document. To delete an entire table, go to the *Table* menu, select the *Delete* submenu, and then choose the *Table* option. This action will permanently remove the entire table and all its data from our document. If our cursor is currently inside a nested table, only that nested table will be removed, not the main, outer table.

To remove specific rows or columns from the table, we have two simple methods.

- Go to the *Table* menu, then choose the *Delete* submenu. From there, we can select either the *Rows* or *Columns* option.
- For a quicker approach, right-click on any cell within the row or column we want to delete. A context menu will appear; hover over the *Delete* option, and then choose either *Row* or *Column* from the submenu.

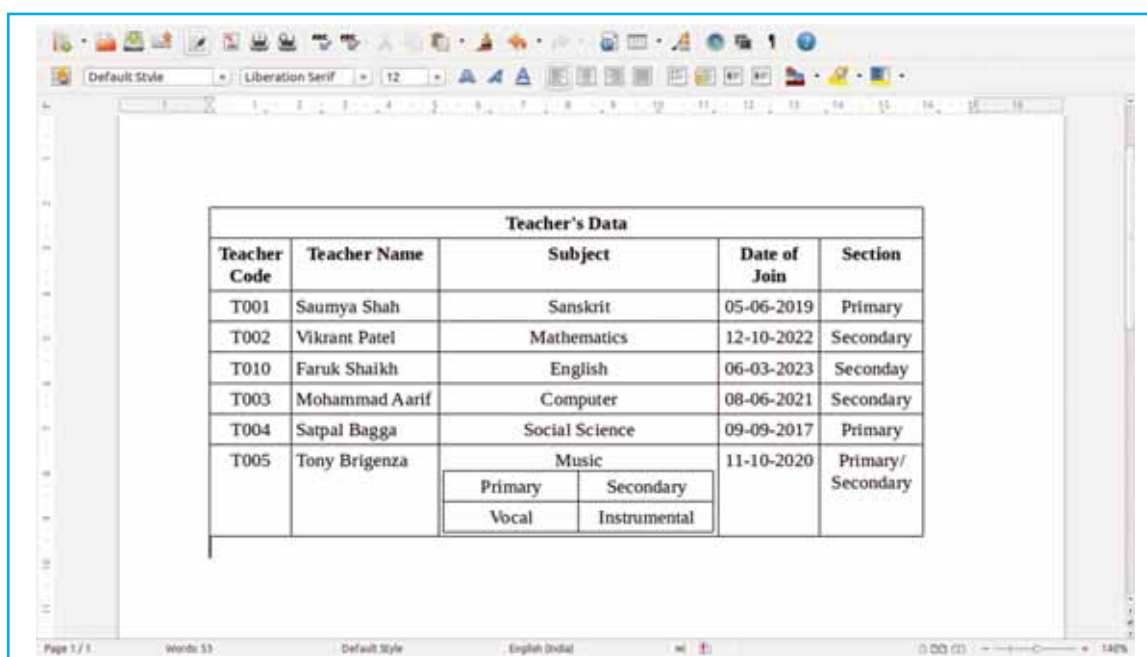
The selected rows or columns will be promptly removed from the table.

Merging Cells

Often, we want to merge several cells to enter common data that applies to specific rows or columns. Writer has a feature to merge the cells. Here is how it works:

- Open the document that contains teacher's table.
- Place the cursor in the first row of the table. Then, go to the *Table* menu, select the *Insert* submenu, and choose *Row*. This will insert a blank row with six cells at the top of the table.
- In the leftmost cell of this new row, type: Teacher's Data.
- Select the entire first row. We can do this by going to the *Table* menu, choosing the *Select* submenu, and then picking *Rows*. Once the row is selected, go back to the *Table* menu and choose *Merge Cells*. Alternatively, we can right-click on the selected cells and choose the *Merge* option from the *Cell* submenu.
- All the cells in that first row will now merge into a single cell.

The figure 8.10 displays a teacher's table that includes merged cells.



Teacher's Data				
Teacher Code	Teacher Name	Subject	Date of Join	Section
T001	Saumya Shah	Sanskrit	05-06-2019	Primary
T002	Vikrant Patel	Mathematics	12-10-2022	Secondary
T010	Faruk Shaikh	English	06-03-2023	Secondary
T003	Mohammad Aarif	Computer	08-06-2021	Secondary
T004	Satpal Bagga	Social Science	09-09-2017	Primary
T005	Tony Brigenza	Music	11-10-2020	Primary/ Secondary
		Primary	Secondary	
		Vocal	Instrumental	

Figure 8.10 :Adding Title of Table by Merging Cells

Splitting Cells

We can also divide any cell in a table into multiple smaller cells. To do this, simply select the cell we wish to divide, then choose the *Split Cells* option from the *Table* menu. This will open the *Split Cells* dialog box as shown in figure 8.11.

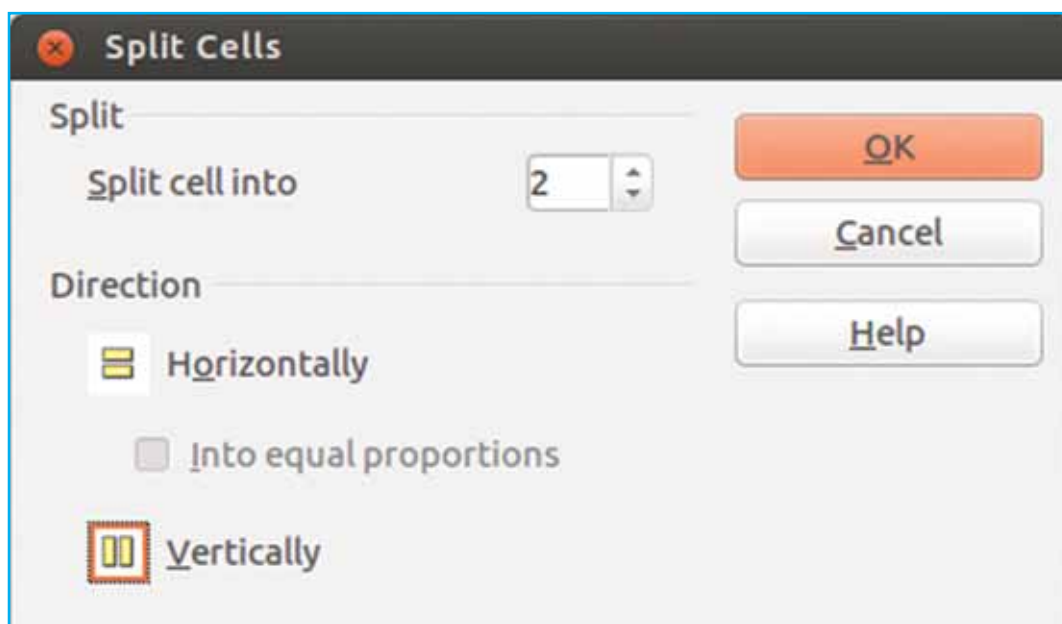


Figure 8.11 : Splitting Cell

In the *Split Cells* dialog box:

- Enter the number of cells we wish to divide the selected cell into.
- In the *Direction* section:
 - Select *Horizontally* if we want to split the cell into multiple rows.
 - Select *Vertically* if we want to split the cell into multiple columns.
- Click *OK* to complete the action.

The cell will then be divided into the desired number of rows or columns. For example, the figure 8.12 shows the fifth row after being split into two columns.

Teacher Code	Teacher Name	Subject	Date of Join	Section
T001	Saumya Shah	Sanskrit	05-06-2019	Primary
T002	Vikrant Patel	Mathematics	12-10-2022	Secondary
T010	Faruk Shaikh	Eng. Text Eng. Grammar	06-03-2023	Secondary
T003	Mohammad Aarif	Computer	08-06-2021	Secondary
T004	Satpal Bagga	Social Science	09-09-2017	Primary
T005	Tony Brigenza	Music	11-10-2020	Primary/ Secondary
		Primary Secondary		
		Vocal Instrumental		

Figure 8.12 : A Row with Split Cell

Adjusting size of Rows and Columns

We already know how to resize columns and rows by dragging the mouse. But if we need to be precise, or want to change the size of multiple rows or columns to the exact same dimensions, we can use the menu options for precise adjustments.

To precisely adjust column width, follow these steps:

- From the *Table* menu, go to the *Autofit* submenu and choose *Column Width....* This will open the *Column Width* dialog box as shown in figure 8.13.
- In the *Column* box, select the column number we want to adjust.
- Specify the desired width in the *Width* box. We can use the up and down arrows to fine-tune the size.
- Click *OK* to apply the changes.

Here is how to adjust the height of rows:

- Select the rows we want to resize.
- Go to the *Table* menu, choose *Autofit*, and then click on *Row Height....* This will open the *Row Height* dialog box as shown in figure 8.14.

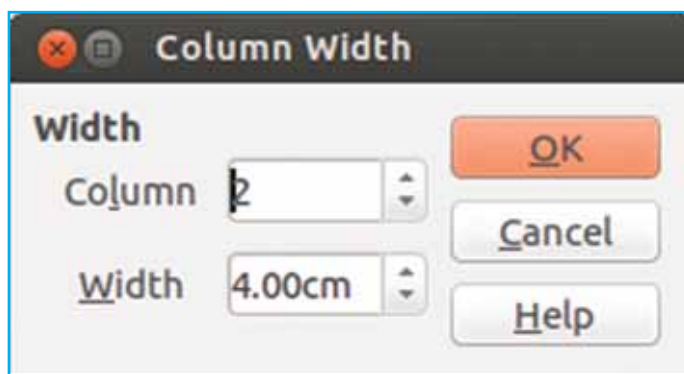


Figure 8.13 : Changing Column Width



Figure 8.14 : Changing Row Height

- In the *Height* box, enter number or use the up and down arrows to select the desired height for the rows.
- Click *OK*.

Autoformatting the Table

Writer makes it simple to format the tables quickly and effectively using the *AutoFormat* option. Here's how to apply an autoformat to the existing table:

- Open the document containing the table we want to format.
- Go to the *Table* menu and select *AutoFormat*. This will open the *AutoFormat* dialog box as shown in figure 8.15.

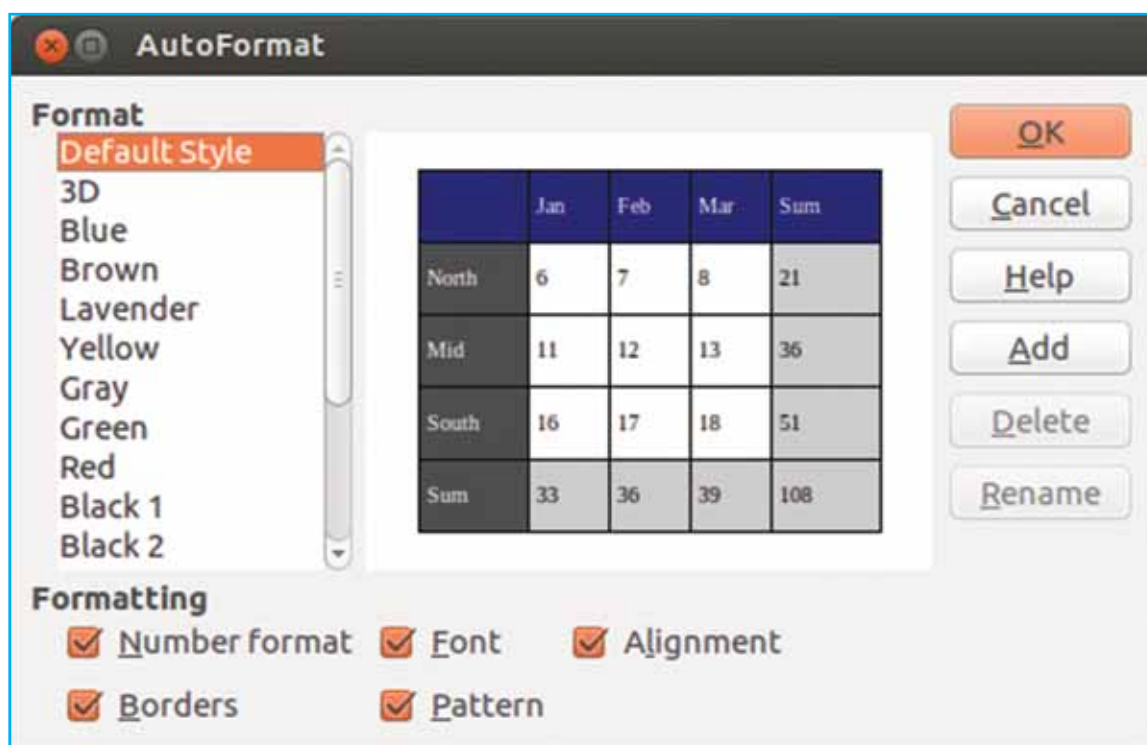


Figure 8.15 : AutoFormat Table

- Choose a pre-defined style from the *Format* selection list.
- We can also fine-tune which formatting elements Writer applies by checking or unchecking the *Formatting* checkboxes. (If our table contains text, make sure to uncheck *Number format* to prevent our text from being incorrectly formatted as numbers.)
- Click *OK* to apply the chosen format.

The figure 8.16 shows a table after AutoFormat has been applied.

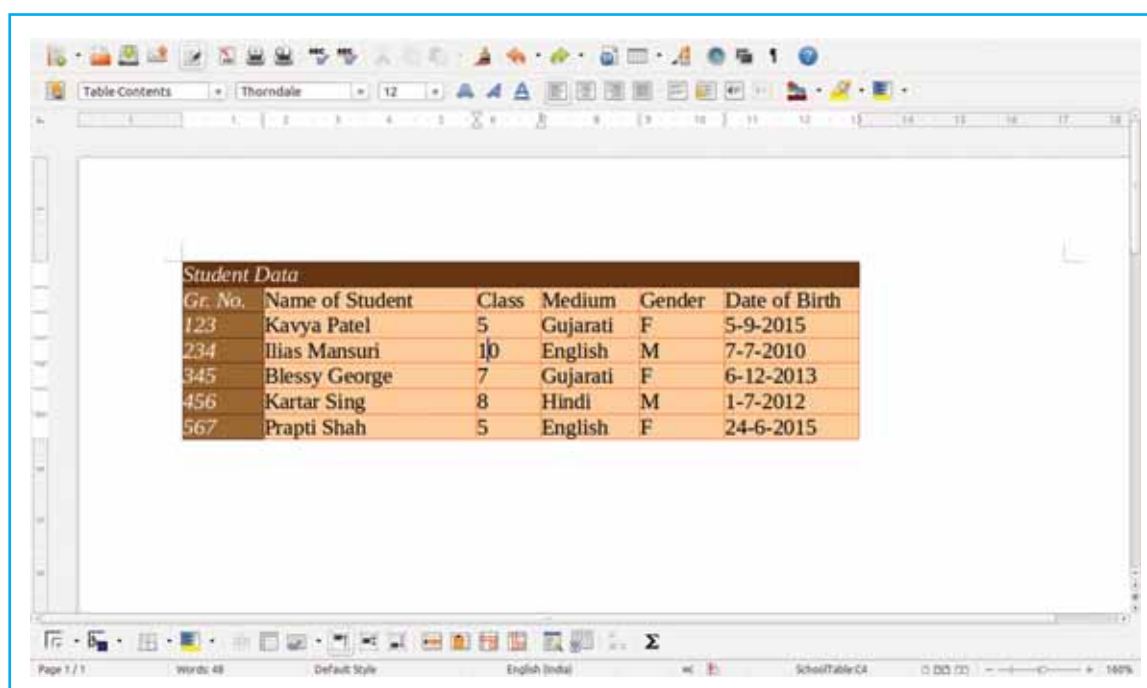


Figure 8.16 : A Table after Applying AutoFormat

Inserting Picture

Pictures are not just decorative; they are vital tools for making a document more effective. They transform plain text into a captivating experience, making information more engaging, easier to grasp, and ultimately, more memorable for the reader.

Pictures serve as powerful visual explanations. They can instantly clarify complex concepts, communicating ideas that would otherwise require lengthy descriptions. Beyond their ability to enhance understanding, images are excellent attention-grabbers, effectively drawing the reader's eye into our content.

Let us learn how to insert an image into Writer document. Follow these steps:

- Open a new document in Writer, or simply place the cursor in an existing document where we wish to insert the picture.
- Go to the *Insert* menu, then the *Picture* submenu, and select *From File....*. This will open the *Insert Picture* dialog box as shown in figure 8.17, showing a list of images saved on our system. We can then browse other folders to find the picture we want.

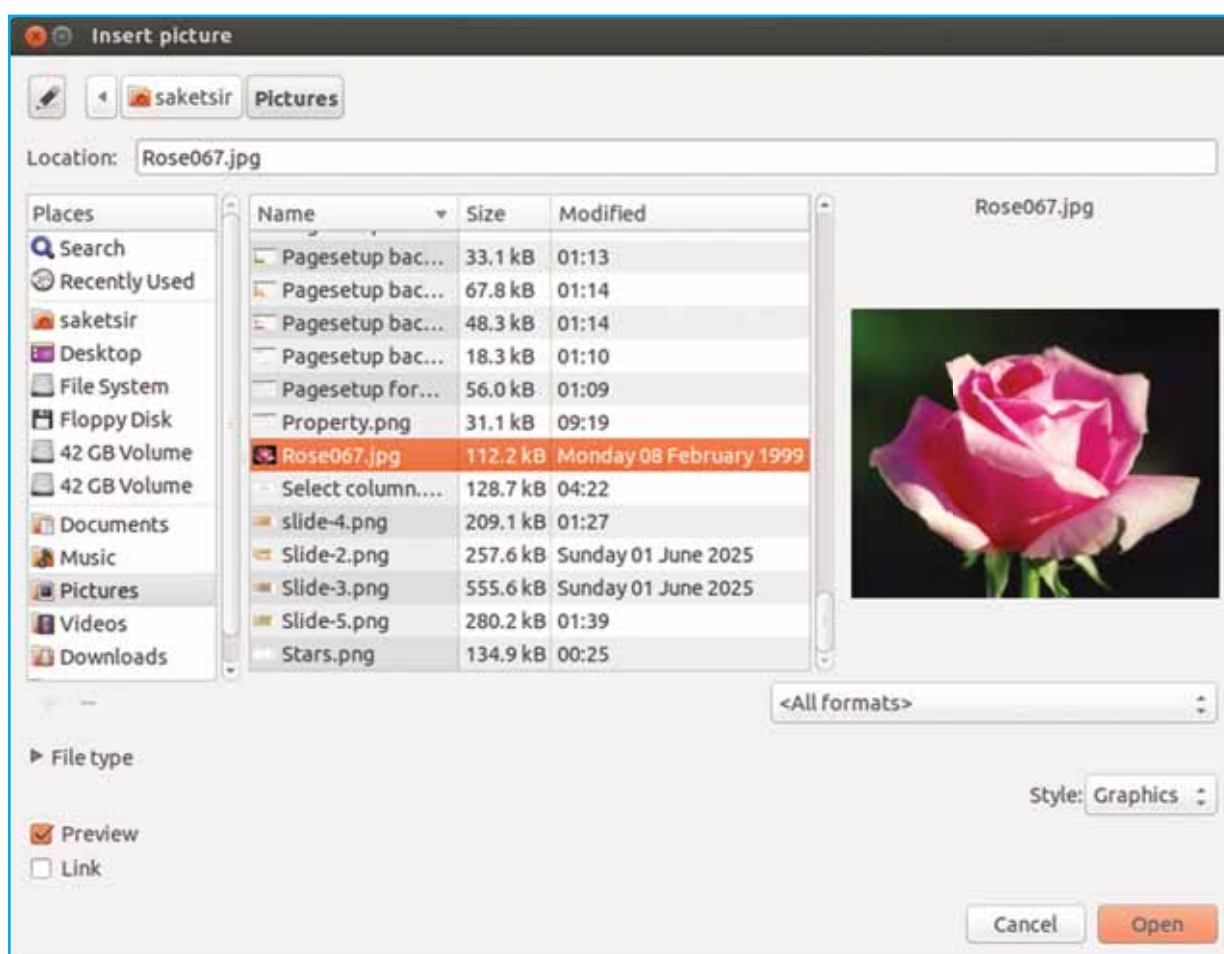


Figure 8.17 : Insert Picture Dialog Box

- Simply select the picture file we want to use and click *Open*. The image will then be inserted into our document with its original dimensions as shown in figure 8.18.

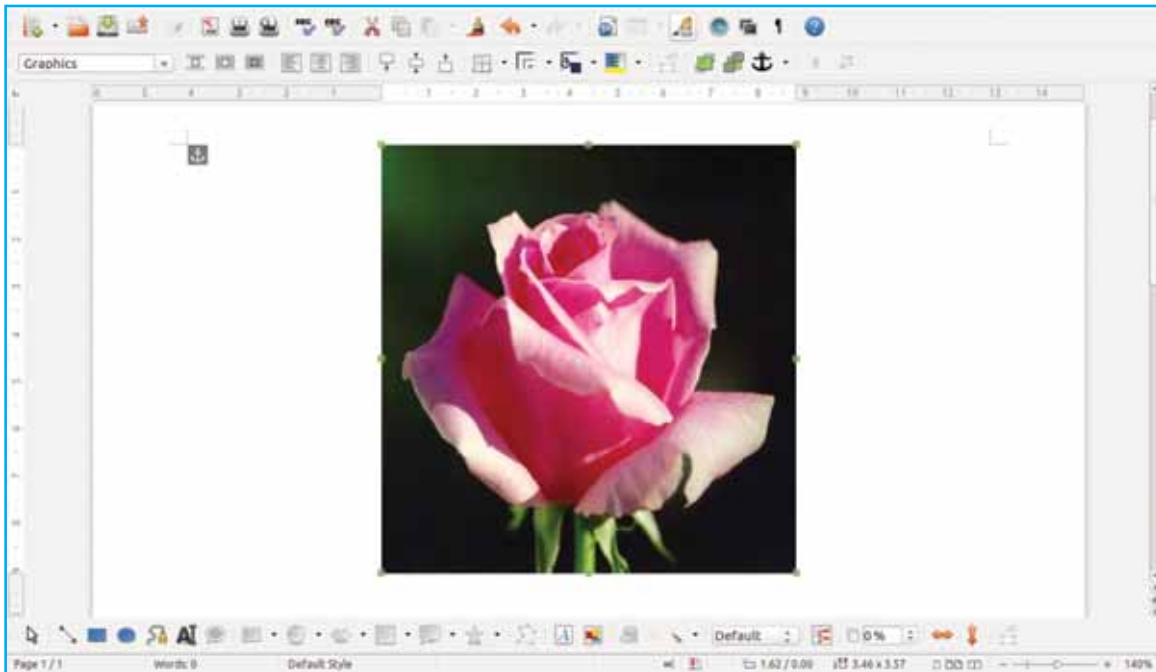


Figure 8.18 : Picture Inserted in Document

- Once our picture is in the document, we will see edit points (tiny green squares) around its border. We can drag any of these points to resize the picture. To keep the image from looking stretched or squished, hold down the Shift key while dragging.
- To move the picture, simply drag it to the desired location in the document.
- When we select a picture, the *Picture* toolbar will pop up at the top of the Writer interface. This toolbar gives us quick access to features like text wrapping, image alignment, borders, and precise positioning.
- We can also use the *Drawing* toolbar to add basic shapes, text boxes, callouts, arrows, stars, and even "fontwork" (stylized text). We will dive deeper into the *Drawing* toolbar in Chapter 10.



Figure 8.19 : Context Menu and Options for Picture

Furthermore, right-clicking on the picture will bring up a context menu with even more options for manipulating the image, as shown in the figure 8.19.

Printing a Document

So far, we have been creating documents meant for viewing on a screen. But what if we need to access document even after closing Writer or shutting down computer? For that, we will want to print the document onto paper, commonly known as a hard copy.

LibreOffice Writer offers a wide array of printing options for documents. Steps to print a document are as follows:

- Open the document we wish to print in Writer. Make sure to format it exactly as we want before proceeding.
- Go to the *File* menu and select the *Print* option. Alternatively, we can simply press *Ctrl + P* to open the *Print* dialog box as shown in figure 8.20.

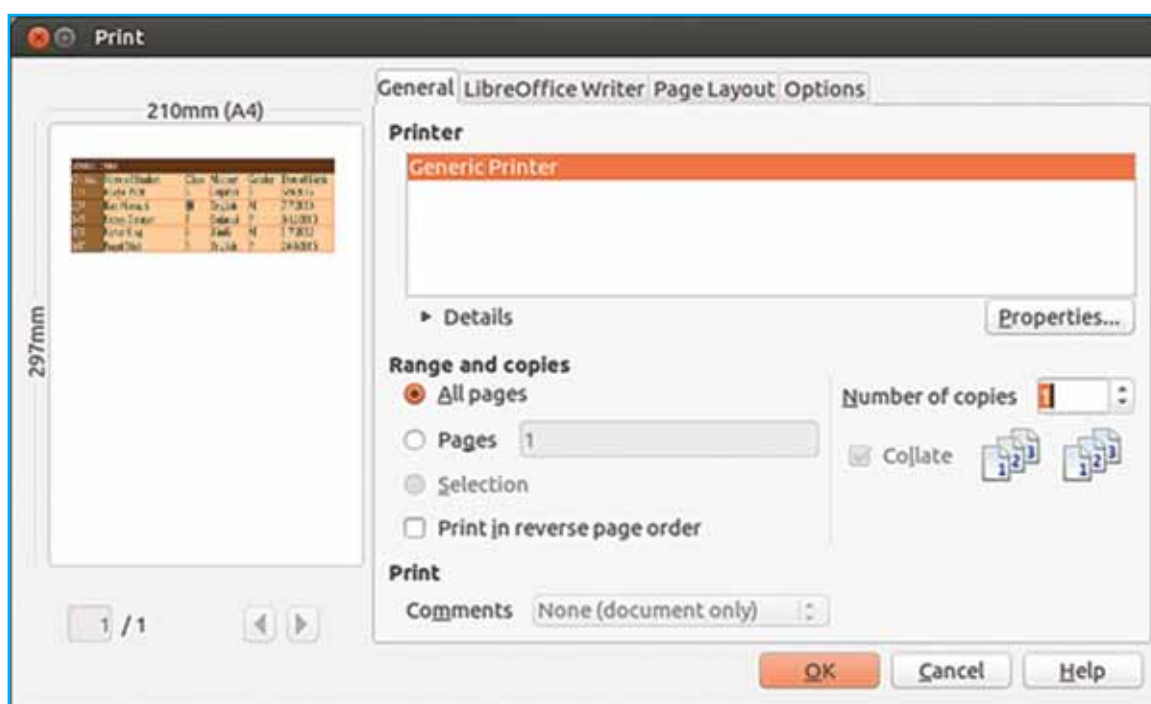


Figure : 8.20 : Printing the Document

On the left side of the *Print* dialog box, we will see a preview of the document exactly as it will appear when printed.

