

Module-1

Hardware Concepts

1. Identify the peripherals of a computer, components in a CPU and its functions.
2. Draw the block diagram of the CPU along with the configuration of each peripheral.
3. Disassemble and assemble the PC back to working condition.

Aim: To Identify the peripherals of a computer, components in a CPU and its functions.

Hardware : Hardware is the physical appearance of the devices or tools. It is what which we can touch and feel. Computer Hardware consists of the Monitor, CPU, Keyboard, Mouse and all other devices connected to the computer either externally 1.

A typical computer (personal computer, PC) consists of a desktop or tower case (chassis) and the following parts:

1. **Cabinet :** A computer cabinet, also known as a case, chassis, or system unit, is the physical enclosure that houses a computer's internal components, providing structural support, protection from damage and dust, and facilitating cooling through features like fans and vents. This protective shell holds essential hardware like the motherboard, power supply unit, storage devices (hard drives), processor, and RAM, all of which work together for the computer's operation.



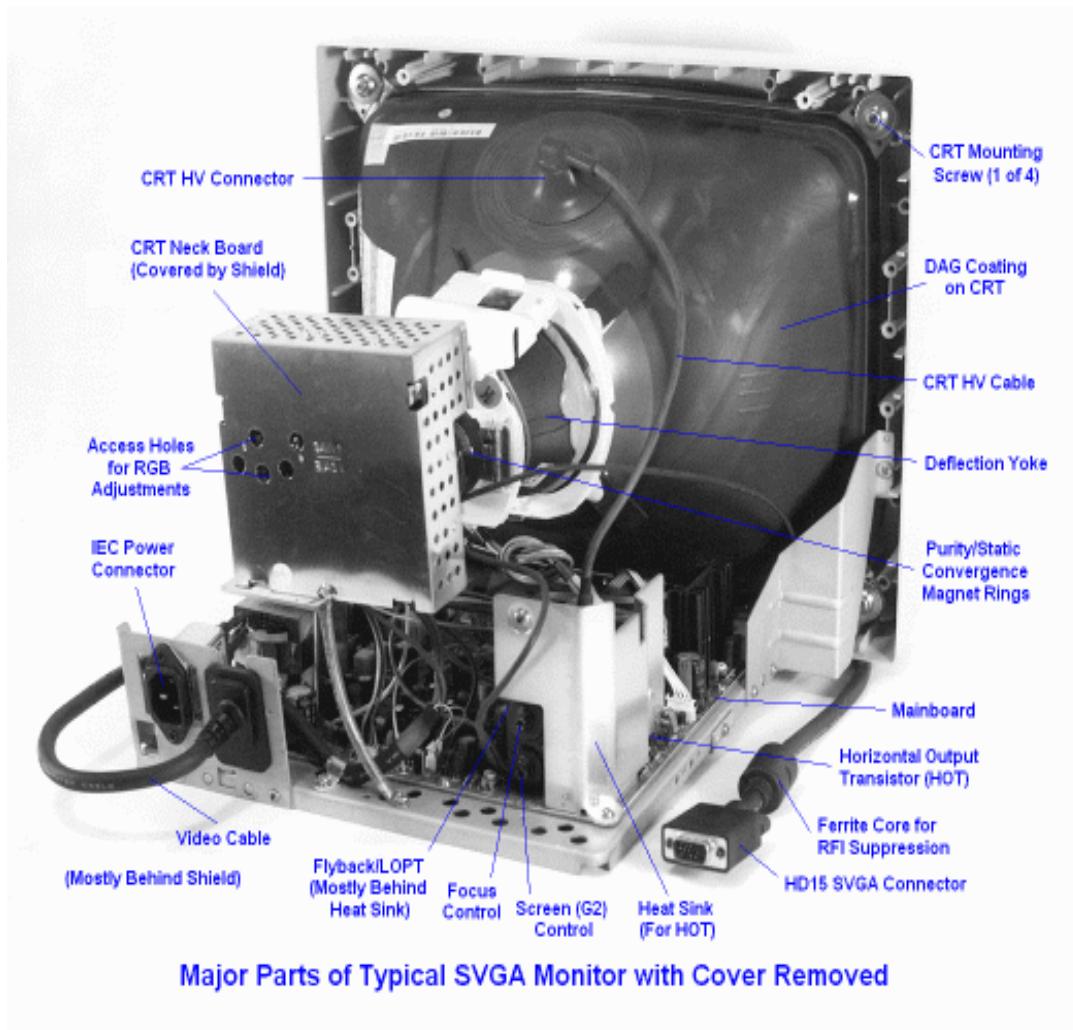
2. **Monitor :** A monitor is an electronic output device that displays text, images, and video from a computer, functioning as a visual interface for the user.