- In the *General* tab of the *Print* dialog box, we will find several options to customize the printing:
 - **Printer:** Choose the specific printer we want to use for the document from this dropdown list.
 - **Properties...:** Click this button to access the settings for our selected printer, such as paper size and orientation.
 - **Range and Copies:**
 - **All pages:** Select this to print every page of our document.
 - **Pages:** If we only need specific pages, enter their numbers here.
 - **Selection:** This option will print only the data we have highlighted in our document.
 - **Print in reverse page order:** Check this box if we want our document to print from the last page to the first.
 - **Number of copies:** Enter the desired number of copies we want to print.
 - **Collate:**
 - **Enabled:** The printer will print one complete set of our document.
 - **Disabled:** The printer will print all requested copies of the first page, then all copies of the second page, and so on.

- Once we have made the selections, click the *OK* button to begin printing. Before we do, double-check that the printer is connected to the computer, powered on, and has paper loaded in its feeder tray.

Mail Merge

Mail merge is a fantastic feature in LibreOffice Writer that lets you create personalized documents for many people with ease. Instead of typing each document manually, mail merge automates the process by combining a single template document with a data source.

The key components of Mail Merge are explained below:

- **Main Document:** This is the template document that holds the content common to all recipients.
- **Data Source:** This is the file, holding unique information for each recipient.
- **Merge Fields:** These are special placeholders we insert into the main document. Each one links up with a specific column in the data source.

Let us walk through an example to understand the Mail Merge feature. Let us say we are planning to invite five friends to the birthday party. The usual way would be to type out one invitation, then copy it four more times, and finally, manually add each friend's address to their respective copy. This whole process can be much simpler and more organized if we use the *Mail Merge* feature.

Now, let us create the first component of Mail Merge. Type the following invitation letter format into a new Writer document.

Sheel Bhatt
2/5, XYZ Apartment,
Paldi, Ahmedabad-380007
Date: 03-11-2025

To,

Dear,

Get ready to celebrate! My birthday is just around the corner, and I would love for you to join me for a party to mark the occasion. It is going to be at my place on 10th November at 6pm. We will have a good music, delicious food and fun games. Your presence would mean a lot to me.

Lovingly yours,

Sheel Bhatt

Save the document as 'Invitation Letter'. To begin the Mail Merge process, open the *Tools* menu and select the *Mail Merge Wizard* option. This action will launch the *Mail Merge Wizard* dialog box, which guides us through five distinct steps. Each step is clearly outlined in the left-hand pane, while the corresponding options for that step are presented in the right-hand section.

Step-1 : Select Starting Document

This is the very first step, where we tell the wizard which document we want to use as the main document for our mail merge. We have four main options here as shown in figure 8.21.

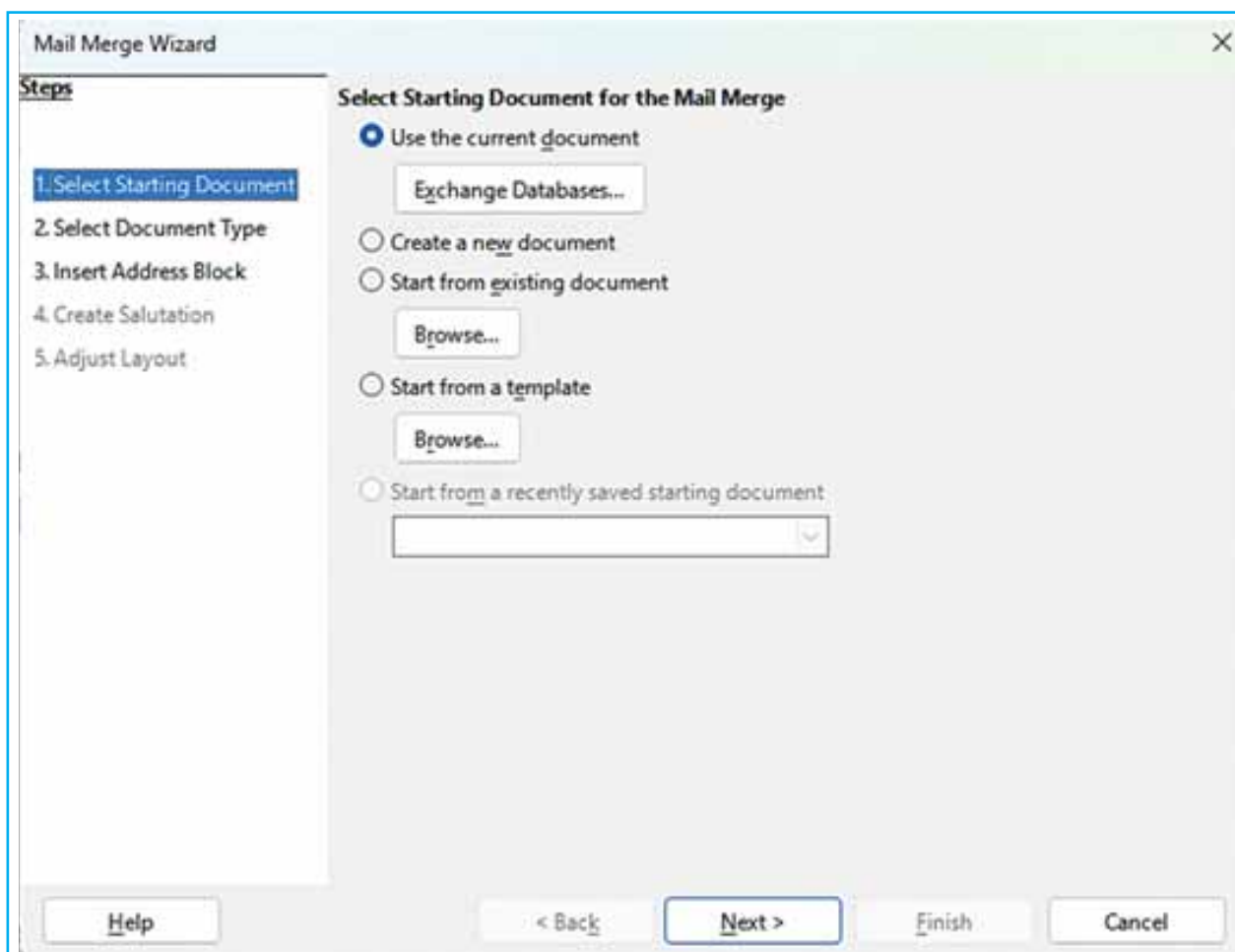


Figure 8.21 : Select Starting Document

- **Use the current document:** This means we will use the LibreOffice Writer document that we currently have opened.
- **Create a new document:** A new, blank document will open. This is where we will compose the main content of our mail merge document.
- **Start from existing document:** This option allows us to browse and select any other existing LibreOffice Writer document on our computer to use as the main document for our mail merge.
- **Start from a template:** If we have a pre-designed template saved in LibreOffice Writer, we can choose this option to start with that template.

Since we have already drafted the invitation letter in our current document, simply select *Use the current document* and then click *Next*. The Mail Merge Wizard's second step will now appear.

Step-2 : Select Document Type

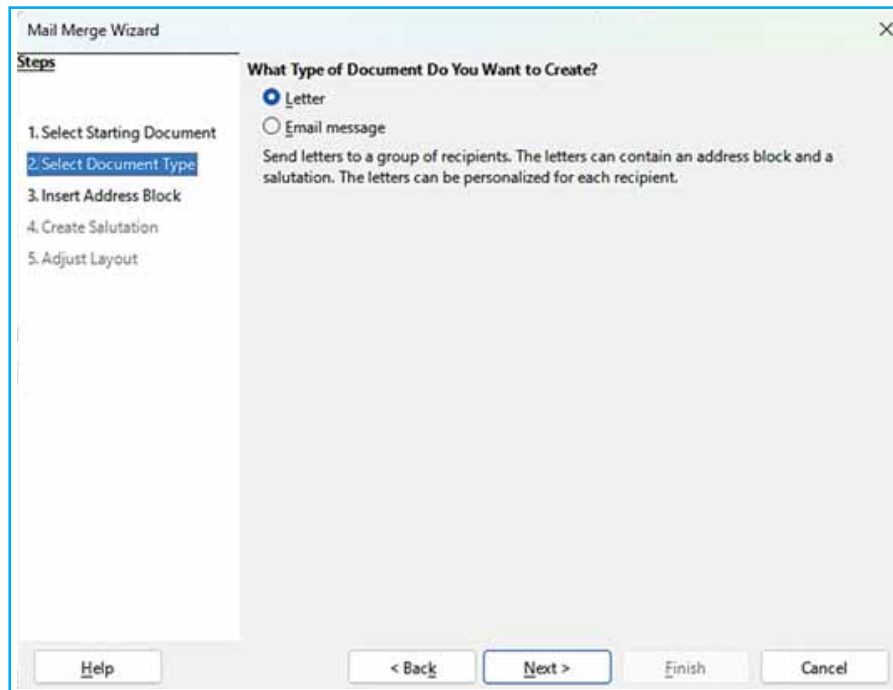


Figure 8.22 : Select Document Type

In this step, we have to determine the final output format and some of the subsequent options we will encounter in the wizard. We will have two options here as shown in figure 8.22:

- **Letter:** Select this option to create multiple personalized documents, each resembling a standard letter.
- **E-mail:** Select this option if we wish to send our merged document as email message.

Select *Letter* option here and click *Next*. The Mail Merge Wizard's third step will now appear.

Step-3 : Insert Address Block

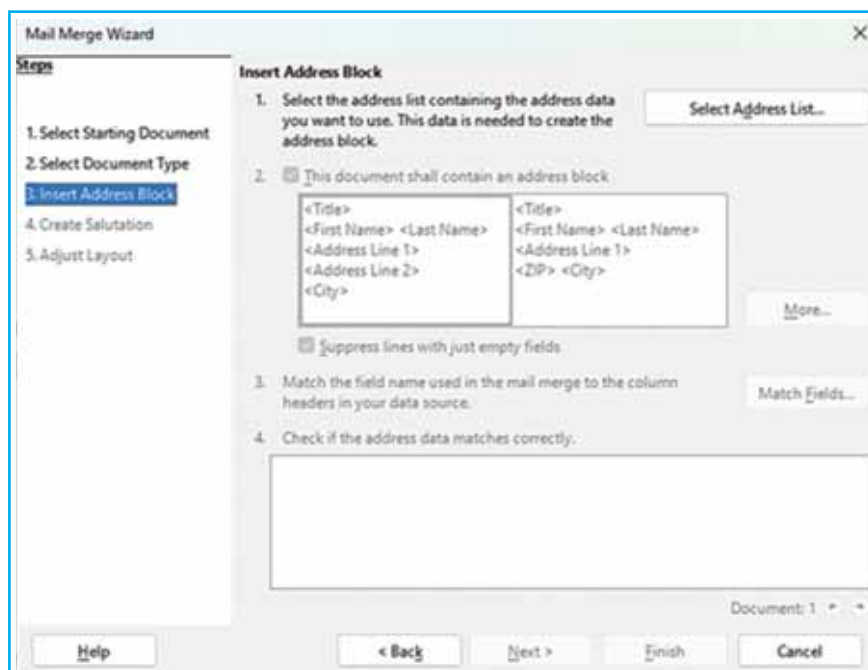


Figure 8.23 : Insert Address Block

Now, it is time to add the addresses of our friends who will receive the invitation. Click the *Select Address List...* button shown in figure 8.23 to open the *Select Address List* dialog box shown in figure 8.24. This is where we will set up the structure for our addresses. To create a new list, simply click the *Create* button, and the *New Address List* dialog box will appear as shown in figure 8.24.

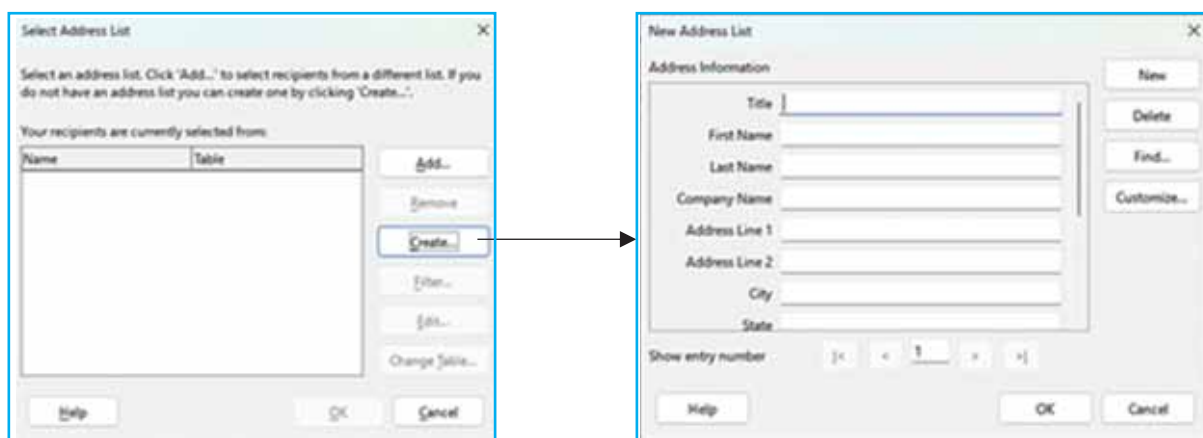


Figure 8.24 : Opening Select Address List and Creating New Address List

In the *New Address List* window, we can immediately begin entering our friends' addresses. If we need to tailor the address structure to our specific needs, simply click the *Customize...* button. This will open the *Customize Address List* dialog box, allowing us to modify the fields. We have full control over our address fields: click *Add* to introduce new ones, *Delete* to remove any we do not need, and *Rename* to change the name of an existing field. The figure 8.25 illustrates our chosen final list of address fields.

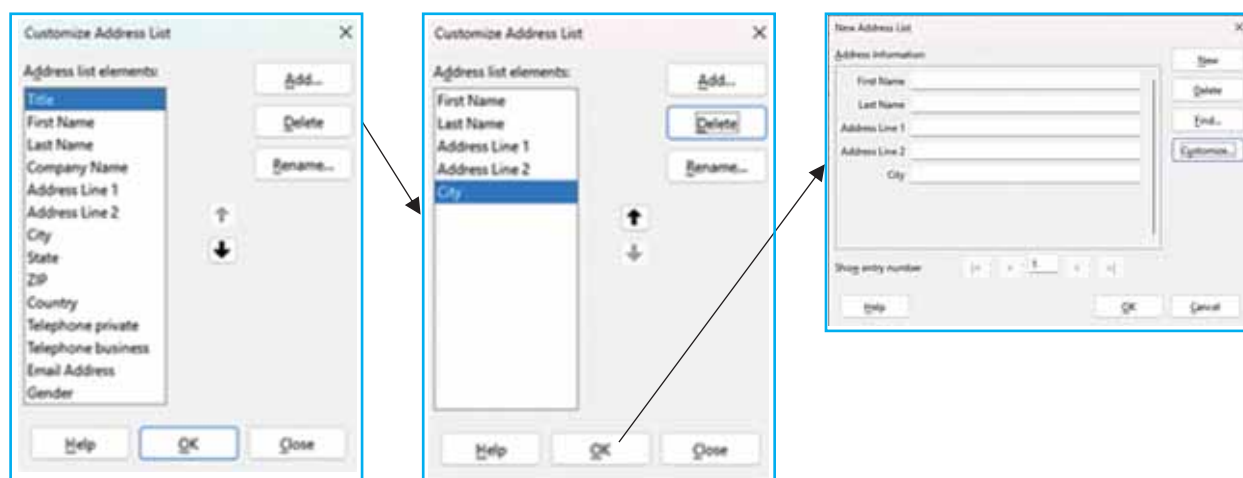


Figure 8.25 : Customizing Address Fields

Enter the address for our first friend, then click the *New* button to add another. Repeat this process for all five friends, and once we are done, click *OK*. Give the address file a name, then click *OK* to save the data source. Click *OK* in the *Select Address List* dialog box to confirm our data source. We will then return to the *Mail Merge Wizard*. Check the box next to *This document shall contain an address block*. To set up the address block, click the *More...* button to open the *Select Address Block* dialog box as shown in figure 8.26. From there, click the *Edit* button, which will open the *Edit Address Block* dialog box. In this dialog box, we can add, remove, or change the order of our address fields.

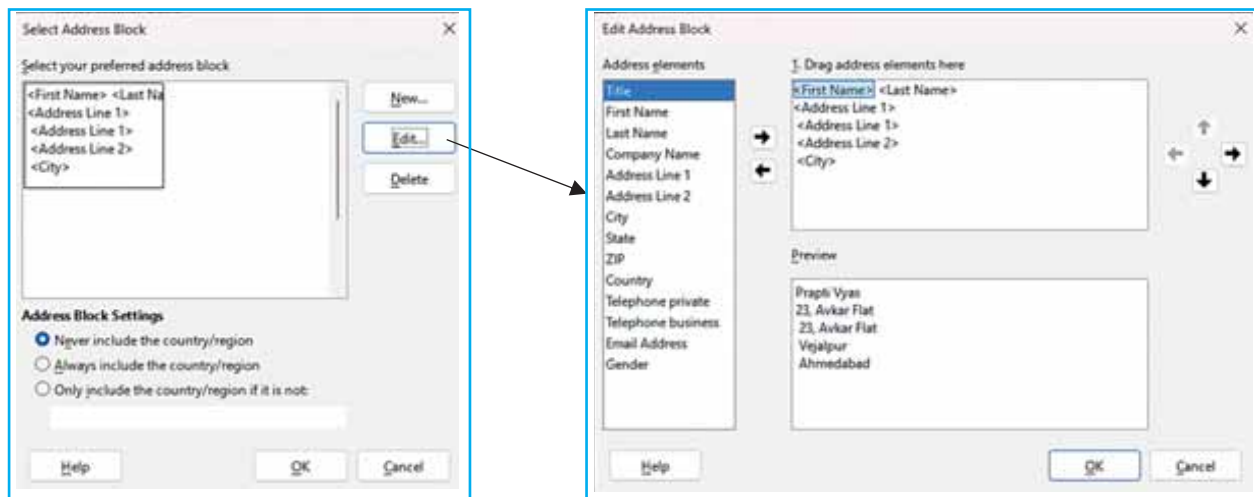


Figure 8.26 : Editing Address Block

Click *OK* when we finish editing the address block. A preview of the first address from our data source will be displayed at the bottom of the *Mail Merge Wizard* dialog box as shown in figure 8.27.

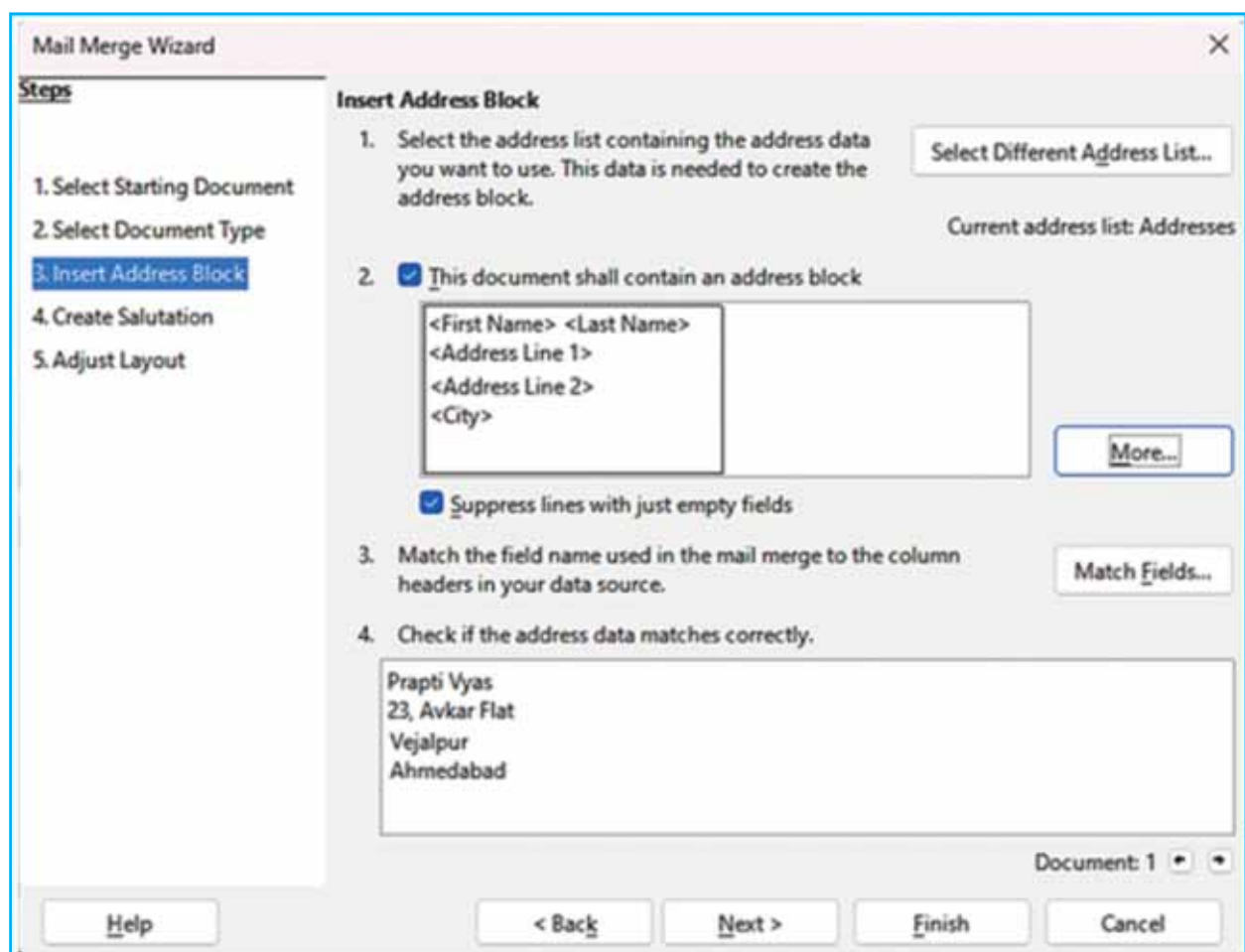


Figure 8.27 : Selecting Address Block

Click the *Next* button to accept the chosen address block. This will take us to the next step of the mail merge wizard: *Create Salutation* as shown in figure 8.28.

The screenshot shows the 'Mail Merge Wizard' dialog box, specifically the 'Create a Salutation' step. On the left, a 'Steps' pane lists five steps: 1. Select Starting Document, 2. Select Document Type, 3. Insert Address Block, 4. Create Salutation (highlighted), and 5. Adjust Layout. The main area is titled 'Create a Salutation' and contains several options and input fields. At the top, there is a checkbox 'This document should contain a salutation' which is checked. Below it is another checkbox 'Insert personalized salutation' which is also checked. There are two rows of input fields: 'Female' with a dropdown menu showing '<First Name>' and a 'New...' button, and 'Male' with a dropdown menu showing 'Dear Mr. <Last Name>' and a 'New...' button. Below these is a label 'Address list field indicating a female recipient' followed by 'Field name' and 'Field value' dropdown menus. There is a 'General salutation' section with a dropdown menu showing 'Hello,'. A 'Preview' section shows a text box with 'Hello,' and a 'Match fields...' button. At the bottom, there are buttons for '< Back', 'Next >', 'Finish', and 'Cancel'. A 'Help' button is also present in the bottom left corner. The status bar at the bottom right indicates 'Document: 1'.

Figure 8.28 : Adding Salutation

Here, we can pick a salutation for our recipients. Since we don't want to use one, just click *Next* to go to the final step of the Mail Merge wizard: *Adjust Layout* as shown in figure 8.29.

The screenshot shows the 'Mail Merge Wizard' dialog box, specifically the 'Adjust Layout of Address Block and Salutation' step. On the left, the 'Steps' pane lists five steps: 1. Select Starting Document, 2. Select Document Type, 3. Insert Address Block, 4. Create Salutation, and 5. Adjust Layout (highlighted). The main area is titled 'Adjust Layout of Address Block and Salutation'. It has two sections: 'Address Block Position' and 'Salutation Position'. In the 'Address Block Position' section, there is a 'From top' dropdown menu set to '5.60 cm' and a 'From left' dropdown menu set to '2.50 cm'. There is a checkbox 'Align to text body' which is checked. In the 'Salutation Position' section, there are 'Move' buttons for 'Up' and 'Down'. To the right of these sections is a large preview area showing a document layout. The document has a header with 'Shed Blunt', '218, Pome Apartment', 'P.O. Box, Ahmedabad-380017', and 'Date: 05-11-2023'. Below the header is a table with columns 'To:', '<First Name>', '<Last Name>', and '<City>'. The table has three rows of data. Below the table is a paragraph of text: 'Get ready to celebrate! My for a party to mark the not have a good music, delicious', followed by 'Sincerely yours,' and 'Shed Blunt'. At the bottom right of the preview area is a 'Zoom' dropdown menu set to '50%'. At the bottom of the dialog box are buttons for '< Back', 'Next >', 'Finish', and 'Cancel'. A 'Help' button is also present in the bottom left corner.

Figure 8.29 : Adjusting Layout of Address Block

In this final step of the Mail Merge wizard, we can adjust the position of our address block in the main document using the *From top* box. We can also zoom in to see the exact placement of our address block within the document.

Click *Finish* to exit the wizard. We will now see the address block, complete with field names, inserted into our main document as shown in figure 8.30.

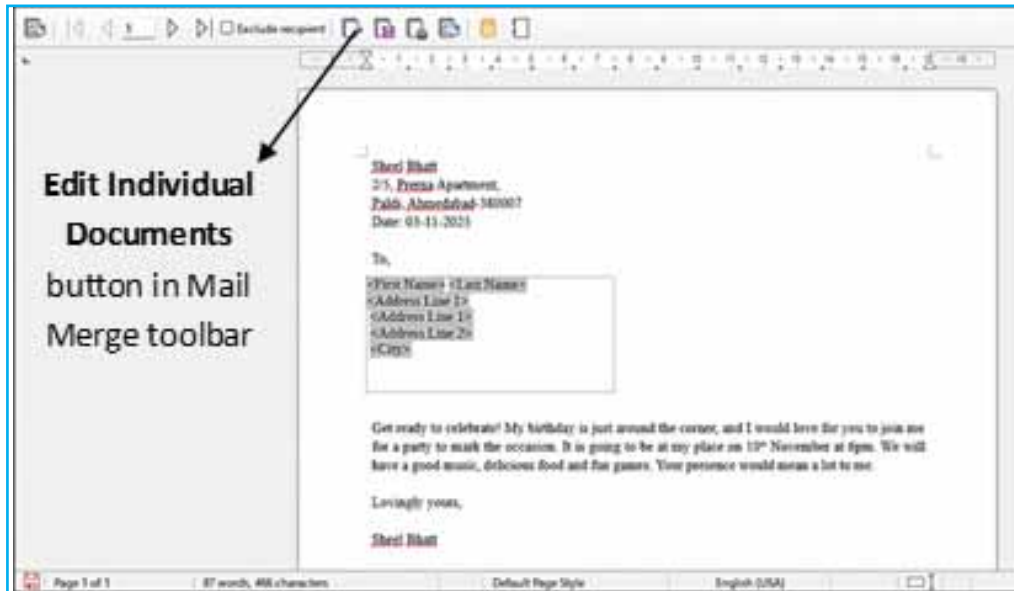


Figure 8.30 : Fields of Address Block Added in Main Document

To finalize the merge, simply click the *Edit Individual Documents* button in the *Mail Merge* toolbar. This action will generate a new document where our main document is merged with all five friend addresses. We can now save the merged document with any filename.

Summary

In this chapter, we gained comprehensive skills in organizing data in tabular form using rows and columns. We learned to create and format tables effectively with LibreOffice Writer's features, including various table operations like inserting, selecting, and deleting data, rows, and columns. We also mastered merging and splitting cells, and adjusting row height and column width for optimal table display. The AutoFormat feature was introduced as a quick way to style our tables.

Beyond tables, we enhanced our documents by inserting pictures, and learned to move and resize them for proper arrangement. Finally, we discovered how to print our documents to obtain hard copies and utilized Writer's powerful Mail Merge feature to generate multiple personalized copies of a document for different recipients.

EXERCISE

1. What is a table and how does it store data?
2. How can we insert a table with 5 rows and 10 columns?
3. What are the methods for selecting an entire row or column within a table?
4. Define a nested table and explain how to create one.
5. How do we delete unwanted rows, columns, or tables from a document?

6. How do we merge cells within a table?
7. What is the AutoFormat feature in Writer?
8. What is the significance of including pictures in documents?
9. Explain the process of printing a document.
10. What is Mail Merge and what are its advantages?
11. **State whether True or False.**
 - (1) It is not possible to embed a table inside an existing table.
 - (2) We can insert a column to the right of an existing selected column.
 - (3) Intersection of row and column is known as table.
 - (4) We can find the AutoFormat option in the Tools menu.
 - (5) When we right-click on selected cells within a table, the context menu provides an option to merge those cells.
12. **Fill-in the blanks.**
 - (1) A file holding unique address for each recipient in Mail Merge is known as _____.
 - (2) _____ can be used to format a table quickly and efficiently.
 - (3) A printed copy of document on paper is known as _____.
 - (4) _____ feature is used to create personalized document for many recipients.
 - (5) _____ is a template document in mail merge to hold common content.
13. **Multi-choice questions. Choose the most correct answer.**
 - (1) Which tool helps manage and understand complex data by organizing it into rows and columns?
 - (a) Image
 - (b) Table
 - (c) Mail Merge
 - (d) Print
 - (2) Which option in Print dialog box should be selected to print a selected block to data?
 - (a) Pages
 - (b) All Pages
 - (c) Selection
 - (d) Block
 - (3) What is the term for the intersection of a row and a column?
 - (a) Table
 - (b) AutoFormat
 - (c) Cell
 - (d) Nested table
 - (4) Where can new rows be inserted into a table?
 - (a) Above the current row
 - (b) Below the current row
 - (c) At the left of current column
 - (d) Both A and B
 - (5) What is a table within another table called?
 - (a) Duplicate table
 - (b) Promoted table
 - (c) Dual table
 - (d) Nested table
 - (6) What are the small green squares that appear around a selected picture known as?
 - (a) Ducks
 - (b) Edit points
 - (c) Placeholders
 - (d) Selection points

- (7) Which toolbar in Writer allows us to insert basic shapes?
(a) Picture toolbar (b) Image toolbar (c) Diagram toolbar (d) Drawing toolbar
- (8) What is the keyboard shortcut to open the Print dialog box?
(a) Ctrl + P (b) Alt + P (c) Ctrl + Alt + P (d) Ctrl + Space + P
- (9) What is a document printed on paper also known as?
(a) Chart copy (b) Hard copy (c) Soft copy (d) Duplicate copy
- (10) Which feature is used to create personalized documents for many people with ease?
(a) Tables (b) AutoFormat (c) AutoMail (d) Mail Merge

Laboratory Exercise

1. Create a table for employees with following columns: Employee name, Department, Date of Join, Date of Birth, Gender. Insert five records in table.
2. Insert one row at the top of table. Merge all the cells of that row and insert heading: Employee Data
3. Insert a column between Date of Birth and Gender. Insert data about Salary of each employee in this column.
4. Adjust the column and row sizes to enhance the table's appearance.
5. Apply AutoFormat to the table created in question 1.
6. Insert a relevant image within the document, positioning it alongside the employee table. Ensure the image is appropriately resized for optimal visual presentation.
7. As a shopkeeper selling electronic products, draft a Mail Merge letter to five customers announcing a new product launch.
8. Request your teacher to show how to print any document you have prepared.





Introduction to Presentation Software

Introduction

We communicate all the time, but relying on just one method is not always enough to get our message across to varieties of audience. Imagine talking on the phone; we hear our friend, but we cannot see his reactions. If we write a letter about our vacation workshop, its just words. But add a picture, and our friend can start to visualize our fun and learning. Send a video clip, and he will get an even clearer idea of everything we did in our workshop. Basically, the more ways we present information, the stronger our communication becomes. This is the core idea behind multimedia: using different elements to make our presentation more effective and informative.

In this chapter, we will learn how to create impactful digital presentations. We are already familiar with LibreOffice. Impress is the presentation software offered by LibreOffice. Impress helps in building everything from simple presentations to those with animations, graphs, tables, pictures, lists and even interactive navigation. Impress has many features like attractive backgrounds, various animation effects, powerful text formations, impactful transitions, colourful charts etc.

Multimedia

The word multimedia comes from “multiple” and “media”. Multimedia is about using more than one type of media to represent an idea. Specifically, it brings together different elements like text, sound, images, videos, and animated content. Multimedia helps organize messages, making them much clearer for the audience. Different components of multimedia are shown in figure 9.1.

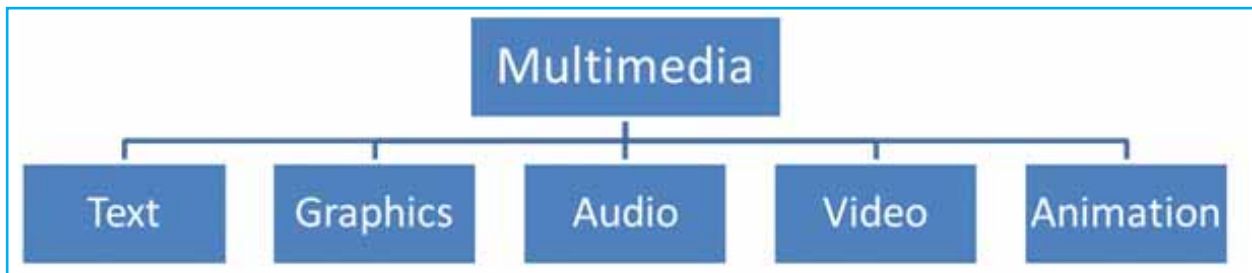


Figure 9.1 : Components of Multimedia

Digital Presentation

A digital presentation is the modern way to connect with an audience, using technology and software to deliver information and ideas. It offers a more dynamic and engaging experience than the traditional methods. For effective communication and audience engagement, digital presentations are key in every environment, from business meetings to educational lectures and online events. Digital presentations are visually appealing and interactive.

Introduction to Presentation Software

Presentation software is a type of computer program specifically designed to create, edit, and deliver the digital presentations. With presentation software, we can create slide show, which is a series of

connected slides. Each slide of a slide show can feature diverse multimedia components. This makes presentations incredibly effective.

The market offers a wide array of excellent presentation software, with Microsoft PowerPoint, Google Slides, Apple Keynote, Canva, and Prezi being some of the most popular examples. These tools are packed with features and templates, enabling users to create rich, engaging slideshows with ease. This chapter introduces Impress, the open-source presentation software included in the LibreOffice suite.

Starting Impress

We can open the Impress in different ways:

- If the shortcut is created, we will find an icon for *Impress* on the desktop. Double click the icon to start the Impress.
- We can also click the *Applications* icon on the Ubuntu dashboard, then search for *Impress*. Once the Impress icon appears, simply click it to launch the program.

When we open Impress, a blank slide appears on our screen, accompanied by various tools and panels. Figure 9.2 illustrates this initial layout of Impress window.

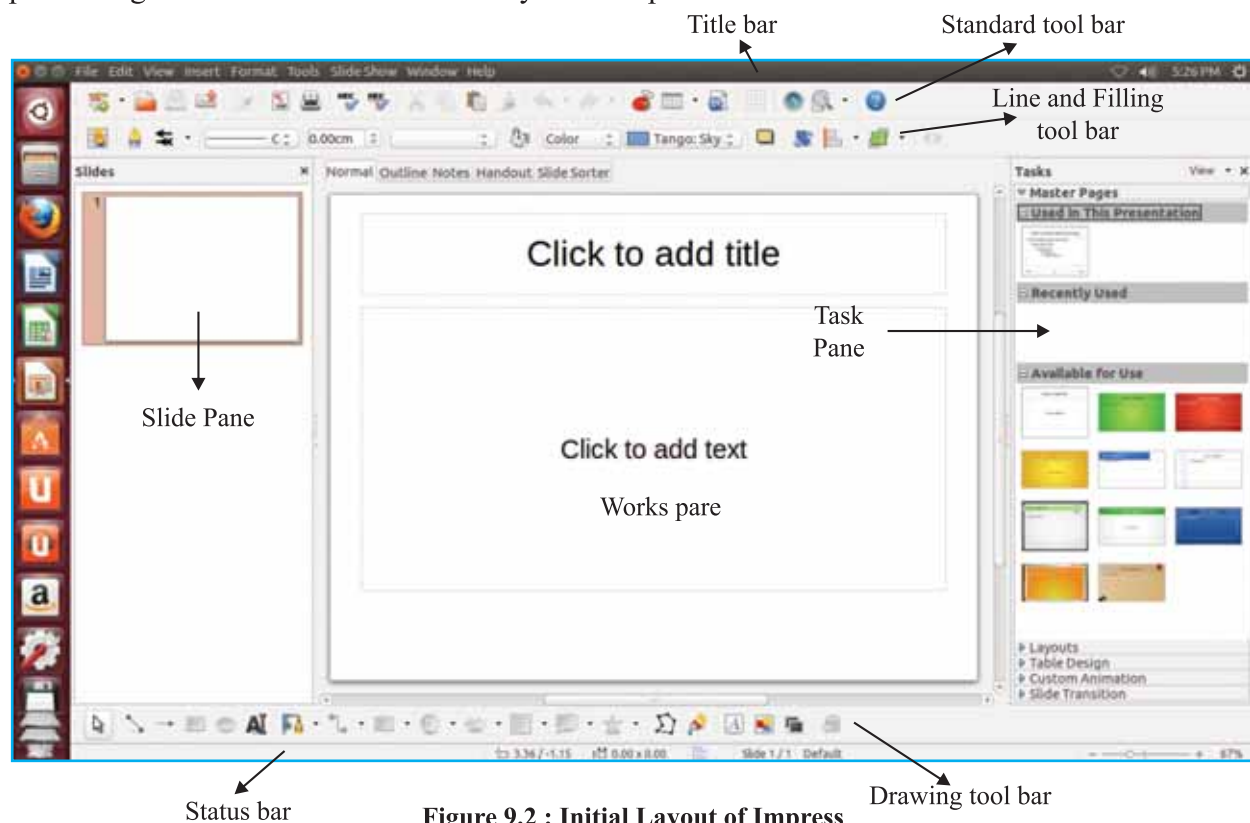


Figure 9.2 : Initial Layout of Impress

Let us explore each component of Impress window.

Title bar

The topmost bar of the Impress window is called the title bar. It displays the application name and a title of our presentation. Since we have not saved our work yet, it will show “Untitled 1.” If we hover our mouse over the title bar, we will see the menu bar and three window control buttons: *Close*, *Minimize*, and *Restore*.

Standard toolbar

The Standard toolbar, found right below the title bar, offers quick access to common commands like *New*, *Open*, *Save*, *Print*, *Cut*, *Copy*, *Paste*, *Undo*, and *Redo*.

Line and Filling toolbar

This toolbar is used to control the visual appearance of drawing objects on our slides. It provides quick access to options for modifying the lines and the fill of shapes.

Slide Pane

This provides a visual overview and management hub for our entire presentation. It displays small thumbnail images of all the slides in our presentation, allowing us to quickly jump between them by simply clicking on the desired thumbnail. We can also easily rearrange the order of our slides by dragging and dropping their thumbnails within the pane.

Workspace

This is the largest central area of the Impress window, where we will add all our presentation's elements and apply effects. Clicking a slide in the slide pane will load it into the workspace.

Tasks pane

This is a dynamic panel located on the right side of Impress window. It consists of five sections: *Master Pages*, *Layouts*, *Table Design*, *Custom Animation* and *Slide Transition*. Here is a brief explanation of each section in the Tasks pane:

Master Pages: A slide master sets the text style for titles and outlines, and it also defines the background design for every slide. If we choose this option, we will see many predefined slides under *Master Pages*. These predefined slides each have unique text styles and backgrounds. Among the available options, the default slide master is a blank template. Available Master Pages are shown in figure 9.3.



Figure 9.3 : Master Pages

Layouts: Choosing this option reveals various preformatted layouts, each with a different number and size of placeholders. These placeholders let us insert various types of content, such as titles, text, images, charts, tables, or even movies as shown in figure 9.4.



Figure 9.4 : Layouts

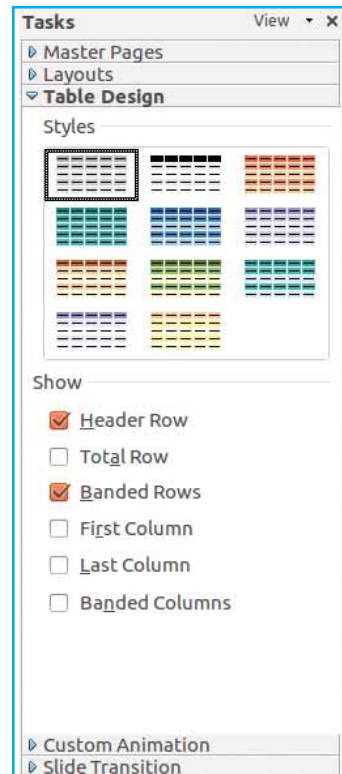


Figure 9.5 : Table Design

Table Design: When we select the *Table Design* option, we will find a range of standard table styles to choose from. We can also flexibly show or hide the highlighting of specific rows and columns. Various table designs are shown in figure 9.5.

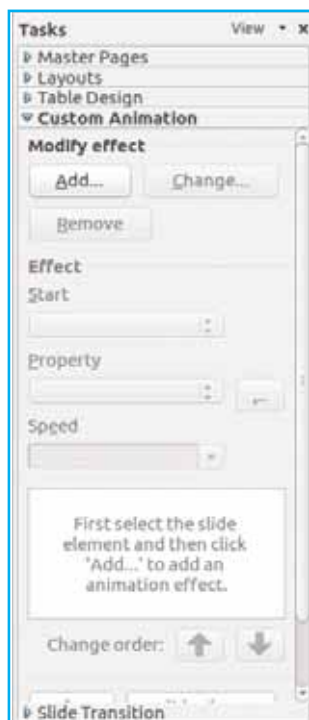


Figure 9.6 : Custom Animation

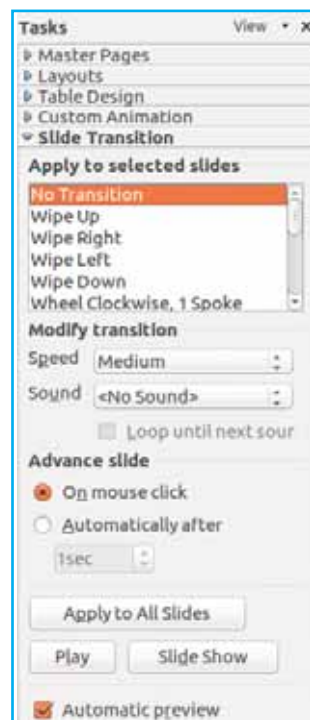


Figure 9.7 : Slide Transition

Custom Animation: Animation brings our slides to life by adding visual changes over time. In this section, we can apply various animation effects to any selected object of our slide. We will find a wide range of animations to choose from, and we can easily change or remove them later if needed. Options available in Custom Animation are shown in figure 9.6.

Slide Transition: Slide transitions are the visual effects we see when moving from one slide to the next during a presentation. We can apply these transitions to a single slide, multiple slides, or even our entire presentation. If we prefer, we can also choose *No transition* for a simple, immediate switch between slides. List of slide transitions is shown in figure 9.7.

Also, we have the control over the transition speed, with options for slow, medium, or fast. Transitions can be set to occur automatically after a specific duration or manually by clicking. Additionally, we can even add a sound to accompany our slide transition.

Drawing Toolbar

Below the main workspace, we will find the *Drawing* toolbar, packed with tools for creating all sorts of visual elements. It includes options for basic shapes, arrows, connectors, symbols, block arrows, callouts, stars, fontwork and many more.

Status bar

At the very bottom of the Impress window, we will find the *Status bar*. This bar displays key information like the current slide number and the total number of slides. It also shows the name of the selected master page and the zoom level. Plus, it even provides the coordinates of our mouse pointer on the workspace and the area of any selected portion of our workspace.

Note: We can easily hide any toolbar or pane from the Impress window using the View menu options. Conversely, if we need more tools, simply go to View → Toolbars to open additional toolbars.

Creating first presentation

We have learned the basics of presentation software. Now, let us make first slide about our school in Impress.

When we open Impress, we will see a default blank slide with two placeholders (See figure 9.2). To make room for various types of content, we will start by changing the slide's layout.

Follow the steps to change the layout of our first slide:

- Click *Layout* section in *Taskspane*.
- Click *Title and 2 Content* layout.

Our slide will now display three placeholders: one for the title, and two positioned below it.

Follow the steps to insert the data in placeholders:

- Click the title placeholder and type the school's name.
- Click the bottom left placeholder and add any relevant text about the school.
- In the bottom-right placeholder, click the *Insert Picture* button. This will open the *Insert Picture* dialog box. Navigate to the folder where our school's logo is saved, select the file, and then click *Open* to insert the image into the slide.

Updated view of layout in the slide is shown in figure 9.8.

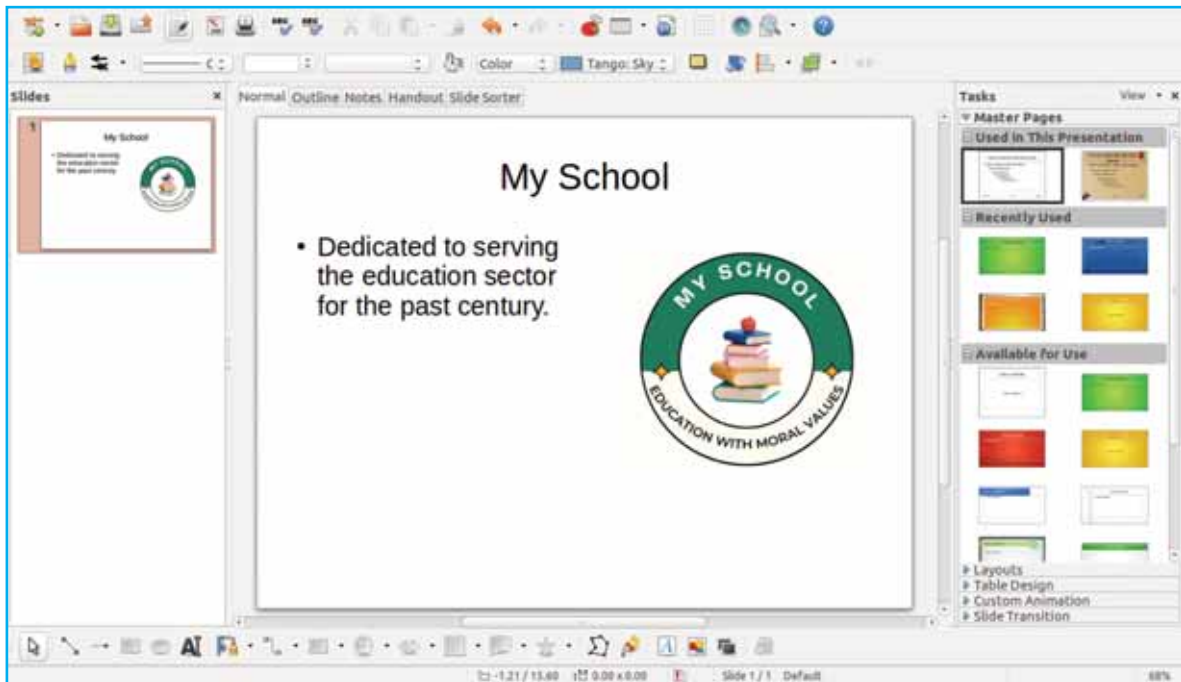


Figure 9.8 : Updated View of Slide after Changing the Layout

To enhance our slide's visual appeal, we can easily change its master page. Follow the steps:

1. In the *Tasks pane*, click on the *Master Pages* section. We will see various master page options displayed.
2. Simply click on any master page that suits our preference, and it will be applied to our slide.

Updated view after applying master page is shown in figure 9.9.

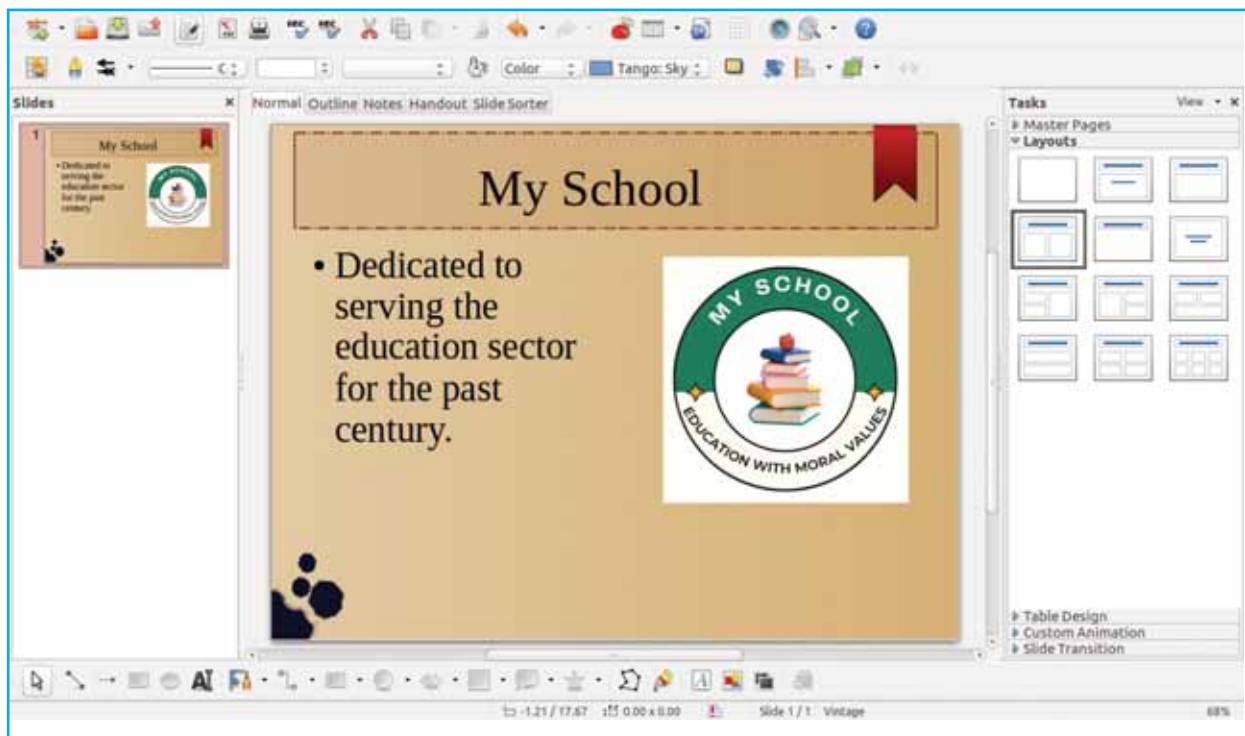


Figure 9.9 : Updated View of Slide after Applying Master Page.