Types of monitors

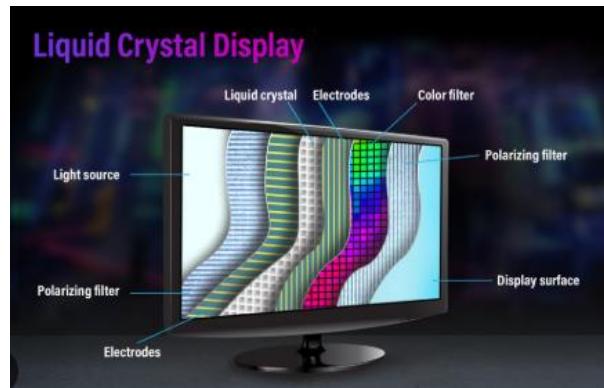
- i. CRT(cathode ray tube) monitors
- ii. LCD(liquid crystal display) monitors
- iii. LED(light Emitting diodes) monitors

CRT(cathode ray tube) monitors : A CRT (Cathode Ray Tube) monitor is a display device that creates images by firing beams of electrons from an electron gun onto a phosphor-coated screen inside a vacuum tube. These beams are steered by magnetic fields, causing the phosphor dots to glow

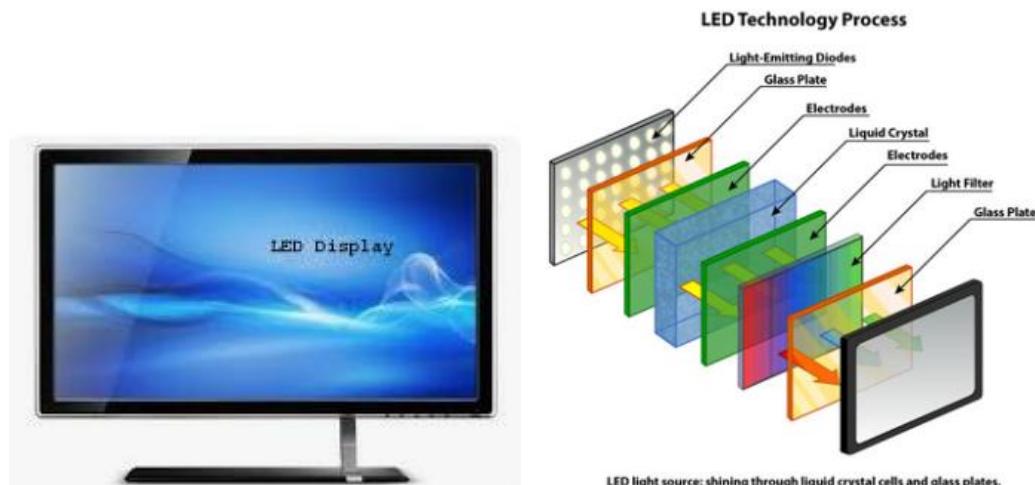
and form a visual image, with red, green, and blue phosphors used in color monitors to produce a full spectrum of colors.



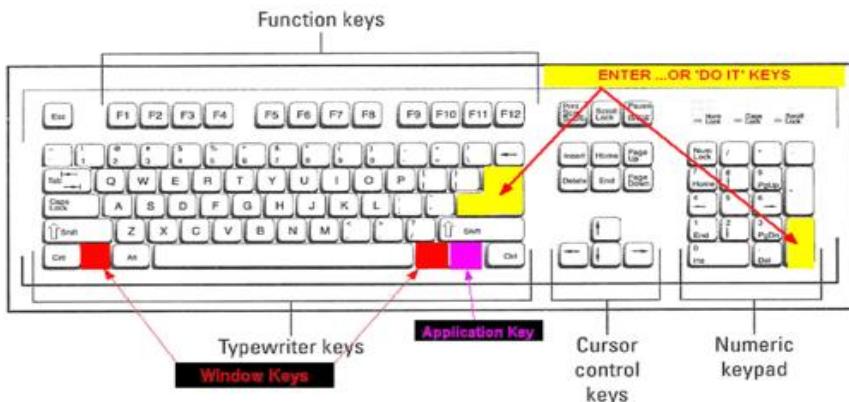
LCD(liquid crystal display) monitors: An LCD (liquid crystal display) monitor is a flat-panel display that uses liquid crystals sandwiched between polarized glass panels to control light from a backlight, creating images on a screen composed of millions of pixels. Each pixel contains red, green, and blue (RGB) sub-pixels that can be individually adjusted to display various colors and shades of light and dark.



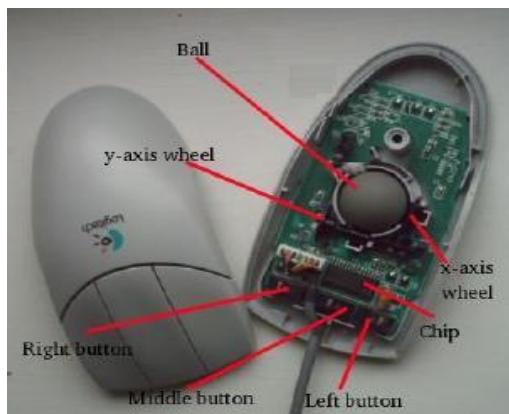
LED(light Emitting diodes) monitors: An LED monitor uses light-emitting diodes for its backlight, a key distinction from older LCD monitors that used CCFL tubes. This LED technology results in a thinner design, superior brightness, more vibrant colors, higher contrast, and better energy efficiency.