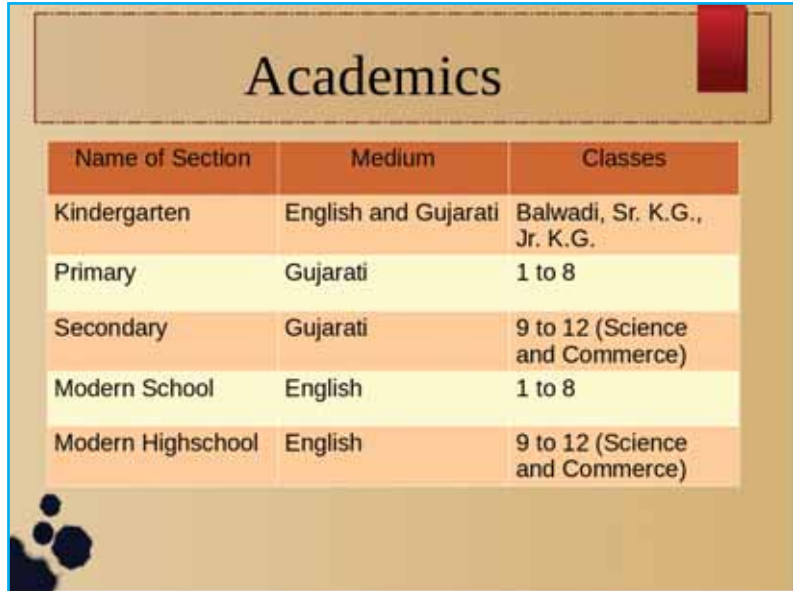
Ready to see our slide in action? To view it as a full-screen slideshow, simply press the *F5* function key or select the *Slide Show* option from the *Slide Show* menu. Our slide will then be displayed in full-screen mode, without the Impress window components visible.

To exit the slideshow and return to the Impress window, simply press the *Escape* key or right-click anywhere and select *End Show*.

Inserting more slides in presentation

We have made the first slide. Now let us add more details about the school!

To insert another slide into the presentation, select *Slide* from the *Insert* menu. We will notice that this new slide automatically inherits the layout and master page of the previous one. Keep in mind that while we can choose different layouts for individual slides, changing the master page on any slide will apply that change across all slides in our presentation.



Name of Section	Medium	Classes
Kindergarten	English and Gujarati	Balwadi, Sr. K.G., Jr. K.G.
Primary	Gujarati	1 to 8
Secondary	Gujarati	9 to 12 (Science and Commerce)
Modern School	English	1 to 8
Modern Highschool	English	9 to 12 (Science and Commerce)

Figure 9.10 : Slide Showing the Sections of the School

Add another slide to our presentation and detail the different sections of the school. To make the information more engaging, feel free to use elements like tables or pictures. We have used a table in our example to organize the data, and we can see the result in the figure 9.10.

Let us add another slide to our presentation and detail the different activities of the school. Visuals often convey ideas more effectively than text alone. We may create a slide for the school activities that include relevant images with accompanying captions.

Insert a new slide by selecting *Slide* option from *Insert* menu. Select *Title only* layout for our slide and insert the title: Activities. Now follow the steps to insert an image in your slide.

- Click on the *Insert* menu.
- Go to *Picture* and select *From File* option.
- In the *Insert Picture* dialog box that appears, locate and select our desired image file.
- Click *Open* button, and the image will be added to the slide.

Once we have inserted an image, we might need to adjust its size. To do this, click on the image to select it. We will then see eight small green circles (edit points) appear around its edges. Simply drag any of these green points inward or outward to resize the image. We can also drag the image to move it to the perfect spot on our slide.

To add a caption, we will use a *TextBox*. Text box is a rectangular area where we can type the text. First, select the *Text* tool from the *Drawing* toolbar. Then, click and drag below the image to create the text box. Now we can type the caption. We will notice that the *Line and Filling* toolbar will be replaced by formatting tools, allowing to customize the caption's appearance.

Figure 9.11 shows a sample slide detailing the school's activities.



Figure 9.11 : Slide Showing the Activities of School

We may create some more slides highlighting information about our school. We have added two more slides on school results and school achievements as shown in figure 9.12 and figure 9.13.

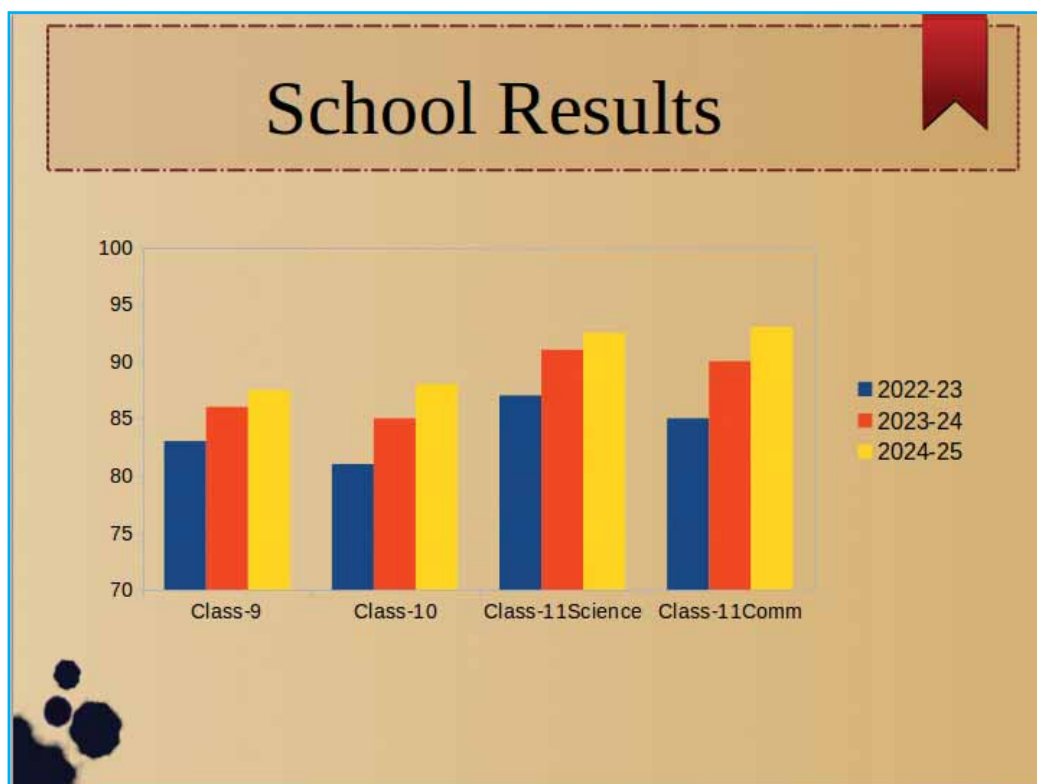


Figure 9.12 : Slide Showing the School Results

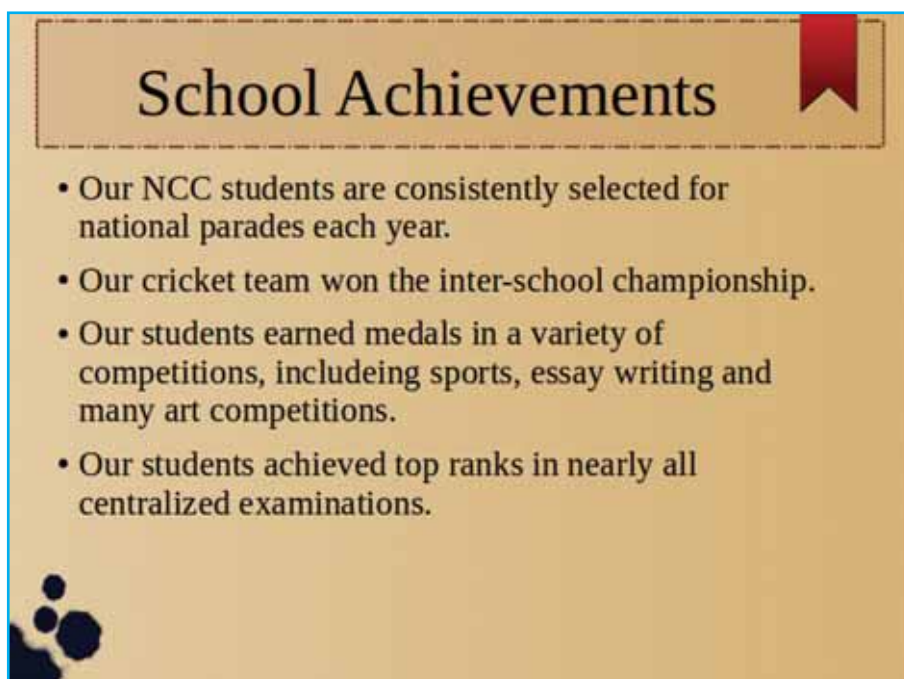


Figure 9.13 : Slide Showing the School Achievements

As we can see, our fourth slide features a chart displaying the school results. Charts are excellent for presenting data graphically, making it much easier to compare and understand trends than with plain text or tables.

Now, let us explore how to insert a chart into our slide.

- Insert a new slide and select the *Title, Content* layout.
- Insert the title of slide.
- Click *Insert Chart* icon in *Content* placeholder. This action inserts a default chart, and we will notice that the Chart toolbar appears directly above it.
- Click the *Chart Data Table* button on the *Chart* toolbar. A *Data Table* window will pop up, displaying sample data. Simply replace this sample data with our actual figures as shown in figure 9.14, then close the window. Our chart will then automatically update to reflect the new values.

Data Table					
2022-23 2023-24 2024-25					
	Categories	Y-Values	Y-Values	Y-Values	
1	Class-9	83	86	87.5	
2	Class-10	81	85	88	
3	Class-11Science	87	91	92.5	
4	Class-11Comm	85	90	93	

Figure 9.14 : Data Table

The slide with updated chart is displayed in figure 9.12. We may also consider adding more slides to further elaborate on various aspects of our school's information.

Slide Views

LibreOffice Impress offers several different slide views; each designed for a specific purpose to help us create and manage our presentations effectively. We can usually switch between these views using tabs at the top of the Workspace area, or by going to the *View* menu.

Impress provides five views: *Normal*, *Outline*, *Notes*, *Handout* and *Slide sorter*. Let us briefly go over the different ways we can view and work with the slides in Impress.

Normal view

Task of creating, formatting, and designing the slides are done using the *Normal* view. This is where we will add the objects like text, graphics, video, animation etc. To work on a specific slide, just click its thumbnail in the Slides pane, and it will appear in the main Workspace area of the *Normal* view. A slide in *Normal* view is shown in figure 9.9.

Outline view

The *OutlineView* displays all the presentation slides in numbered order, but it focuses only on the text content. We will see just the topic titles and any bulleted or numbered lists, all presented as left-justified text. This view intentionally hides drawing objects, the text inside those objects, and even the slide names, keeping the focus purely on our presentation's structure and content.

The *OutlineView* is used for quickly editing text across our slides. We can easily add or delete text, move and copy content, and even change a paragraph's outline level using the left and right arrow buttons as shown in figure 9.15.

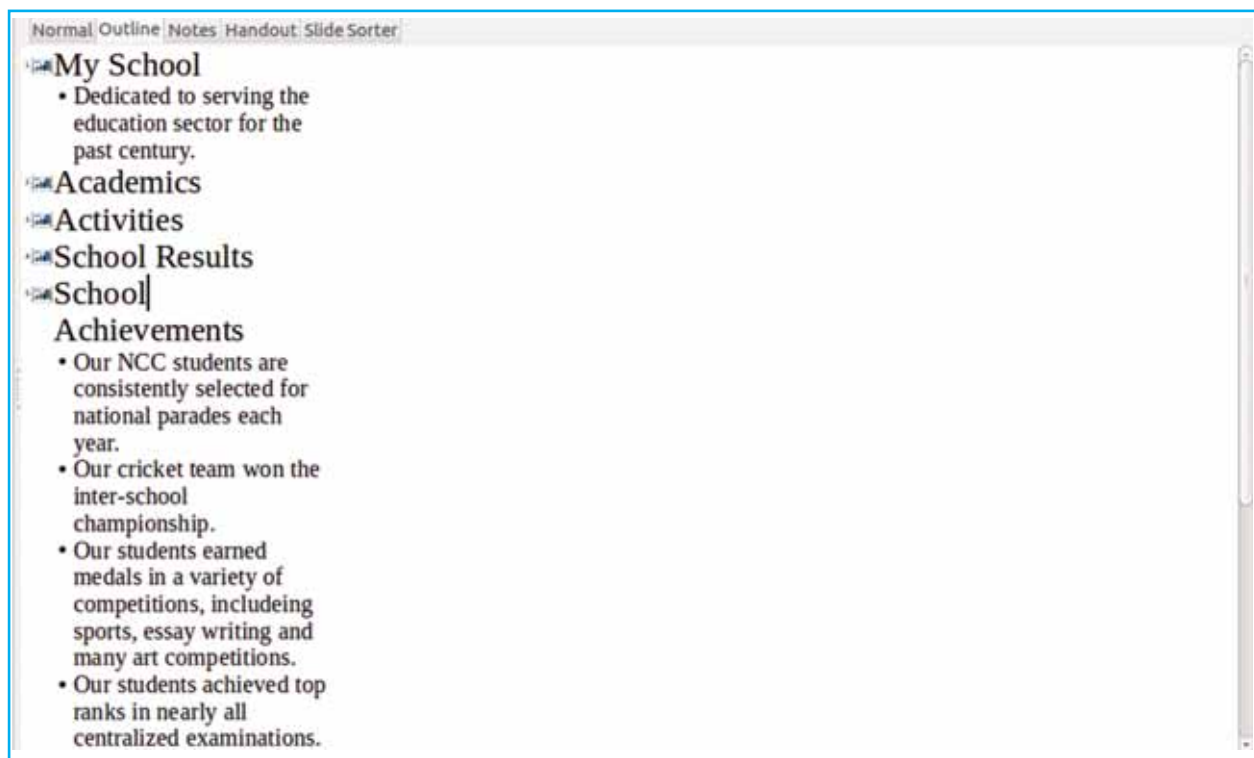


Figure 9.15 : Outline View

Notes view

The *Notes view* is where we add personal notes to our slides. These notes are only for our reference and won't appear during the slide show. To start adding notes, just click *Click to add notes* in the text box below the slide, then begin typing. We can also resize the notes text box just like any other window; simply place the pointer on its border and drag it to our desired size. These notes are typically used to give the presenter extra information or reminders during the presentation. Notes view is shown in figure 9.16.

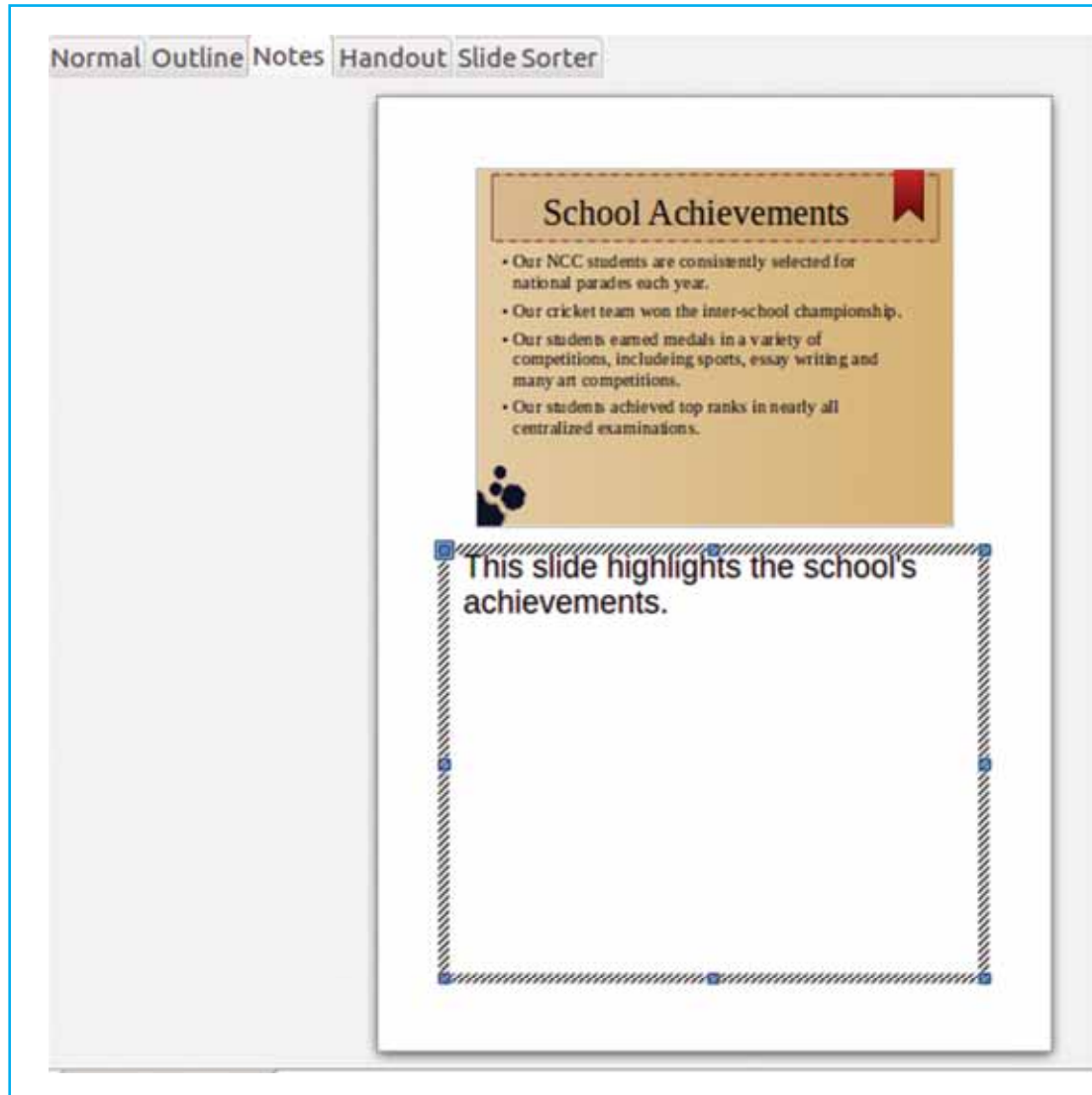


Figure 9.16 : Notes view

Handout view

The *Handout view* is primarily used for printing multiple slides on a single page, which is incredibly useful for both the presenter and the audience. For the presenter, it is a great way to check the overall appearance and flow of the slides when printed. For the audience, handouts provide a hardcopy of the presentation's content, allowing them to follow along and take notes.

When we are ready to print, we will use the *Handout view* to set up the page layout, choosing how many slides we want on each printed page. We can select from various layout options: 1, 2, 3, 4, 6, or 9 slides per page, depending on our needs. Printing of Handout view is shown in figure 9.17.

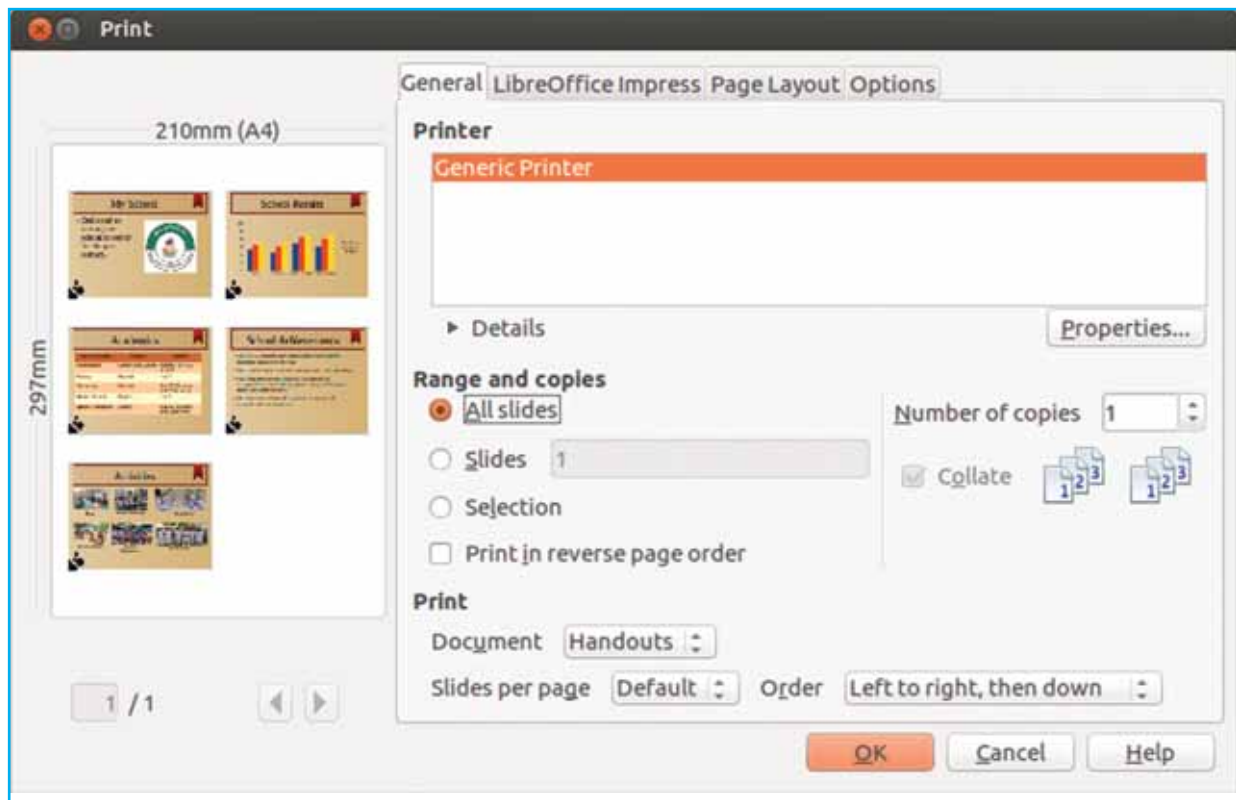


Figure 9.17 Handout View

Slide Sorter view

This view displays all the slides as small thumbnails, giving us a complete overview of the presentation. It is incredibly useful for rearranging slides with a simple drag-and-drop action, or for applying changes to several slides simultaneously. Slide Sorter view is shown in figure 9.18.



Figure 9.18 : Slide Sorter View

Saving Presentation

Now that we have put work into our presentation, let us make sure it's saved for future use!

- Go to the *File* menu and select *Save*. We can also quickly save by pressing *Ctrl + S*.
- *Save As* dialog box will pop up. Write a name in the *Filename* field.
- Click the *Save* button.

Our file will be saved as an Impress presentation, and the application automatically adds the *.odp* extension to it. We can open our presentation at any time by simply selecting the *Open* option from the *File* menu.

Summary

We explored the importance of digital presentations for effectively conveying ideas and learned how to create them using Impress. We discovered that an Impress presentation is essentially a slideshow, which is a compilation of interconnected slides. We practiced embedding multimedia objects into the slides and experimented with various layouts and appealing master pages. Finally, we learned how to display the presentations as a full-screen slideshow and utilize different slide views. In the next chapter, we will explore some advanced Impress features that will help you create more attractive and effective presentations by incorporating some special effects.

EXERCISE

1. What is a Multimedia? List the components of multimedia.
2. Why multimedia is important for communication? Give one example.
3. What is the importance of Digital presentation?
4. How can we start the Impress application in our Ubuntu system?
5. Make a list of components that are shown in the initial layout of Impress window.
6. Which sections are included in Tasks pane?
7. What is a Master page? Which master page is default in Impress?
8. Write a difference between Custom animation and Slide transition.
9. Write steps to insert an image in slide.
10. What is a chart? How can we insert a chart in a slide?
11. **State whether true or false.**
 - (1) We cannot change a slide master once it is chosen.
 - (2) Escape key can be used to end the full screen slide show.
 - (3) We can choose different layouts for our different slides in a presentation.

- (4) Outline view in presentation software only shows images of the slides.
- (5) It is possible to arrange 7 slides on a single page using the Handout view.

12. Fill-in the blanks.

- (1) _____ view is used to print multiple slides on a single page.
- (2) _____ view is used for working on a specific slide.
- (3) Slide sorter view shows each slide in _____ view.
- (4) _____ view is used to add personal notes to a slide.
- (5) _____ key is used to end the slide show.

13. Multi-choice questions. Choose the most correct answer.

- (1) Which out of the following is a presentation software?
(a) Impress (b) Writer (c) Base (d) Calc
- (2) The topmost bar of Impress window is known as...
(a) Status bar (b) Standard toolbar
(c) Title bar (d) Drawing toolbar
- (3) Which bar has the New, Open, and Save tool buttons?
(a) Drawing toolbar (b) Line and Filling toolbar
(c) Standard toolbar (d) Picture toolbar
- (4) Which part of the presentation software displays a thumbnail view of each slide?
(a) Tasks pane (b) Slide pane (c) Workspace (d) Status bar
- (5) Which panel has the subsections like Master pages, Layouts and Table Design?
(a) Tasks pane (b) Slide pane (c) Workspace (d) Status bar
- (6) Which out of the following is default slide master?
(a) Designed (b) Bordered (c) Blank (d) Highlighted
- (7) What is a visual change over time?
(a) Image (b) Audio (c) Text (d) Animation
- (8) Which is the visual effect you see when moving from one slide to the next during a presentation?
(a) Slide Transition (b) Custom Animation
(c) Slide Dynamism (d) Slide Transformation

- (9) Which bar of the Impress interface contains the zoom slider?
- (a) Title bar (b) Menu bar
(c) Standard toolbar (d) Status bar
- (10) What is the shortcut key to begin a full-screen slide show?
- (a) F3 (b) F5 (c) F7 (d) F10

Laboratory Exercise

1. Prepare additional slides for the existing school presentation, focusing on history of school, achievements of students, faculties in each section etc.
2. Choose a mathematics theorem from your textbook and create a presentation that walks through it step-by-step. Make sure to use the drawing toolbar effectively to create and display all relevant images needed to explain the theorem.
3. Design a presentation showcasing India's diverse geography, religions, languages, and cultures, and demonstrate how unity is maintained across these variations.
4. Prepare a presentation showing importance of sports in a student's life.
5. Create a presentation detailing the causes of global warming, and also outline the actions we should take and avoid to help protect the Earth from it.





Enhancing Presentation

Introduction

We have already learned how to create digital presentations using LibreOffice Impress. We have made slideshows on a variety of topics, adding multiple slides and different multimedia elements to them. We also know how to use various master pages and layouts to effectively present different types of data.

In this chapter, we will learn how to take our Impress presentations to the next level by using some of its more advanced features. We will discover how to:

- Add transition and animation effects to our slides and their content.
- Insert consistent content across all slides, like the date or time.
- Create new slide masters and templates for our presentations.
- Utilize drawing and diagrammatic tools within our slides.
- Customize our slide's page settings.
- Prepare custom slideshows.
- Set specific timings for each slide in our presentation.
- Linking and exporting presentation.

Transition

Slide transitions are the visual effects that occur when one slide moves to the next during a presentation. They add a dynamic element to our slideshow, making the shift between slides more engaging than a simple cut.

We can apply a different transition to each selected slide. Alternatively, we can apply a common transition to all slides in the presentation. A variety of transitions are available to choose from, such as *Wipe*, *Checkers*, *Bar*, *Fade* etc. We can also choose *No Transition* which means the next slide will simply replace the

current one without any special effect. Impress allows us to preview the chosen transition effect immediately, helping us decide which one works best.

Now, let us add transition effects to the presentation we created earlier. Follow the steps given below:

- Go to the *File* menu and select *Open*, or simply press *Ctrl + O*. The *Open* dialog box will appear as shown in figure 10.1. Browse and select the presentation file, then click the *Open* button. All of the presentation's slides will appear in the slide pane, ready for us to work on.

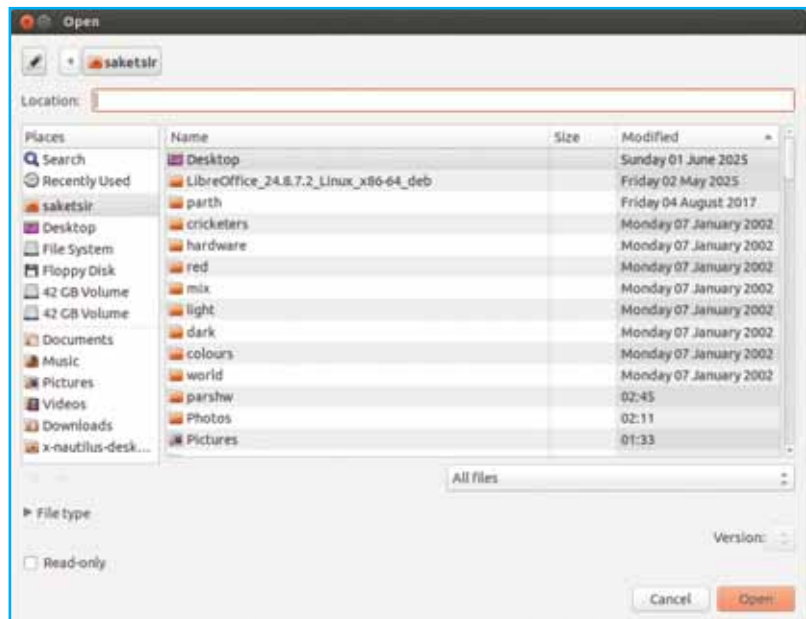


Figure 10.1 : Open Presentation

- To apply a transition effect, simply select the specific slide from the Slide pane that we wish to modify.
- In the Tasks pane, click on the *Slide Transition* section. Options regarding slide transition are displayed as shown in figure 10.2. Under *Apply to selected slides* selection list, choose the transition effect we want. If the *Automatic preview* checkbox is selected, we will see an instant preview of the transition.
- From the *Speed* dropdown menu, select the desired speed: *Slow*, *Medium*, or *Fast*. Optionally, pick a sound from the *Sound* dropdown menu.
- To apply the transition to every slide in our presentation, simply click *Apply to All Slides*. To see the transition in action, click the *Play* button. And to start the slideshow with the selected transitions, click the *Slide Show* button.

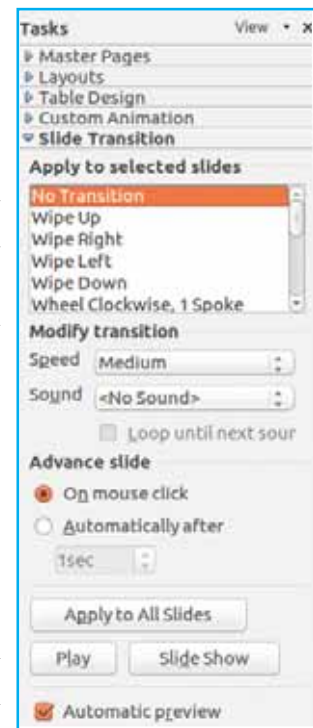


Figure 10.2 : Slide Transition

Custom Animation

As we learned previously, animation brings objects to life through movement. We can apply animation effects to almost any object on our slide, making presentation more engaging for viewers.

Let us add some animation effects to the objects on our slide. Follow the steps given below:

- Open the presentation we made for our school.
- Select a slide and the object we want to animate.
- Click the *Custom Animation* section in the Tasks panes. This will display options for adding animation to our object.
- Click the *Add* button. This will open the *Custom Animation* dialog box as shown in figure 10.3.

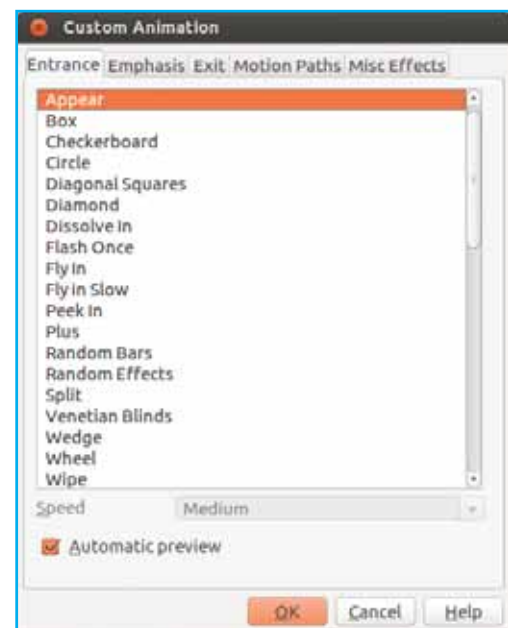


Figure 10.3 : Custom Animation Dialog Box

- As shown in figure, the *Custom Animation* dialog box has several sections, including:
 - *Entrance*: How an object appears on the slide.
 - *Emphasis*: Effects that draw attention to an object already on the slide.
 - *Exit*: How an object leaves the slide.
 - *Motion Paths*: Defines a path for the object to move along.
 - *Misc Effects*: A category for various other effects.
- Choose an animation effect of our choice. We can repeat this process to add animations to other objects on our slide. After applying animations to several objects on a slide, the *Custom Animation* section in the Slide pane will appear as shown in the figure 10.4.

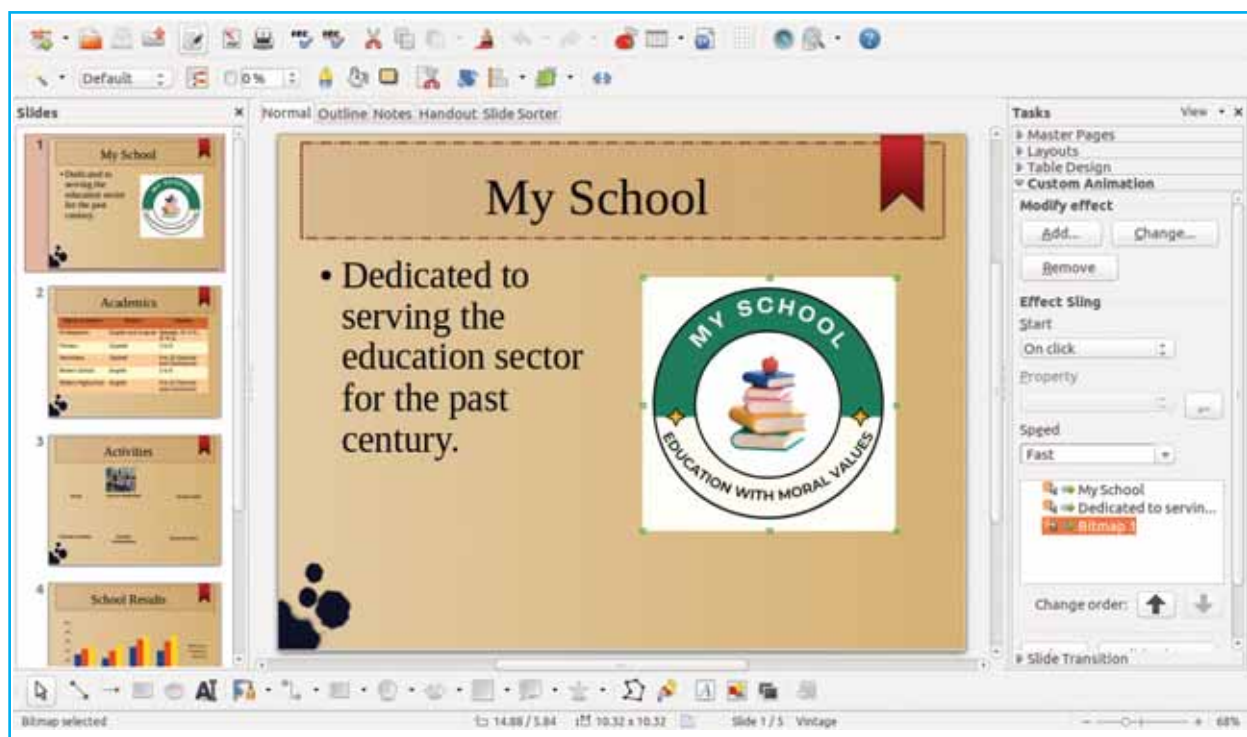


Figure 10.4 : Custom Animation Effect Applied to Slide Objects

Let us explore each control in the *Custom Animation* section of the **Tasks** pane.

Add: We can use this button to open the *Custom Animation* dialog box, allowing us to select animation effects for objects on our slide.

Change: We can use this button to change an animation we have already applied.

Remove: We can remove animation using this button.

Start: It offers options like *On Click*, *With Previous*, and *After Previous*. We can choose how our object animates: either by clicking the mouse, simultaneously with the previous animation, or immediately following the previous animation.

Speed: We can choose the animation speed for our object from options like *Very Slow*, *Slow*, *Medium*, *Fast*, and *Very Fast*.

Change order: We can change the order in which animations appear by clicking the up and down arrow buttons.

Adding Content to All Slides

We might want to display consistent information on every slide, such as the date, slide number, or our school's name. The most effective way to add content to all slides in a LibreOffice Impress presentation is by using Master Slides. A Master Slide (also called a Slide Master) acts as a template for our presentation. Any content, formatting, or design elements we place on a Master Slide will automatically appear on all slides that use that specific master.

Follow the steps to insert content to all the slides:

- Click on *View* in the menu bar and select *Master*→*Slide Master*. This will open the *Master View* as shown in figure 10.5, where we will see our current master slide in the left-hand pane. The main workspace will display the selected master slide.

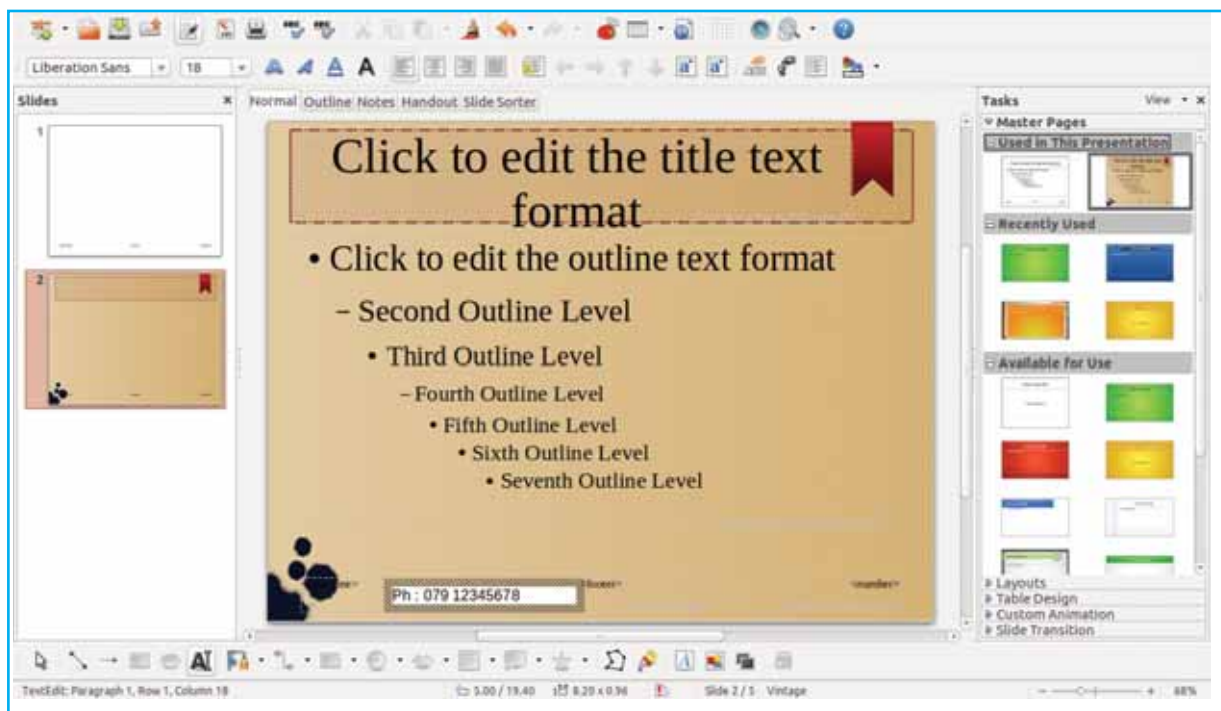


Figure 10.5 : Adding Content to All the Slides Using Master Slide

- In the main workspace, use the text box tool to draw a text box and type a phone number of our school. We can also add lines, shapes, or other graphic elements from the Drawing toolbar.
- Go to *View* menu and select *Header and Footer*. A dialog box will be opened as shown in figure 10.6. Select checkboxes for *Date and Time* and *Slide number*. Click *Apply to All* button.

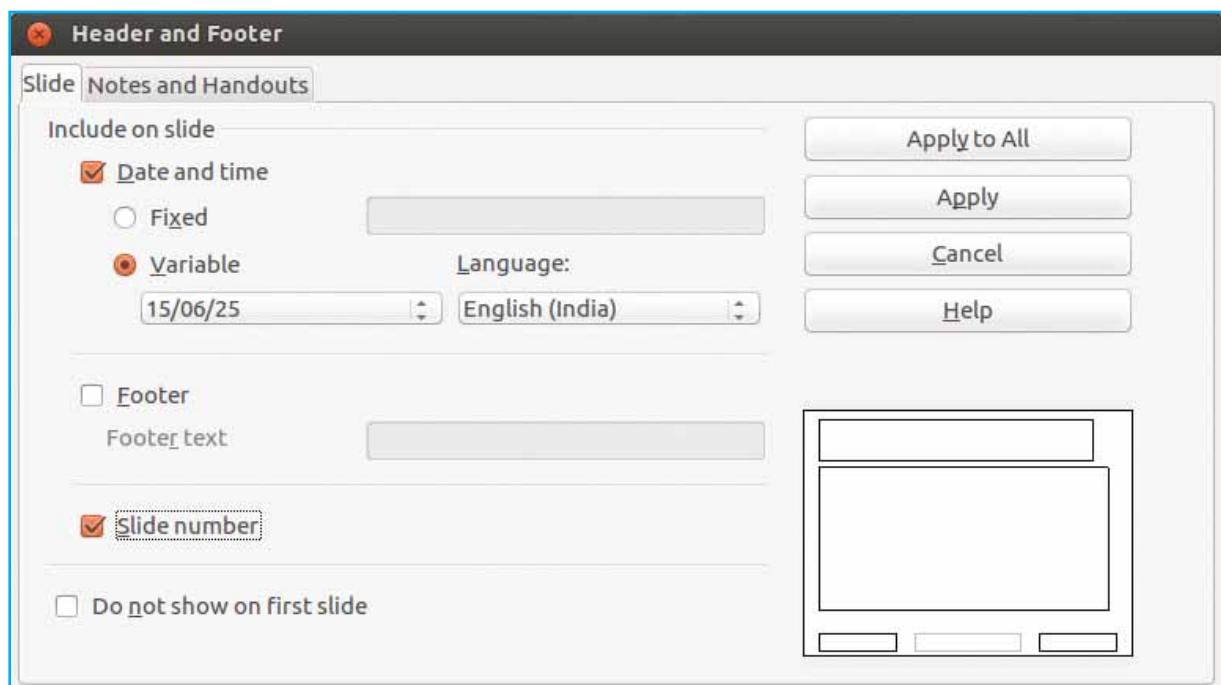


Figure 10.6 : Adding Date and Slide Number Using Header and Footer

- Select *Normal* view in *View* menu. All changes we make to the Master Slide will automatically appear on every slide in our presentation.

Creating New Slide Master

Creating a new Slide Master in LibreOffice Impress allows us to design a unique layout and style that we can then apply to specific slides in our presentation. This is incredibly useful for maintaining different themes or sections within a single presentation.

Follow the steps to create a new Slide Master for presentation:

- Select *View* → *Master Slide*. This will open the Master View, where we will see thumbnails of existing master slides on the left pane.
- Right-click on any empty space in left pane and from the context menu, select *New Master*.

Right-click on the new master slide thumbnail and select *Rename Master...* *Rename slide* dialog box will appear as shown in figure 10.7. Enter 'My Master Page' as a name for new master. Click 'OK'.

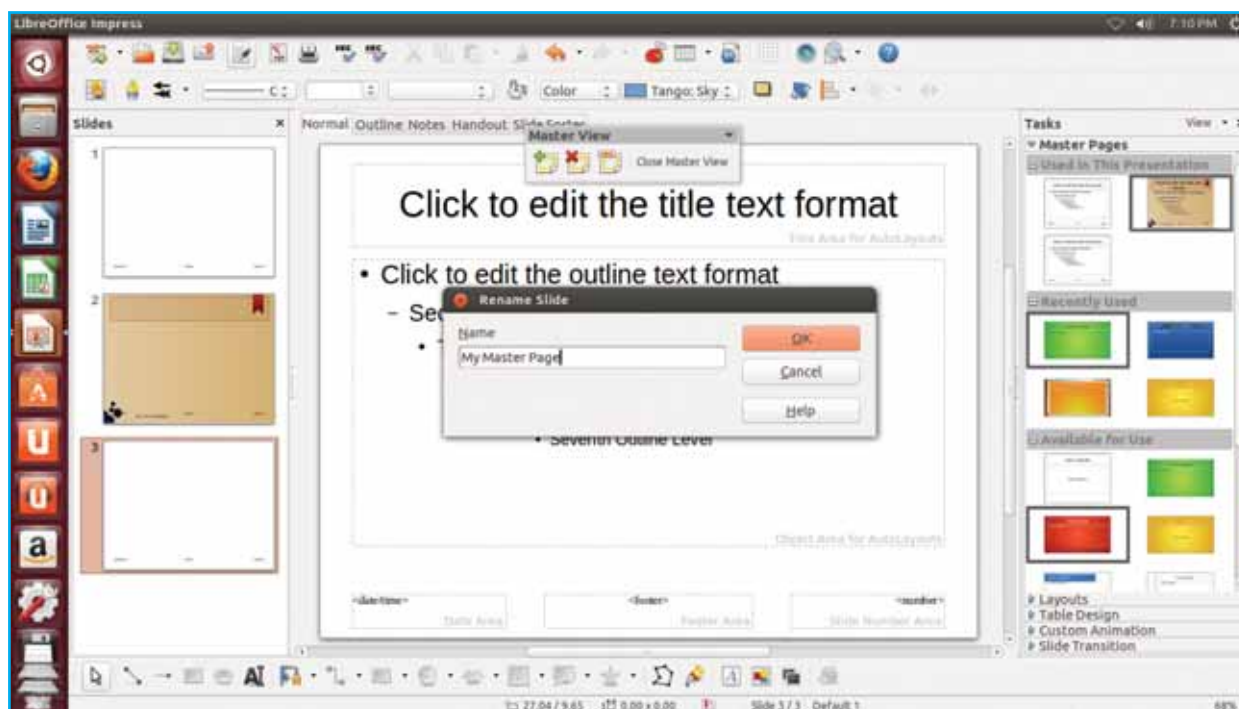


Figure 10.7 : Adding and Renaming New Master Page

- Once new Master Slide is selected, we can begin customizing it. Feel free to add or modify the placeholders to suit the layout needs. We can also personalize the background by right-clicking on an empty area of the master slide, selecting *Slide* → *Page Setup...*, and then navigating to the 'Background' tab. Here, we can choose from various options like a colour, gradient, image, pattern, or hatching to set the desired background. Figure 10.8 shows the options available in *Background* tab of *Page Setup* dialog box.

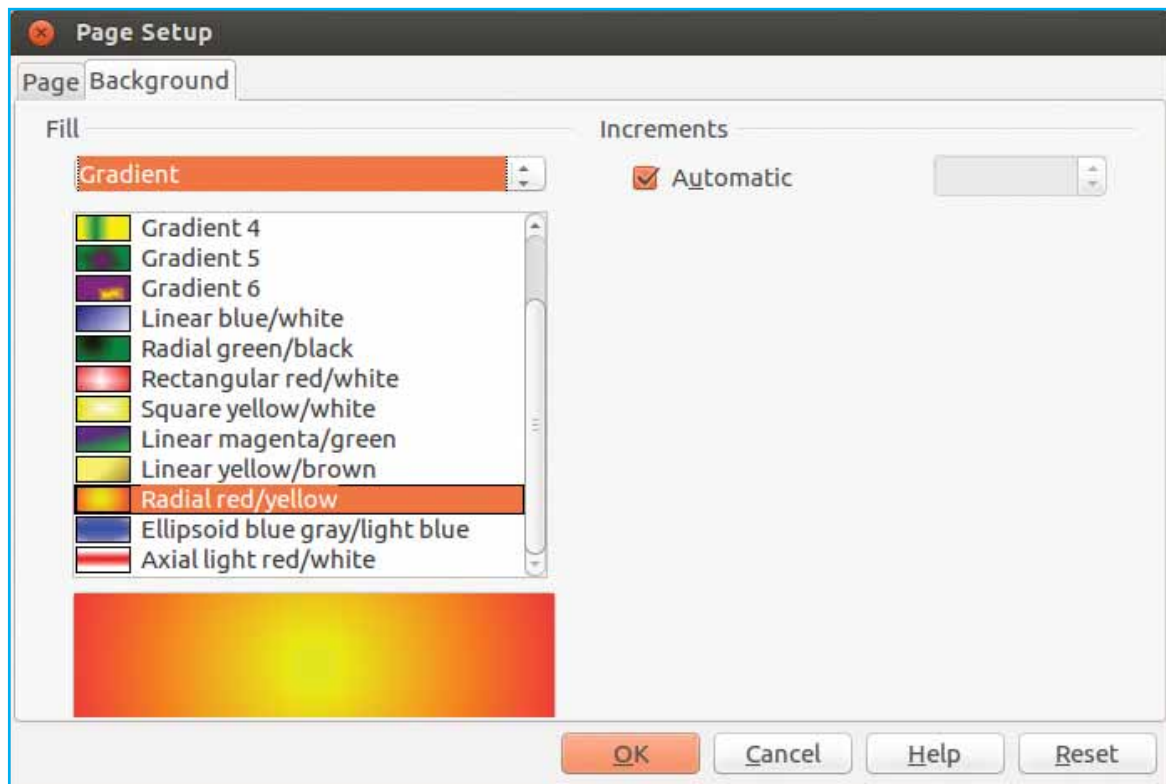


Figure 10.8 : Applying Background to New Slide Master

- Click the *Close Master View* button on the Master View toolbar or go to *View → Normal*.
- In *Normal View*, we can easily apply our newly created master slide to an existing slide by selecting it from the *Master Slide* section within the Tasks pane.

Drawing and Diagrammatic Tools

Impress provides a diverse set of drawing tools to graphically enhance our slides. We will find these tools located in the *Drawing* toolbar, typically positioned at the bottom of the Impress interface, allowing us to easily insert various drawing objects into our presentation. If the Drawing toolbar is not visible, we can enable it by navigating to *View → Toolbars*, then selecting *Drawing*. Figure 10.9 shows the *Drawing* toolbar.

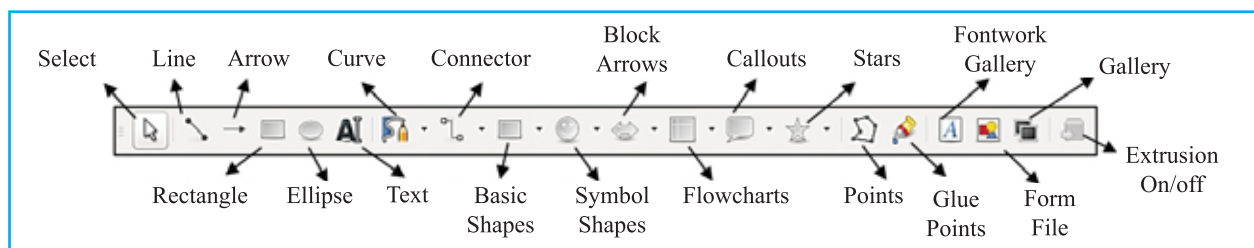


Figure 10.9 : Drawing Toolbar

Let us discuss drawing tools, one by one.

Select: This tool selects one or more objects on our slide. When an object is selected, it will display selection handles (usually small blue squares) around its perimeter. These handles indicate that the object is active and ready for manipulation. We can drag the selection handles to change size of an object. To move an object, simply drag the mouse pointer over it.

Line: The *Line* tool draws a straight line. We can click and drag from starting point to the end point. We may hold Shift key to draw perfectly horizontal, vertical, or 45-degree angled lines.

Arrow: This tool draws a line with an arrowhead on one end. We typically use arrow lines to point at something or to illustrate a flow.

Rectangle: The *Rectangle* tool lets us draw both rectangles and squares. Simply click and drag to create a rectangle. To draw a perfect square, hold down the Shift key while you drag.

Ellipse: The *Ellipse* tool draws both ellipses and circles. To create an ellipse, just click and drag. If we want a perfect circle, hold down the Shift key while you drag.

Text: This tool creates a rectangular area for typing and formatting text. Just click and drag to set the text box size, then start typing.

Curve: The *Curve* tool lets you draw freehand curves. Simply click and drag; the curve will follow the mouse's movement, creating a continuous line. See figure 10.10 (a).

Connectors: These tools are essential for creating diagrams like flowcharts and organization charts. They automatically stick to objects and adjust when objects are moved. See figure 10.10 (b).

Basic Shapes: This sub-menu typically contains a variety of common shapes such as *Triangle*, *Trapezoid*, *Parallelogram*, *Pentagon*, *Hexagon*, *Octagon*, *Cross*, *Heart*, *Sun*, *Moon* etc. See figure 10.10 (c).

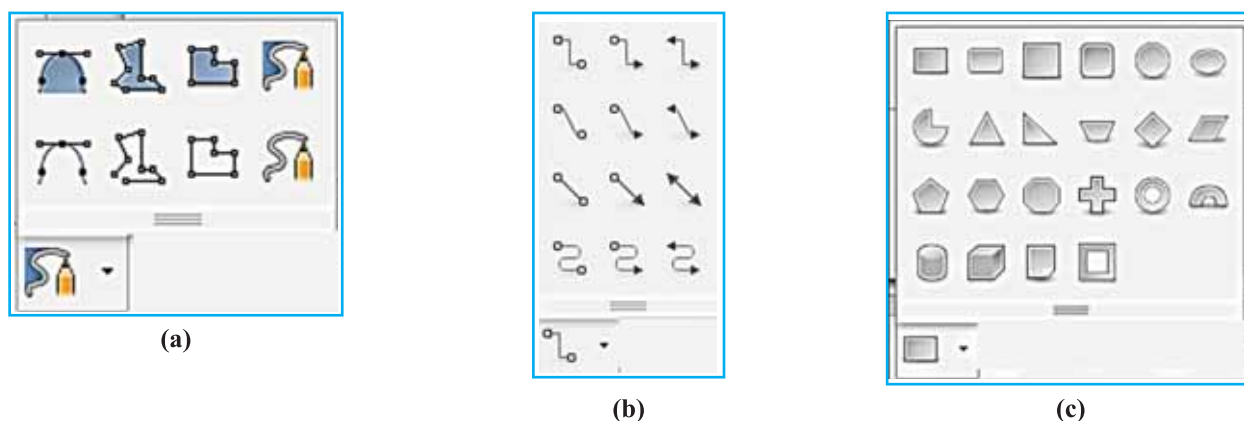


Figure 10.10 : Sub-menus of Curve, Connector and Basic Shapes

Symbol Shapes: Here is a collection of more specialized symbols, including the *Smiley Face*, *No Entry Sign*, *Cloud*, *Lightning Bolt* etc. See figure 10.11 (a).

Block Arrows: This sub-menu contains pre-defined arrow shapes with filled areas such as *Right Arrow*, *Left Arrow*, *Up Arrow*, *Down Arrow*, *Four-pointed Arrow*, *U-turn Arrow* etc. See figure 10.11 (b).

Flowcharts: This menu offers common flowchart shapes, including the *Process (rectangle)*, *Decision (diamond)*, *Start/End (rounded rectangle/oval)*, *Data (parallelogram)*, and *Connector (circle)*. See figure 10.11 (c).

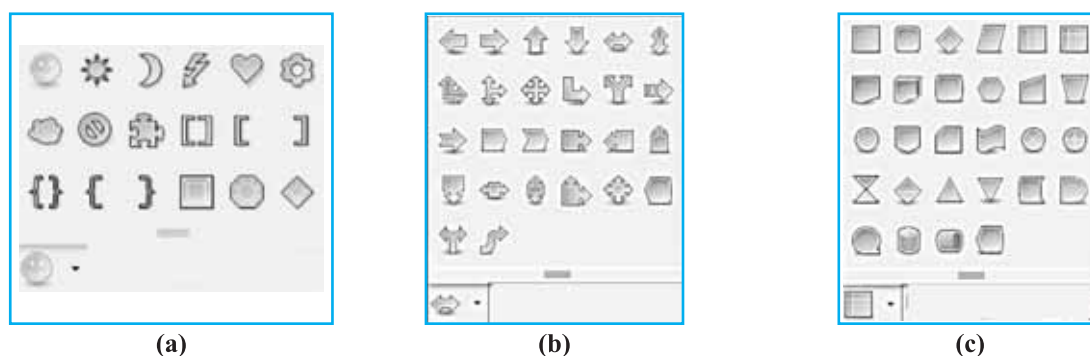


Figure 10.11 : Sub-menus of Symbol Shapes, Block Arrows and Flowcharts

Callouts: Callouts are essentially speech and thought bubbles. This submenu includes options like *Rectangular Callout*, *Rounded Rectangular Callout*, *Round Callout*, *Cloud Callout*, and *Line Callout*. They are perfect for adding commentary or dialogue to our drawings. See figure 10.12 (a).

Stars: This menu offers various star and banner shapes, including the *4-point Star*, *5-point Star*, *Exploding Star*, *Ribbon Banner*, and *Scroll*. These are great for adding decorative flair or highlighting information. See figure 10.12 (b).

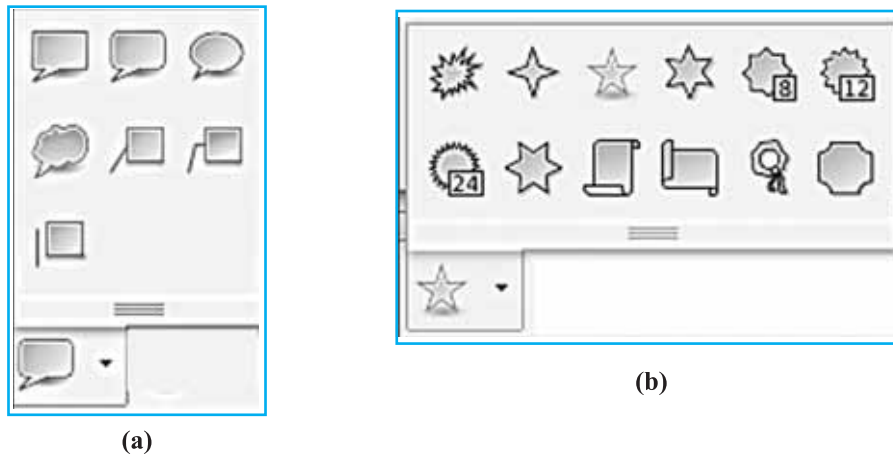


Figure 10.12 : Sub-menus of Callout and Stars

Points: This tool opens a submenu allowing you to add or remove points on an existing line or shape. We can then drag these points to modify the line or shape.

Glue Points: We can define glue points on our objects. These points allow connectors to attach precisely, ensuring consistent diagramming.

Fontwork Gallery: The *Fontwork Gallery* lets us create artistic text effects. Simply click the icon, pick a style from the gallery, and then edit the text by double clicking it. Figure 10.13 shows the *Fontwork Gallery*.

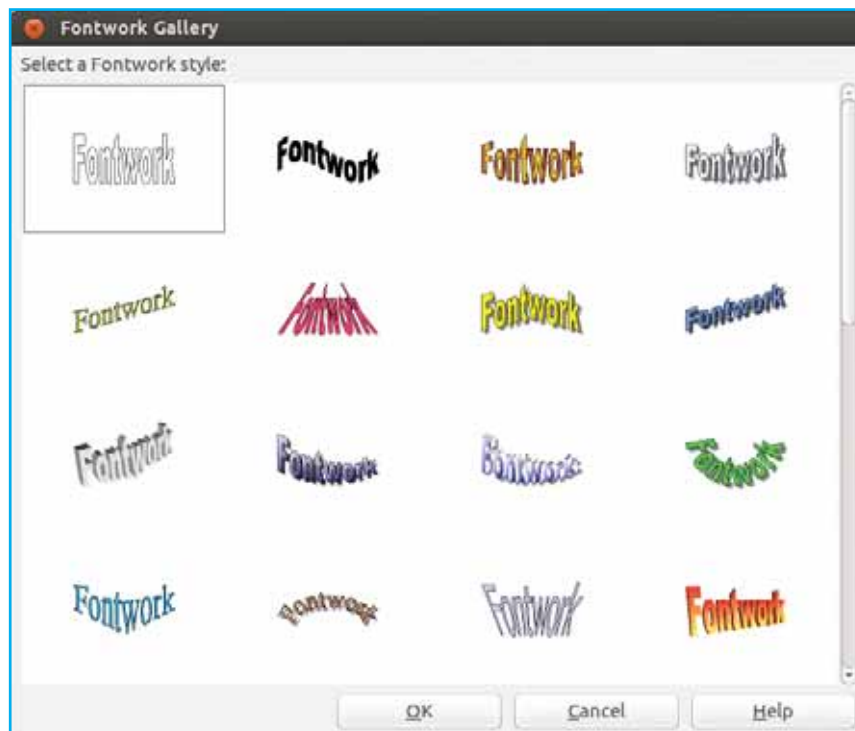


Figure 10.13 : Fontwork Gallery

From File: Clicking this tool opens the *Picture* dialog box, where we can select an image to insert into our slide. We have already covered how to insert images into slides in the previous chapter.

Gallery: The *Gallery* is a collection of reusable media objects organized into themes such as backgrounds, bullets, sounds etc. Figure 10.14 shows the options available in *Gallery*.

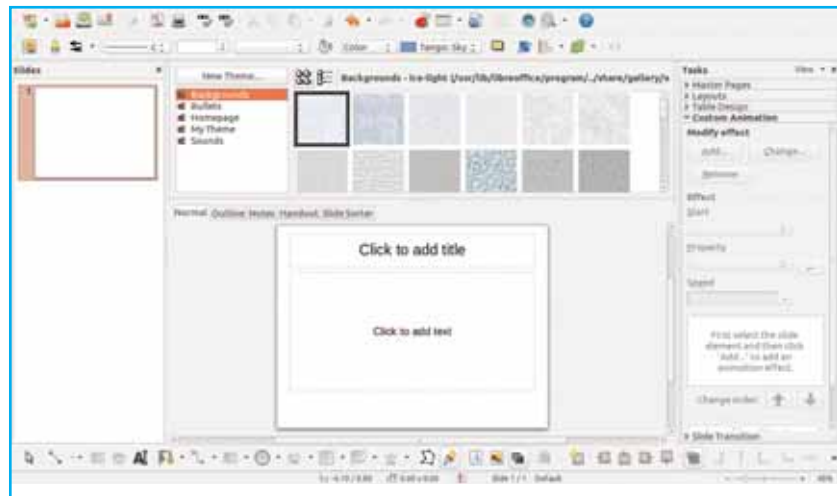


Figure 10.14 Gallery

Extrusion On/Off: This tool allows us to quickly transform a flat, 2D drawing object into a 3D object by giving it depth. This process is called 'extrusion'. Clicking this tool opens a group of tools that let us add or remove extrusion from the selected object.

Page setting

In LibreOffice Impress, *Page Setup* option gives us control over the fundamental characteristics of our slides. These settings dictate how our presentation looks both on screen and when printed, making them essential for defining the overall appearance and feel of our entire presentation.

We can find *Page Setup* dialog box by clicking on *Page* option in *Format* menu. This will open a dialog box shown in figure 10.15 with two tabs, each controlling different aspects of our slides.

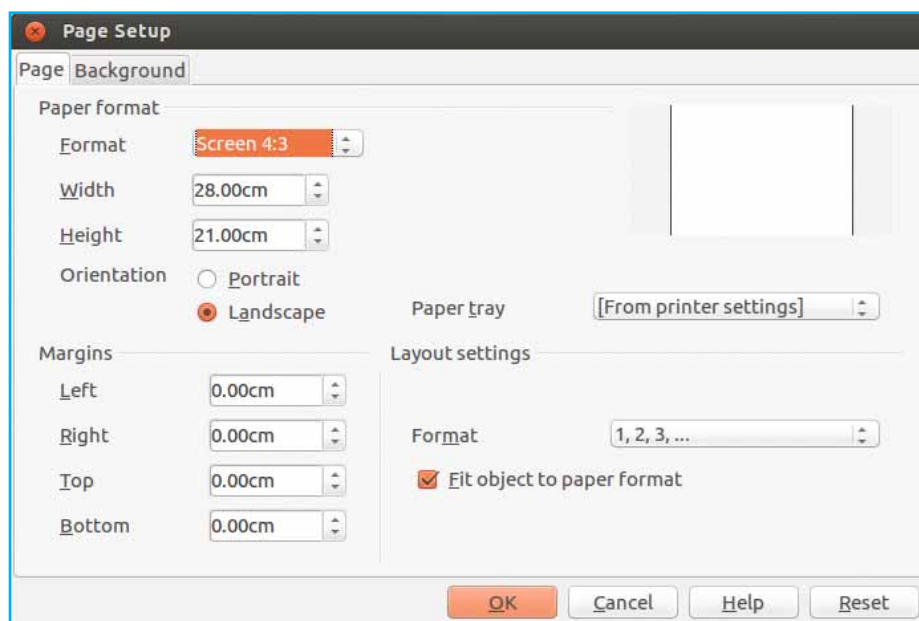


Figure 10.15 : Page Setup Dialog Box

Let us understand the options in both the tabs.

Page Tab

This tab provides options to customize the slide's dimensions, orientation, and margins as shown in figure 10.16.

Format: Here, we can define our slide's dimensions. We have the flexibility to select from standard paper sizes (like A4) or input our own custom width and height. This ensures our slides look correct on various screens and print accurately on different paper sizes.

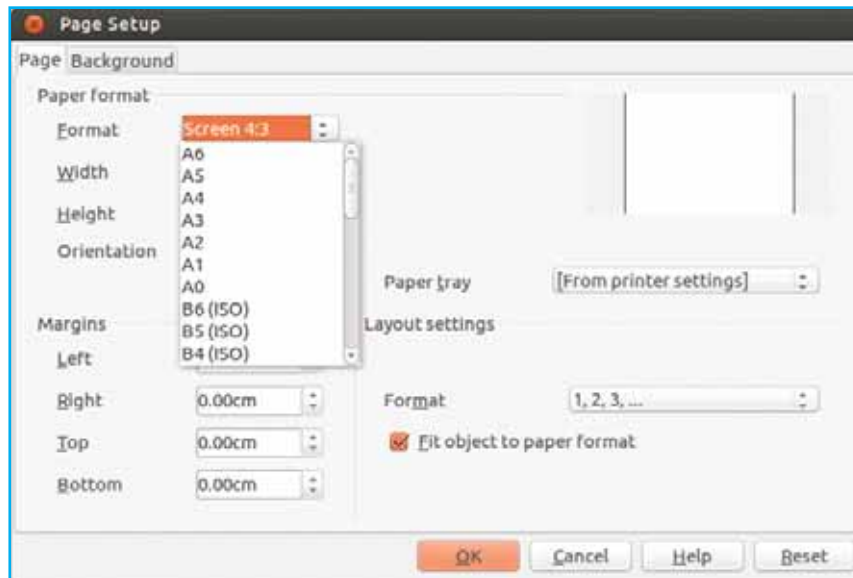


Figure 10.16 : Selecting Dimensions of a Slide

Orientation: We can choose between *Portrait* (taller than wide) or *Landscape* (wider than tall) orientation. Landscape is the default and most common choice for presentations, though Portrait may be better for certain design needs.

Margins: We can set the top, bottom, left, and right margins of our slides. These margins create the printable area, ensuring our content is not cut off at the edges.

Background Tab

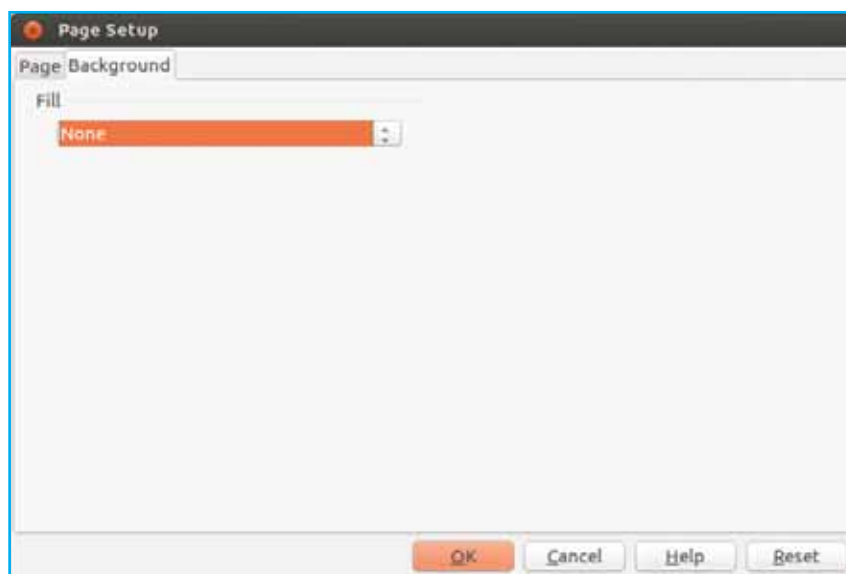


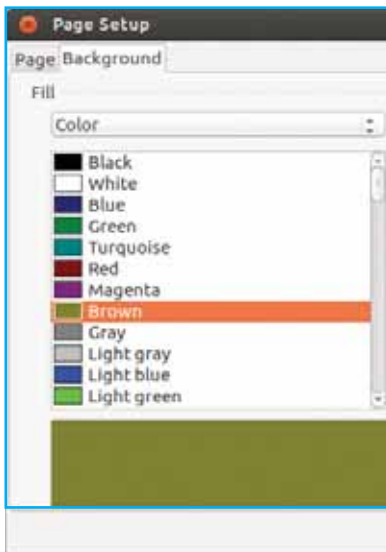
Figure 10.17 : Background tab in Page Setup Dialog Box

Here, we can customize slide's background. We have several options :

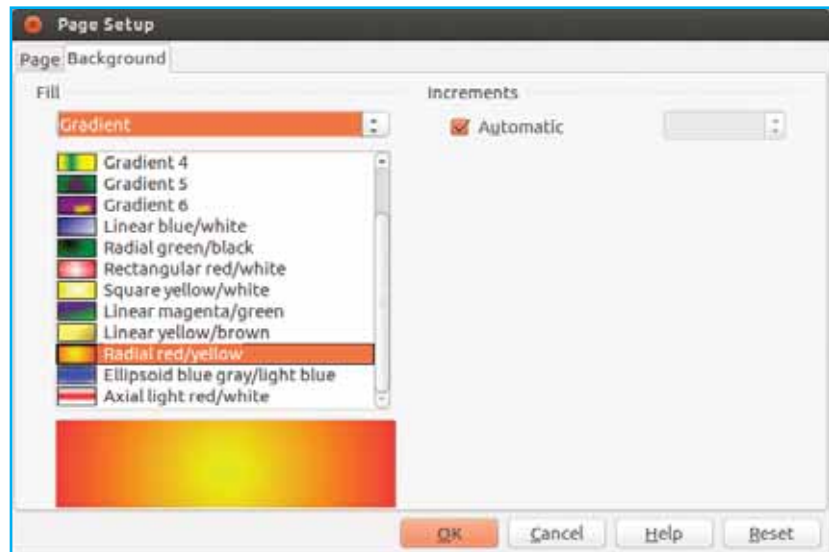
None: This option removes the slide's background entirely. See figure 10.17.

Color: We can choose a solid colour for our slide background. See figure 10.18 (a).

Gradient: We can use this option to apply a gradient of two or more colours. See figure 10.18 (b).



(a)

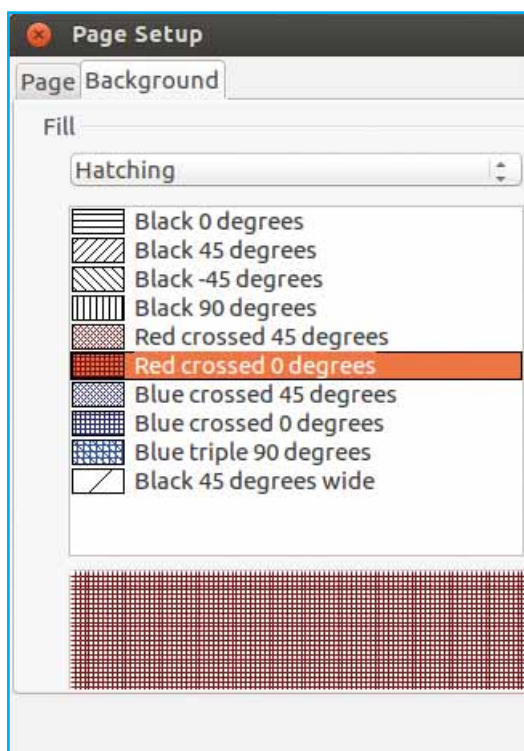


(b)

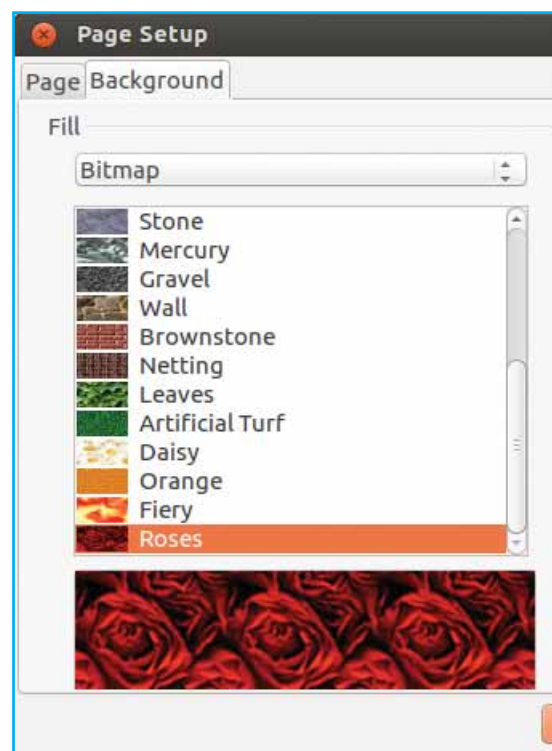
Figure 10.18 : Colour and Gradient Options for Background

Hatching: This option provides a patterned background with lines (hatching), and we can also set a background colour for the hatching. See figure 10.19 (a).

Bitmap: This will use an image as slide background. See figure 10.19 (b).



(a)



(b)

Figure 10.19 : Hatching and Bitmap Options for Background

Custom Show

The *Custom Show* option in Impress lets us tailor our presentation for different audiences or situations without needing to create entirely new files.

Sometimes, we do not need to show every slide in our presentation. Rather than duplicating our entire file and deleting slides, we can use custom shows. Think of a custom show as a pre-defined selection of our original slides, arranged in a specific order, all within the same presentation file.

To create custom slide show, simply click on the *Slide show* menu, then select the *Custom Show* option. This will bring up the *Custom Slide Shows* dialog box as shown in figure 10.20.

To create a new custom slide show, simply click the *New* button. This will open the *Define Custom Slide Show* dialog box as shown in figure 10.21, where we can give our custom show a name.



Figure 10.20 : Custom Slide Shows Dialog Box

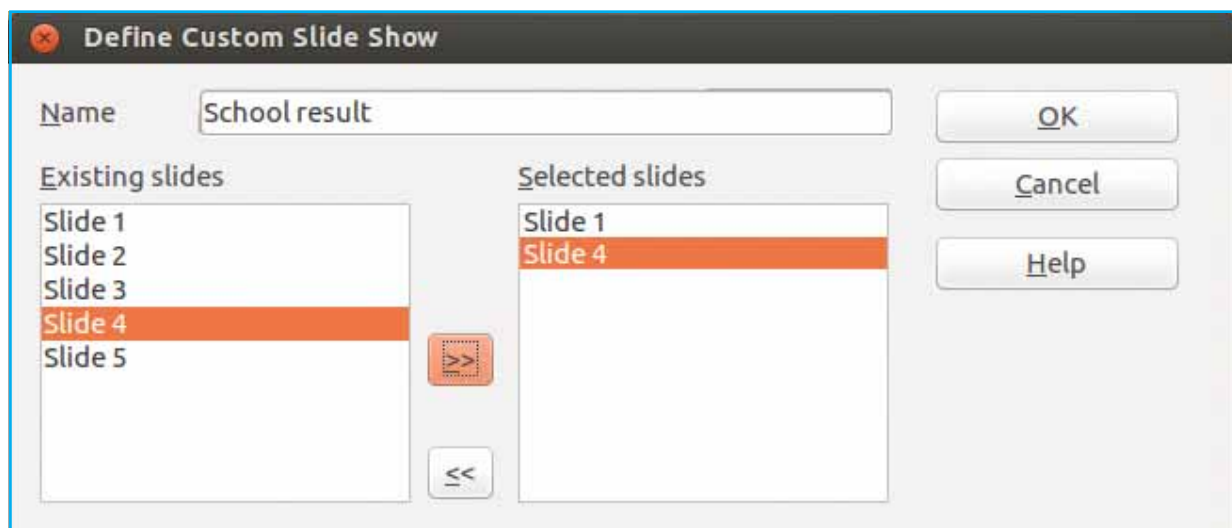


Figure 10.21 : Defining Custom Slide Show

We will see a list of all our presentation's slides in the *Existing slides* section. Use the >> button to add slides from this list to our 'Selected slides' list. If we change our mind, the << button will remove a selected slide. Once we are happy with our custom show's slide selection, click *OK*.

In the *Custom Slide Shows* dialog box, we can click *Edit* button to modify an existing custom show, or click *Delete* button to remove one entirely. To begin the custom slide show, simply click *Start*.

Rehearse Timings

The *Rehearse Timings* option in Impress is a great feature that helps us practice our presentation and fine-tune our delivery time. It allows us to run through our slides just like a real presentation, while Impress automatically records how long we spend on each one.

Go to the *Slide Show* menu and select *Rehearse Timings*. Our presentation will begin in full-screen mode, and a timer will appear. Advance through your slides just as we would during a live presentation. Impress will automatically record how much time we spend on each slide. Once we reach the end, a message will pop up asking if we want to save the new slide timings. Click *Yes*. Now, when we play our slideshow, the slides will automatically advance based on the timings we just recorded.

Linking a Presentation

If we have multiple presentations on the same topic, we can use the *Hyperlink* feature in Impress to link them. This feature also allows us to connect to other types of files, websites or email addresses.

Here is how to create a hyperlink:

1. Open the presentation and select the text or object we want to turn into a link.
2. Go to the *Insert* menu and choose *Hyperlink*. A dialog box will open as shown in figure 10.22.

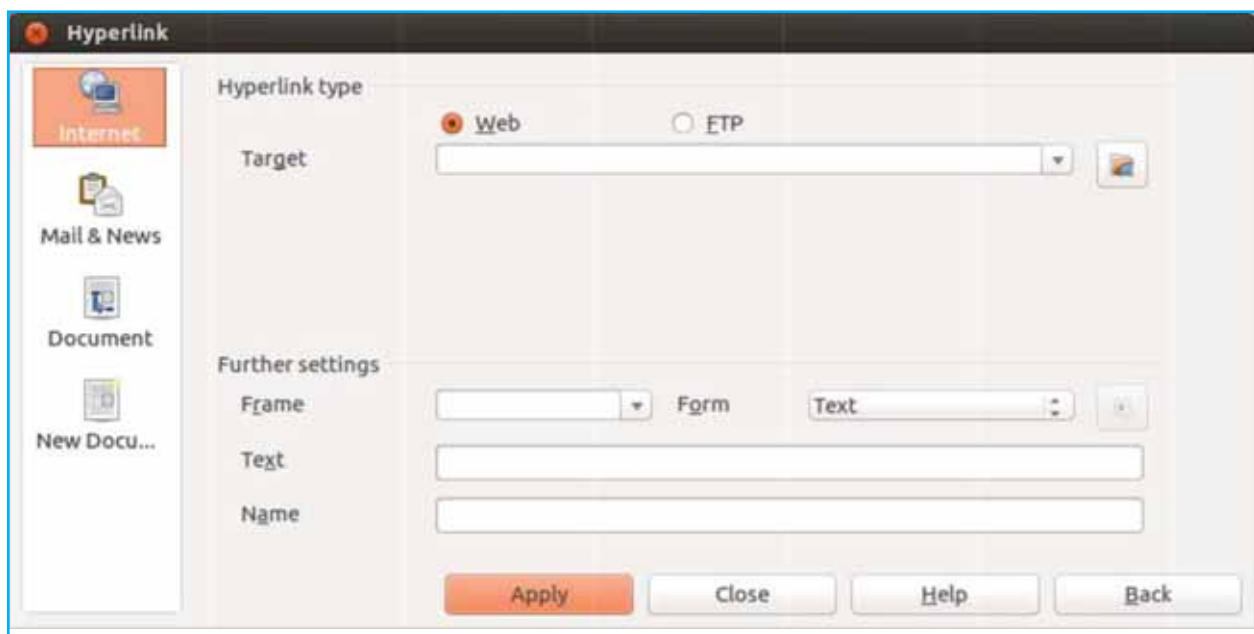


Figure 10.22 : Hyperlink

3. In this box, we can choose what we want to link to:
 - o **Internet:** Link to a website.
 - o **Mail:** Link to an email address.
 - o **Document:** Link to a file on our computer, such as another presentation.
 - o **New Document:** Create a link to a new document.
4. After we have selected the document, click *Save* to create the link.

This makes it easy to navigate between related presentations and other resources.

Exporting a Presentation

Sometimes, we may want the presentation in different formats. To save our presentation in a different format, we can use the *File* → *Export* command. This lets us convert the slides into various file types like PDF, JPEG or GIF.

Here are the steps to follow:

1. Open the presentation you want to export.
2. Go to the *File* menu and select *Export*. Export dialog box will open as shown in figure 10.23.

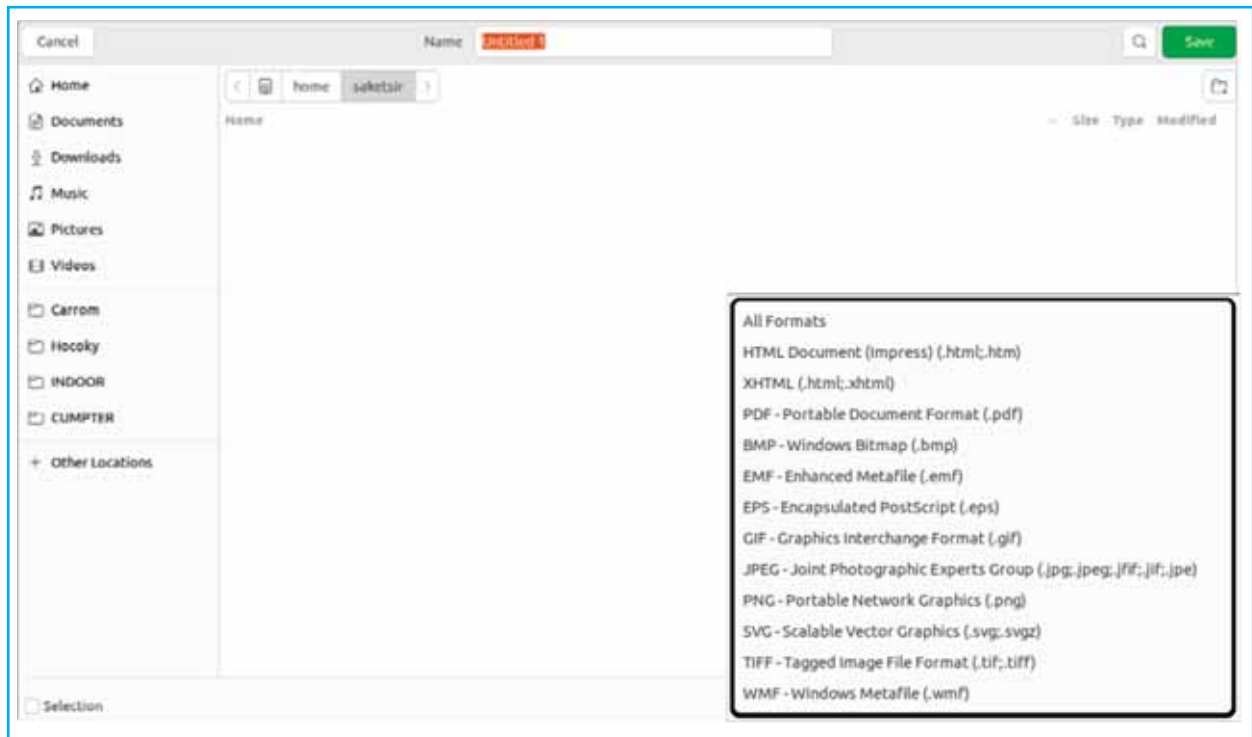


Figure 10.23 : Exporting a Presentation

3. In the *Export* dialog box find the 'Save as type' dropdown menu.
4. From the menu, choose the format. We have a wide range of options, including *PDF*, *HTML*, *BMP*, *GIF* and *JPEG*.
5. Click *Save*. Our presentation will now be exported in the format we selected.

Selecting Template to create a Presentation

Using a pre-made template is a great way to start a new presentation. Templates provide a ready-made structure and design, saving the time and effort.

Here is how to create a new presentation from a template:

1. Open the *File* menu and navigate to the *New* submenu.
2. Select the *Template* option. This will open the *Template Manager* dialog box as shown in figure 10.24.

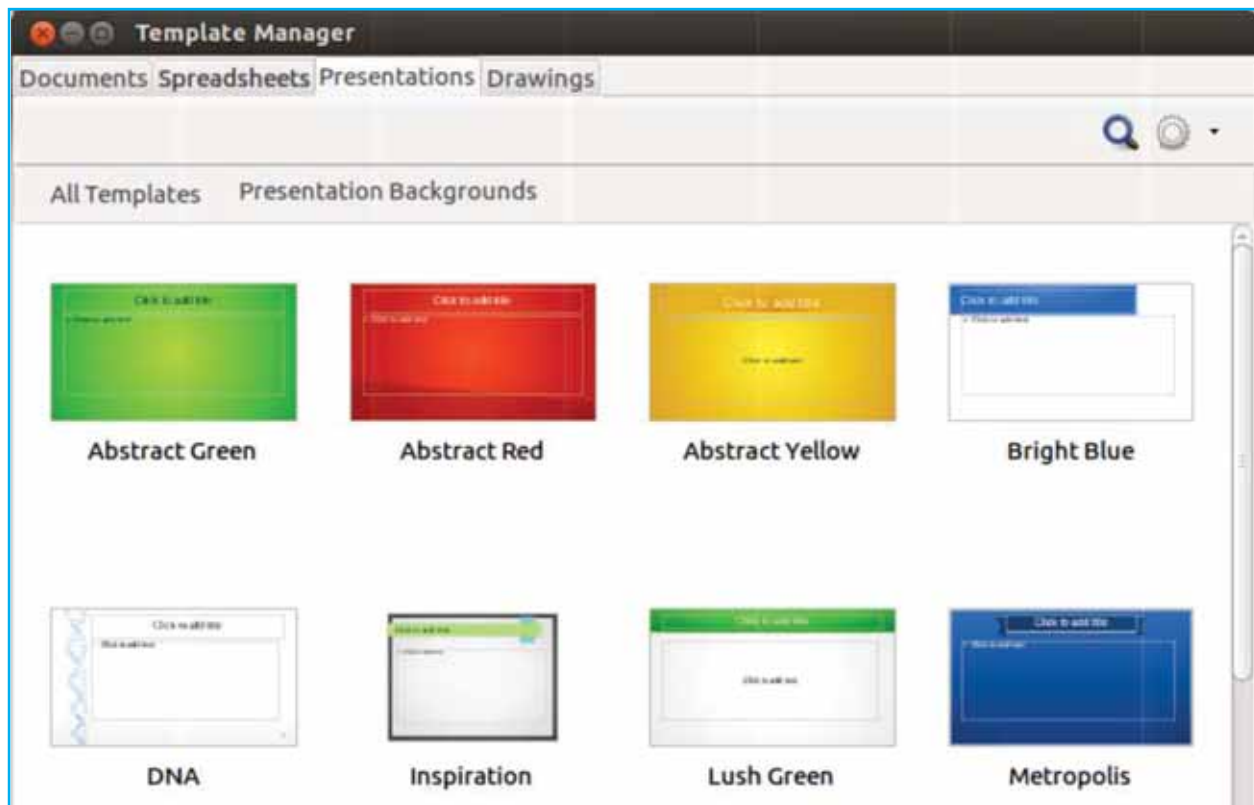


Figure 10.24 : Selecting Template

3. Choose the template you want to use, then click *Open*.

Your new presentation will now open with the design and structure of the template you selected.

Guidelines for a Good Presentation

Delivering a great presentation can be challenging, but with the right preparation, we can deliver a clear, engaging, and impactful message.

- **Know the audience:** Before creating our slides, understand who we are speaking to. Tailor your message, examples and depth of information to their needs.
- **Create a clear narrative:** Have a clear beginning, middle and end to guide the audience.
- **Keep it simple:** Focus on a few core messages. Don't try to cram too much information into one presentation, as it can overwhelm the audience.
- **Minimal text:** Use bullet points sparingly and keep them short. Slides should support our message, not be a replacement for it.
- **Use high-quality visuals:** Incorporate professional, high-resolution images, charts and graphs. Visuals are often more powerful than text.
- **Maintain consistent design:** Use a consistent color scheme, font and layout throughout the presentation for a polished and professional look.
- **Choose a readable font:** Select a simple, clean font and ensure it is large enough to be easily read from the back of the room.

By focusing on these key areas we will be well on our way to giving a memorable and effective presentation.

Summary

We learned some advanced LibreOffice Impress features to help you create more dynamic slideshows. We explored applying transition effects to animate how slides appear, and custom animation effects to bring individual objects on your slides to life. We have used slide master to add consistent content across all slides and even created our own custom Slide Master with personalized elements. We have learned to insert drawings using the various tools in the *Drawing* toolbar. We also explored *Page Setup* to customize the look of our slide settings. We have successfully created *Custom Slide Shows* using a selection of slides from our presentations. We also learned how to set precise timings for each slide using the *Rehearse Timings* feature, how to link a presentation and how to export a presentation in various formats.

EXERCISE

1. How do we open a saved presentation in Impress?
2. How do we apply slide transitions to a presentation?
3. Write steps to add custom animations to objects on a slide.
4. What sections are included in the '*Custom Animation*' dialog box?
5. How do we insert page numbers on every slide in a presentation?
6. What advantages does creating a custom slide master offer?
7. List the tools available in Impress's '*Drawing*' toolbar.
8. What settings can be adjusted in the '*Page*' and '*Background*' sections of '*Page Setup*'?
9. How would we describe a custom show in presentations?
10. How do we set automatic slide timings for a whole presentation?
11. **State whether true or false.**
 - (1) We cannot create a new slide master in Impress.
 - (2) '*Rehearse Timings*' option is available in 'Tasks Pane'.
 - (3) Slide transitions can be set to '*Slow*', '*Medium*', or '*Fast*' speeds.
 - (4) The '*Add*' button in '*Custom Animation*' applies an animation effect to a selected object.
 - (5) The '*Header and Footer*' dialog box includes options for Date and Time.
12. **Fill-in the blanks.**
 - (1) _____ provides an artistic text effect.
 - (2) _____ provides a template for our presentation.
 - (3) _____ is a visual effect that appears when one slide moves to next.
 - (4) Custom Animation feature is used to give _____ effects to any object on slide.
 - (5) _____ decides timings for each slide in presentation.

13. Multi choice questions. Choose the most correct answer.

- (1) Which is the shortcut key to open an existing presentation in Impress?
(a) Ctrl + P (b) Ctrl + S (c) Ctrl + X (d) Ctrl + O
- (2) Which section of the 'Tasks Panes' is used for applying animations to slide objects?
(a) Slide Transition (b) Master Slide
(c) Table Design (d) Custom Animation
- (3) Which menu has the '*Master > Slide Master*' option?
(a) Slide Master menu (b) View menu
(c) Slide menu (d) Slideshow menu
- (4) Which tool in the '*Drawing*' toolbar is used to create a circle shape?
(a) Circle (b) Ellipse (c) Rectangle (d) Arrow
- (5) Which tool is used to create artistic text effects?
(a) Slide Transition (b) Custom Animation
(c) Slide Master (d) Fontwork Gallery
- (6) Which menu allows us to adjust slide margins?
(a) Print Setup (b) Slide Setup (c) Show Setup (d) Page Setup
- (7) Which option in the '*Background*' section allows us to use an image as the slide background?
(a) Hatching (b) Color (c) Bitmap (d) Gradient
- (8) What feature allows us to selectively show slides in a presentation?
(a) Slide Show (b) Slide Transition
(c) Custom Show (d) Rehearse Timings
- (9) Which button in the '*Define Custom Slide Show*' dialog box adds selected slides?
(a) > (b) < (c) >> (d) <<
- (10) Which menu has the '*Rehearse Timings*' option?
(a) Edit (b) Slide (c) Slide Show (d) Tools

Laboratory Exercise

1. Apply transition effects to all slides in our previous presentations.
2. Apply animation effects to all the objects in our previous presentations.
3. Create a custom slideshow using a selection of slides from our school presentations.
4. Set appropriate timings for all slides across our presentations.
5. Add the date, time, and page numbers to one of our presentations.

6. Design a new slide master with your preferred options.
7. Draw something similar to the image below using the drawing toolbar in our slide.





Introduction to Computer Security

Introduction

Computer becomes part of our daily life. We use computer to perform many of our daily repetitive tasks. We store a significant amount of our personal data like photographs, copy of Aadhaar card, bank details, school projects, assignments, etc. on devices like desktop computers, laptops and smart phones. These data can be misused by someone like hackers for their personal benefits. Hence it is important for us to protect such data from unauthorized use. By learning the computer security fundamentals, we can better protect our computer systems and data from harm, theft, and misuse. This chapter helps to learn the essential concepts of computer security. Throughout this chapter, students will learn importance of the computer security, major cyber threats, key security mechanisms, and general computer security guidelines specifically designed for students.

Need of Computer Security

Today, we heavily depend on computer usage to store our personal data. When we use a computer, we focus only on the software relevant to our tasks. However, there are many other components and processes working in the background that play a crucial role, especially from a security point of view. A computer system also involves various actors such as regular users, hackers, and hidden programs like viruses and worms. Security features like antivirus software and system settings are constantly working to protect the system. It is important to understand all these additional elements as shown in figure 11.1 to ensure the overall security of your computer.



Figure 11.1 Additional Elements of Today's Computer System

It is very important for us to understand basic computer security techniques to protect our digital resources from misuse by hackers. Let us understand why computer security is important and what we can do to protect our digital resources from cyber attacks.

Why Computer Security is Important?

Computer security is essential because we depend on technology for everyday activities like schoolwork, social media communication, online banking, shopping, and entertainment. By learning about computer security, we can protect our personal and sensitive information, and create a safer digital environment.

Origins of Computer Security

The concept of computer security was not a concern during the early days of computer usage. Computers were initially large, isolated machines used by a limited group of individuals. However, as technology evolved and interconnected computer systems emerged, the need for security became

apparent. The development of the internet in the late 20th century was a turning point, as it opened up new opportunities along with challenges.

The Evolution of Cybersecurity

Nowadays, computer security is commonly referred to as cybersecurity. This field focuses on protecting computers, smartphones, networks, and data from unauthorized access by attackers, known as hackers. The evolution of cybersecurity began along with the rise of computer networks. As the internet grew in the 1990s, cyber threats like viruses, worms, and hacking became more common. Usage of the internet brought new types of challenges. The computer based malicious programs like viruses started creating problems for many internet users. This led to the birth of cybersecurity, a field dedicated to developing strategies and technologies to defend against various types of cyber problems.

Important Digital Resources

In the context of computer security, "digital resources" refers to anything that exists in a digital format and holds some value, which needs protection from unauthorized access or attacks. Table 11.1 outlines some of the key digital resources that individuals, schools, governments, and businesses need to safeguard against potential attackers.

Category	Digital Resources That Need Protection
Individuals	Phone numbers, residence address, email addresses, bank account numbers, debit/credit card details, UPI IDs, identity cards (Aadhaar, PAN, Passport, Driving License), personal photographs and videos, biometric details (fingerprints, face ID), social media account IDs, etc.
Schools	Student and teacher contact details, attendance records, academic results, digital question papers and answer sheets, e-learning platforms, apps and their usernames/passwords, school websites, fee payment data, school networks and Wi-Fi passwords, etc.
Government	Aadhaar and other ID databases, election records, income tax records, health data, passport/immigration data, ration cards, pensions, land and property records, digital maps, secret information related to defence, etc.
Businesses	Bank details, customer data (names, emails, phone numbers), employee records and salary details, business emails, websites and apps, loans/investments details, business secrets, vendor details, etc.

Table 11.1 : Important Digital Resources

All of these digital resources require protection not only from hackers but also from accidental damage, insider attacks by employees, business competitors, and international attacks.

Data Privacy and Protection

It is crucial for us to understand data privacy and protection, especially since we rely heavily on smart phone in daily lives.

Data privacy refers to the practice of securing personal information such as names, addresses, and school records, against unauthorized access and misuse. Protecting this data is vital for maintaining our privacy and ensuring that our information does not fall into the wrong hands.

Why Data Privacy Matters for Students

Understanding data privacy is crucial for students as mostly they are not aware about the dark side of the fancy internet world. Maintaining data privacy helps in protecting identity and personal information from cyber criminals who may attempt to exploit it for malicious purposes. Being aware of data privacy means:

- Being cautious about what you share online.
- Understanding the privacy settings on our social media accounts.
- Recognizing the importance of strong and unique passwords.

Role of Schools and Students in Data Protection

Schools play a crucial role in data protection by implementing secure systems for managing student information, conducting regular security audits, and educating students on responsible online behavior.

As students, you can contribute to data protection by:

- Being mindful of the information you share.
- Using secure Wi-Fi networks.
- Reporting any suspicious activities to a trusted adult or your teacher.

Students can help to create a safer digital environment for themselves and their family members by educating themselves about data privacy and protection techniques.

Introduction to Cyber Security

Cybersecurity involves safeguarding computers, smartphones, networks, and data from unauthorized access. It ensures that the digital information we use and share is protected from threats such as hackers and viruses. For students, cybersecurity means learning how to keep personal information secure, being aware of potential online dangers, and understanding the importance of strong passwords and safe online practices. By grasping the basics of cybersecurity, students can surf the digital world safely, engage in secure online activities, and develop skills to protect themselves and their communities.



Basic Do's and Don'ts of Cybersecurity

Understanding and implementing effective cybersecurity habits is essential for us to protect our safety and privacy in the digital world. By following the basic do's and don'ts given in table 11.2, we can greatly minimize chances of becoming victims of cyber-attacks.

Aspects	Do's	Don'ts
Personal Information	Keep your data private on social media platforms. If required, share minimal data.	Avoid posting full name, address, phone number and birth date on social media and public websites.
User IDs	Use a different user IDs (username) for each online accounts wherever possible.	Avoid using your email address as a username, as it helps attackers to find your other online accounts.
Passwords	Use strong, unique passwords for each account. To create a strong password, use combination of uppercase and lowercase letters, numbers, and symbols. For example, "P@ndas\$5Rocks" is a strong password.	Never use easy-to-guess passwords like your name, birthday, or "abc123". Don't use same password for multiple accounts. Avoid writing passwords on paper. "panda123" is an example of a weak password.
Two-Factor Authentication (2FA)	Enable 2FA on all your accounts, especially email, banking and social media accounts.	Never share your 2FA codes like One-Time-Password (OTP) with anyone.
Public Wi-Fi	Only access HTTPS sites while using public Wi-Fi. Also, ensure your home Wi-Fi is password-protected.	Avoid using banking or shopping accounts on public Wi-Fi. Avoid connecting unknown Wi-Fi networks. Hackers may steal our data.
Software Updates	Install software updates for operating system, web browser, and Apps as soon as they are available.	Don't ignore software updates alerts.
Links and Emails	Verify sender details before opening links or attachments. Hover over a link to see the actual URL before clicking it.	Avoid clicking links from unknown SMS and email senders, and don't share personal data in response to unfamiliar requests.
App Downloads	Download apps only from official app stores like Google Play Store and Apple App Store.	Never download apps or .APK files from third-party sources. Don't grant unnecessary permissions to any apps (e.g., a flashlight app requesting access to your contacts).
Security Alerts	Pay attention to security alerts from operating system and antivirus software, and act on them promptly.	Never dismiss or ignore any security alerts without understanding the potential risks.
Backup	Take regular backups of important data files. Store backups in different places (e.g., cloud, external disks and pen drives).	Disconnect backup drives from computers after taking backups. Don't keep it connected.
Cyberbullying	If encountering cyberbullying, report it to a teacher and parent.	Don't engage with cyberbullies by resending or reacting.
Suspicious Activity	Report any suspicious activity on your accounts or devices immediately to teacher and your parents.	Don't ignore any unusual login attempts or very small financial transactions in online accounts.

Table 11.2: Basic Do's and Don'ts of Cybersecurity

Safe Browsing Habits for Students

Navigating the internet websites safely is crucial for all of us to protect our personal information and maintain privacy online. Being aware of safe browsing habits helps us to avoid cyber threats, such as malware and phishing. Followings are some key practices for safe browsing:

- **Use the Latest Web Browser:** Always keep your web browser updated to the latest version to benefit from the latest security features and patches.
- **Look for HTTPS:** When visiting websites, ensure they use "HTTPS" in the URL, indicating a secure connection and our data is encrypted.
- **Avoid Clicking on Unknown Links:** Be cautious of links shared in emails or messages from unknown sources. Hover over links to preview the URL before clicking.
- **Use a Pop-up Blocker:** Enable a pop-up blocker in browser settings to prevent potentially harmful pop-up ads from appearing.
- **Be Skeptical of Free Offers:** Be wary of websites offering free downloads or gifts, as they often contain malware or lead to phishing sites.
- **Logout of Accounts:** Always logout of online accounts when using shared or public computers to prevent unauthorized access.
- **Regularly Clear Cookies and Cache:** Clear your browser's cookies and cache regularly to protect your privacy and improve browser performance.

Students can minimize the risks of cyberattacks by adopting these safe browsing habits, and can enjoy the internet safely.

Introduction to Cyber Threats

A cyber threat is defined as any harmful action aimed at damaging, stealing, or disrupting data, digital systems and networks. In essence, it represents the possibility of a successful cyberattack. Hence, we all need to know about the threats that can harm our computers and personal information. Let us understand the characteristics and some common cyber threats.



Key Characteristics of Cyber Threats

- **Cyber Threat Actors:** They are popularly known as hackers who has some malicious intent. They aim to misuses weaknesses of the system to gain unauthorized access and then misuses victims' data, devices, systems, and networks.
- **Malicious Intent:** They are typically carried out by individuals or groups (hackers) with harmful intentions like financial or non-financial gains.
- **Targeting Vulnerabilities:** Threat actors exploit weaknesses or vulnerabilities in information systems, software, hardware, or even human behavior.
- **Impact on Confidentiality, Integrity, and Availability (CIA Triad):** Cyber threats aim to compromise one or more of these core security principles:
 - Confidentiality: Unauthorized access to sensitive information.
 - Integrity: Unauthorized modification or destruction of data.
 - Availability: Disruption of access to systems or data (e.g., Denial of Service attacks).You will learn more about CIA triad in your higher standards.

Types of Cyber Threats

Let us understand common types of the cyber threats.

Malware

It is a type of software designed to damage or gain unauthorized access to a computer system. Malware is a general term used to refer all types of malicious software, such as viruses, worms, Trojans, etc. Malware can be hidden in email attachments or downloads from unreliable websites.

Malware can be classified into various types such as viruses, worms, trojans, ransomware, spyware, adware, and key loggers. These are commonly used by hackers to carry out cyberattacks.

Virus

Viruses are harmful programs that can spread from one computer to another. They attach themselves to files and programs, causing them to run slowly or not at all. Viruses can also corrupt or delete important data files and personal information from your computers.



Worms



Worm is a type of self-replicating malware that spreads across computers and networks without any user action. Unlike viruses, worms do not need to attach themselves to a host program or file.

Trojans

Trojan is a type of malicious software that looks as a legitimate software or file. Trojans often present themselves as helpful software, such as games, utilities, or email attachments. Once activated, it can execute various harmful actions without the user's knowledge.



Ransomware



Ransomware is a type of harmful software that locks - encrypts our data, making it unusable. It can also lock our computer. The attacker then demands money (ransom) to unlock it. It often spreads through fake emails or unsafe downloads. Paying the ransom does not always guarantee that our data or computer will be recovered from attacks.

Spyware

Spyware is a type of malware designed to secretly monitor and collect information about a user's activities on their computer or mobile device.

Adware

Adware is a type of software that automatically displays unwanted advertisements to a user's device, often without user consent. They are not always malicious, but it can slow down your system, consumes internet bandwidth and compromise your privacy.

Keyloggers

Keyloggers are programs designed to capture every keystroke made on our keyboard. These malicious tools can record our usernames, passwords, messages, and various other personal information without our knowledge. Once they have gathered these sensitive details, such programs transmit the information to hackers.

Social Engineering

It is a method used by attackers to trick people into revealing sensitive information, such as passwords, bank details, or personal data, through misleading communications using fake emails, SMSs, phone calls, or even face-to-face conversations.



Instead of hacking a computer, the attacker "hacks" the human mind by pretending to be someone you trust, like your teacher, friend, or bank officer. The goal is to gain access to systems or data by exploiting human trust rather than technical weaknesses. For example, a stranger might contact you, pretending to be your teacher, friend, or relatives, asking for your login details, OTP, or bank details while helping you. This is a social engineering trick, which later on can be misused.

Phishing

Phishing is a type of social engineering cyberattack where attackers try to trick people into sharing personal or sensitive information like passwords, credit card numbers, or OTPs by pretending to be a trusted source. It usually happens through fake emails, messages, or websites that look real. These messages often create a sense of urgency, such as saying your account will be blocked unless you act quickly. Following is a phishing example:



- You receive an email that looks like it's from your bank, asking you to click a link and verify your account details. If you click and enter your information the attacker steals it.

Phishing is dangerous because it can lead to identity theft, financial loss, or unauthorized access to accounts. Always double-check links and sender details before responding.

Denial of Service (DoS)

In this category of threat, attackers overwhelm a system with excessive traffic to make it unavailable to genuine users of the systems.

Data Breaches

Data breaches occur when unauthorized individuals gain access to or expose private data, which can potentially lead to significant privacy violations and financial losses.

Man-in-the-Middle (MitM)

This type of attacks involve intercepting communications between two parties to steal data without the knowledge of legal parties involved in the communications.

Insider Threats

It involves the malicious acts carried out by individuals who have genuine access to the organization systems, e.g. unhappy employees.

Zero-day Exploits

Zero-day Exploit is a type of attack that leverage newly discovered websites, apps or games vulnerabilities before a patch or fix is available.

Fake Websites

It's crucial for students to be aware of fake websites, suspicious links, and fake SMSs, as these are common tricks used by cyber criminals to cheat and harm users. Fake websites are designed to look like legitimate sites but are actually fraudulent. These websites aim to steal personal data or install malware on your device.

Example: Imagine you receive an email claiming to be from your favorite online store, offering a massive discount. The email directs you to a website that looks identical to the real online store but is actually a fake website designed to capture your Login-ID and Password.

Security Tip: Always read the website address (URL) carefully. Genuine websites have URLs that start with "https://" and a small padlock icon, indicating a secure connection. In case you have any doubt in the received link, it's safer for you to type the website's address directly into your browser instead of clicking on the received links.

Suspicious Links

Suspicious links are often found in emails, messages, or on websites. Clicking on such links can lead to malware downloads into your system.

Example: You might get a message from a friend on social media with a link saying, "Check out this cool video!" However, the link could lead to a dangerous site that infects your device with malware.

Security Tip: Hover over links to read the actual website address, see where they lead you before clicking. If the URL looks unfamiliar or suspicious, do not click it. Always confirm with the sender if they honestly sent the message.

Fake SMS

Fake SMS, also known as Smishing, are fraudulent text messages that try to trick users into revealing personal information or clicking on malicious links.

Example: You might receive a text message saying you have won a prize and need to click a link to claim it. These messages are often scams meant to steal your information or install harmful software on your phone.

Security Tip: Read carefully when receiving unexpected messages from unknown numbers, particularly those requesting personal information or pressuring you to take immediate action. Never click on links in such messages, and delete them immediately. If required, take advice from your teacher or parents before taking any actions.

Computer Security Mechanisms

Understanding computer security mechanisms is vital for internet users. Computer security mechanisms are tools and techniques designed to protect our devices and personal information from cyber attacks. By learning these security mechanisms, we can safeguard our online activities, ensure digital privacy and safety. Let us understand some of the computer security mechanisms.

Antivirus

Antivirus is a computer program designed to detect and eliminate viruses and other malicious programs from our computer, mobile phone and tablets. It scans files and system regularly to identify threats and remove them before they can cause harm. Keeping antivirus software updated is crucial for maintaining the security of digital devices.

Firewall

A firewall acts as a barrier between our computer and the internet, controlling the incoming and outgoing network traffic. Firewall protects our internal digital resources from outsiders like hackers. It allows only validated and genuine network traffic to enter into our internal computer network. It helps prevent unauthorized access to our system by blocking harmful data and allowing safe data to pass through. Firewalls can be hardware-based, software-based, or a combination of both. See figure 11.2.

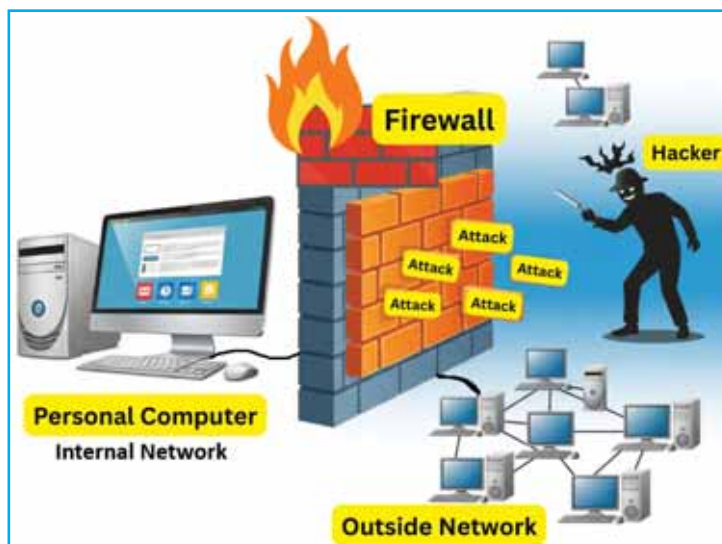


Figure 11.2 : Firewall

Secure Use of Internet and Wi-Fi

Using secure internet connections is important for protecting our data. Avoid using public Wi-Fi for sensitive activities, as these networks are often less secure and more susceptible to cyber-attacks. If you must use public Wi-Fi, consider using a Virtual Private Network (VPN) to encrypt your internet traffic and protect your privacy.

Regular Software Updates

Keeping computer operating system and applications up-to-date is essential for protecting against weaknesses and attacks. Software updates often include security patches that address known threats and weaknesses, ensuring that our device remains protected against the latest cyber threats.

User Education and Awareness

Being aware of potential cyber threats and learning how to recognize and respond to them is a key aspect of computer security. This includes being cautious of phishing scams, fake websites, and suspicious links. Educating yourself and others about safe online practices helps create a more secure digital environment. Students can significantly reduce their risk of falling victim to cyber threats by carefully understanding and implementing computer security mechanisms.

Cyber Crime Portal of Govt. of India

The Government of India has launched a special website called the National Cyber Crime Reporting Portal. This website allows citizens of India to report online crimes such as financial frauds, cyber bullying and hacking. It is an important tool for ensuring online safety and protecting citizens. The website makes it easy to file complaints about internet-related crimes. Figure 11.3 shows the homepage of the Portal. (<https://cybercrime.gov.in/>)



Figure 11.3 : National Cyber Crime Reporting Portal

Let us learn more about what this portal is and how it can be used.

How does it work?

- **Reporting Cyber Crimes:** If you see or experience something bad online, like a scam or someone being bullied, you can report it on the portal. It's important to tell an adult first, like a parent or teacher, and they can help you use the portal.
- **Filling out a Form:** On the portal, there is a form where you can write down what happened. You will need to include details like what kind of problem you are facing and when it happened.
- **Staying Safe:** The portal helps the government find and stop people who are doing bad things online. By reporting these problems, you help make the internet a safer place for everyone.
- **Getting Help:** Once you report a problem, the authorities can investigate and help solve the issue. They might also give advice on how to protect yourself online in the future.

The Cyber Crime Portal is important because it helps protect people from internet dangers. By reporting cyber-crimes, you help stop bad people from hurting others. It also teaches everyone about being safe online and encourages us to be responsible digital citizens.

Remember! If you ever feel unsafe online or notice something wrong, always tell to your parents and your class teacher. They can help you decide what to do next and how to use the Cyber Crime Portal. This portal is an important tool for keeping the internet safe place for everyone.

CERT-IN (Indian Computer Emergency Response Team)

CERT-IN (Indian Computer Emergency Response Team), is one of the Indian national nodal agency for responding to computer security incidents as and when they occur. CERT-In addresses threats by issuing advisories, security alerts, vulnerability notes, and guidelines to help organizations and

individuals secure their systems and networks.

For more detailed information on cybersecurity threats and best practices, you can visit the official CERT-In website: <https://www.cert-in.org.in/>.

Note: For additional cybersecurity practices, visit the official Cyber Crime portal of the Government of India (<https://cybercrime.gov.in>). The following links provide valuable resources to improve cybersecurity awareness:

- Refer a very useful document on **A Handbook for Students on Cyber Safety** at link: https://static.cybercrime.gov.in/Webform/Crime_OnlineSafetyTips.aspx
- Refer important **Cyber Awareness Documents** at link: <https://static.cybercrime.gov.in/Webform/CyberAware.aspx>

Summary

In this chapter, students are introduced to the importance of computer security in the digital age, focusing on the protection of digital resources and data privacy. It covers the fundamentals of cybersecurity, common cyber threats, basic do's and don'ts and safe browsing habits. Chapter discusses various dangers such as viruses, malware, phishing, ransomware, keyloggers, cyberbullying, and social engineering tactics. The chapter also addresses how to recognize fake websites, suspicious links, and fake SMSs. It also covers important security mechanisms, highlighting safe use of devices and applications through antivirus software and firewalls. Additionally, students are also introduced about the cybercrime portal for reporting and addressing cybercrimes, equipping them with the skills to safeguard their information online.

EXERCISE

1. Why computer security is important?
2. List the important digital resources used by Schools.
3. What do you mean by Data Privacy?
4. How to create a strong password? Give any three suitable examples of strong passwords.
5. What do you mean by a weak password? Give examples of three weak passwords.
6. Mention any three safe browsing habits for students while using the Internet.
7. Prepare a list of common cyber threats.
8. What do you mean by the Ransomware?
9. What are some safe practices to follow when downloading mobile apps?
10. Write a brief note on the secure use of Wi-Fi and the dangers of using public Wi-Fi.
11. **State whether true or false.**
 - (1) Regular scans using Antivirus can protect against malware, viruses, and other cyber threats.

- (2) Firewalls act as a barrier between your device and potential threats on the Internet.
- (3) It is safe to reuse passwords across multiple social media accounts.
- (4) Zero-day Exploits involve intercepting communications between two parties to steal data without the knowledge of legal users.
- (5) Trojans are a category of malicious code that demands a payment to unlock your encrypted data.

12. Fill-in the blanks.

- (1) One of the basic "do's" of cyber security is to regularly _____ your software.
- (2) The _____ refer to the categories of people who aims to exploits the weaknesses of the computer system to gain unauthorised access and misuses data.
- (3) A _____ password includes a mix of letters, numbers, and special characters.
- (4) Antivirus software helps protect devices from _____.
- (5) The Cyber Crime Portal of Govt. of India is a platform for reporting _____ activities.

13. Multi-choice questions. Choose the most correct answer.

- (1) What is the primary purpose of cyber security?
 - (a) To improve computer speed
 - (b) To protect digital data from unauthorized access
 - (c) To increase internet bandwidth
 - (d) To enhance graphic quality
- (2) Why is it important to follow safe browsing habits?
 - (a) To make your internet connection faster
 - (b) To avoid exposure to cyber threats and protect personal information
 - (c) To access more websites
 - (d) To improve computer graphics
- (3) Which of the following cyber threats looks like legitimate software, but once activated, executes harmful actions?
 - (a) Virus (b) Worm (c) Trojan (d) Ransomware
- (4) Which category of threats demands payment to unlock our data?
 - (a) Ransomware (b) Virus (c) Trojan (d) Adware
- (5) Which of the following is a recommended "do" for cyber security?
 - (a) Use the same password for all accounts
 - (b) Click on pop-up ads frequently
 - (c) Regularly update your software
 - (d) Share passwords with friends

- (6) What is a "don't" in basic cyber security practices?
- (a) Using strong, unique passwords
 - (b) Sharing personal data on unsecured websites
 - (c) Logging out from public computers
 - (d) Turning on two-factor authentication
- (7) Cyberbullying typically involves:
- (a) Physical harm
 - (b) Using technology to harass someone
 - (c) Legal action
 - (d) Academic dishonesty
- (8) Why is using a public Wi-Fi network risky?
- (a) Hackers may steal our data.
 - (b) Clicking on such links are safe
 - (c) It requires a password
 - (d) It is more expensive
- (9) Which of the following is related to a suspicious link?
- (a) It has a clear, and readable URL
 - (b) It appears to come from a trusted source
 - (c) It is frequently visited
 - (d) Clicking on such links lead to malware download
- (10) Which of the following is a type of malware?
- (a) Firewall
 - (b) Virus
 - (c) Encryption
 - (d) Browser

Laboratory Exercise

1. Visit the ***<https://cybercrime.gov.in>*** website and locate various cyber safety guidelines given under the ***Learning Corner*** section. Write a brief note on any one Cyber Safety Guideline.
2. Visit the official CERT-In website ***<https://www.cert-in.org.in/>*** and prepare a brief note on any three of the latest ***Security Alerts*** mentioned on the website.
3. Prepare a list of any five popular Antivirus software names.
4. Prepare a list of any five sample weak passwords. Write a justification for why they are called weak passwords.
5. Create any five Strong Passwords, and write the justification for why they are strong passwords. (Note: Don't write your real passwords in your answer.)
6. Visit various URLs and identify safe websites. Make a list of 3 safe websites.
 - Hint: Locate ***<https://>*** in website name
7. Prepare a security checklist for your computer:
 - **Task:** Check to ensure that antivirus software is installed, the operating system is updated, and the screen lock is enabled, etc.

8. Create a “Cyber Safety Poster”.
 - Hint: Include 5 safety rules (e.g. Don't share OTP, Don't share password, etc.)
9. Create a poster on “Safe Browsing Habits for Students”.
10. Prepare a poster on “Common cyber threats and its prevention mechanisms”.



Appendix

Installing Ubuntu Alongside Windows in Dual-Boot

The Ubuntu operating system can be installed on almost all modern days personal computers. It supports a wide range of processor, motherboard and hardware combinations. We can download the freely available Ubuntu distributions from the Internet and create a bootable disk, which can be used to install Ubuntu on any computer system.

We can use Ubuntu as the only operating system and can also use it alongside an existing Windows operating system. A computer running both Windows and Ubuntu operating systems is known as a dual boot system. The dual boot system allows the user to choose a particular operating system at the start. Here, we will discuss how to install Ubuntu 22.04 along with the pre-existing Microsoft Windows operating system to set up a dual boot system.

Installation Requirements:

- A computer with Windows already installed (preferably with some free disk space).
- A USB drive with at least 4GB capacity (to create a bootable Ubuntu installer).
- An Internet connection (recommended for downloading updates during installation).
- A backup of your important Windows data (essential).

Installation steps:

1. Prepare the Windows system for dual boot:

- Back up all important data stored in the Windows system.
- Create a Windows drive partition with at least 500 GB free space. You may free up existing D:\ or E:\ partition or create a new partition. Windows disk management utility can be used to create, resize or format a partition. However, it is recommended to back up the data before doing any modification in the existing partition system. For detailed information related to modifying Windows partition refer to <https://support.microsoft.com/en-us/topic/microsoft-support-how-to-re-partition-without-destroying-the-data-c3d64de0-4672-b21f-de4e-b4908fb35ae3> (Alternatively, searching “How to modify windows partition” also leads to similar page.)

2. Ubuntu Installation:

Once an empty partition or free space is created in the Windows system, we can start the Ubuntu installation process as mentioned below.

- Download the Ubuntu 22.04 installation image from <https://ubuntu.com/download/desktop>
- Write the downloaded ISO of Ubuntu 22.04 to a USB drive (pen drive) to create the installation media. Note that, simple copy paste to USB drive does not create a bootable media. We need a specialized software tool to create a boot image drive. Use the following link to create a bootable USB of Ubuntu 22.04 <https://etcher.balena.io/>

- Once the bootable USB drive is created, insert it into the laptop or PC and boot or restart the device.
- Once the media boot-up a new grub screen, as shown in the figure 1, should appear on your monitor. From the menu select *Install Ubuntu* and hit Enter to continue.
- After the boot media finishes loading into RAM you will end up with a completely functional Ubuntu system running in live mode. On the Launcher choose Install Ubuntu, and the installer utility will start. Choose the preferred language and keyboard layout and click on the *Continue* button to proceed further.



Figure 1: Ubuntu Installation Screen

- The next screen will ask for installation preference, as shown in figure 2. choose the first option *Normal Installation* and hit the *Continue* button.
- The next screen will ask to select an Installation Type. Choose *Install Ubuntu alongside Windows* option. It will automatically take care of all the partition steps.
- Once the installation starts, follow all the on screen instructions, until the installation process is completed.
- After successful installation, restart the machine. As shown in figure 3, the computer will show the Grub boot loader screen, which allows us to choose between Windows and Ubuntu. Select Ubuntu and start working with Ubuntu. In case you need to switch back to Windows, just reboot the computer and select Windows from the Grub menu.

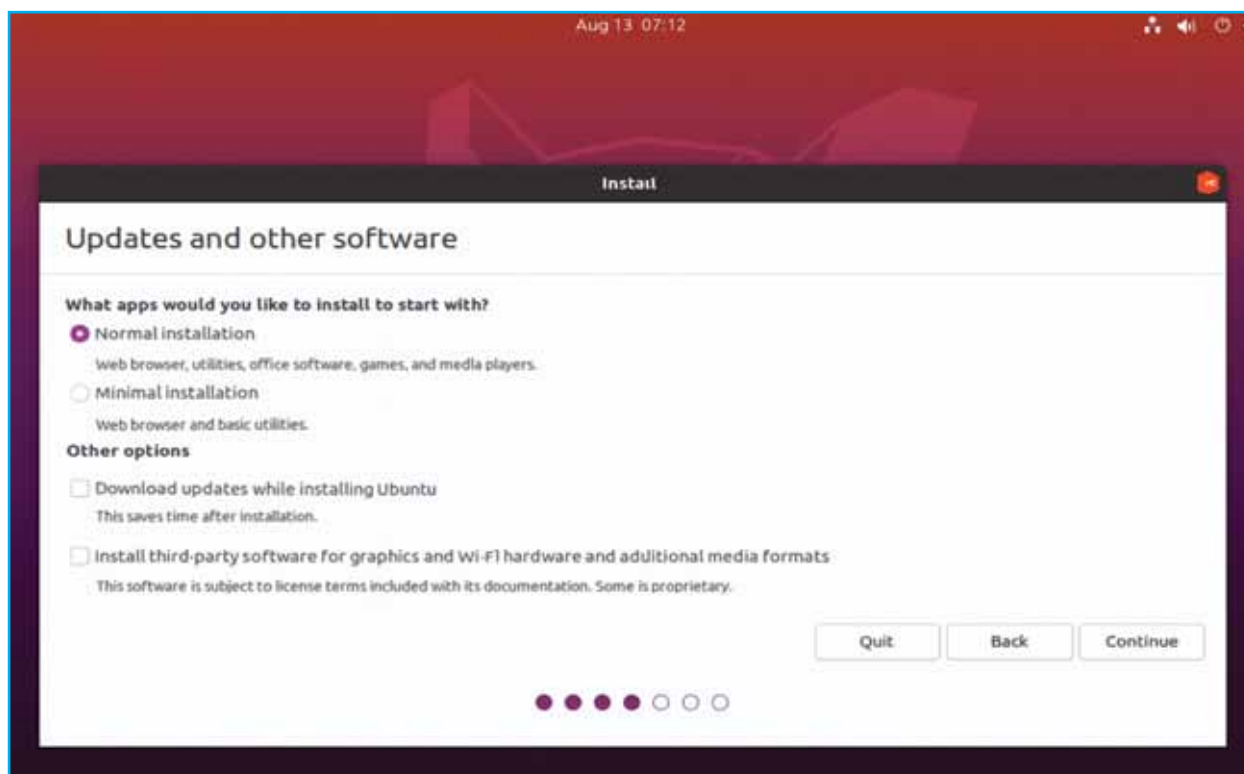


Figure 2 : Ubuntu Installation Preferences



Figure 3 : Grub Bootloader

Note : For detailed instructions and latest updates related to Ubuntu installation on various platforms refer the link : <https://ubuntu.com/tutorials/install-ubuntu-desktop#1-overview>



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