3. **Keyboard:** A keyboard is a standard input device with a set of buttons called keys, used to input letters, numbers, and commands into a computer or electronic device. As a primary input device, it allows users to type text and interact with the system by sending data to it. Keyboards typically feature alphanumeric keys, function keys, and other special keys, and they connect to devices either by a cable or wirelessly.



- 4. Mouse:** A computer mouse is a hand-held, input device that translates your physical movements on a surface into cursor movement on a computer screen, allowing you to control a graphical user interface. It features one or more buttons for clicking, a scroll wheel for navigation, and uses either optical sensors or a laser to detect movement.

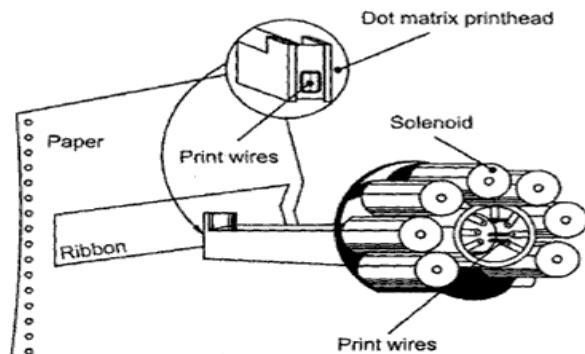


- 5. Printer:** A printer is an electronic output device that transfers digital text and graphics from a computer to a physical medium, most commonly paper, to create a hard copy. It functions as a peripheral device, taking digital files and producing durable representations of documents and images.

Types of printers

- a) **Impact printers:** An impact printer creates an image by using pins or hammers to press an inked ribbon against the paper.
 - i. Dot-matrix printers
 - ii. Daisy-wheel printers
- b) **Non-impact printers:** This type uses other means to create an image for example in ink jet printers tiny nozzles are used to spray droplets of ink on the page.
 - i. Thermal printers
 - ii. Ink jet printer
 - iii. Laser printers.

- i. **Dot-matrix printers :** A dot matrix printer is an impact printer that creates text and images by striking pins against an inked ribbon to transfer ink onto paper, forming characters out of small dots



- ii. **Daisy-wheel printers:** A daisy wheel printer is an old type of impact printer that uses a rotating disk, called a "daisy wheel," with characters arranged on its spokes, to print text. To print, the printer rotates the wheel to the desired character, then a hammer strikes the character against an inked ribbon, creating a high-quality, typewriter-like impression on the paper.

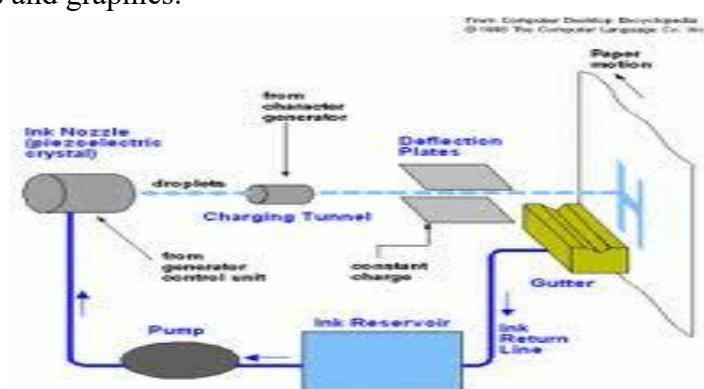


- i. **Thermal Printers:** A thermal printer uses heat to create images or text on specially treated paper or labels, requiring neither ink nor toner. It features a thermal print head with tiny heating elements that activate specific areas of the paper, causing a chemical reaction that darkens the paper to produce the desired print.

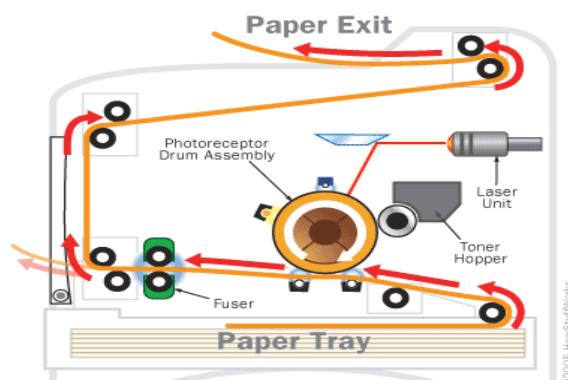
Thermal Printers



- ii. **Inkjet printer:** An inkjet printer creates documents and images by spraying microscopic droplets of liquid ink onto paper from tiny nozzles in a print head. It uses a thermal bubble method, where ink is heated to form bubbles that propel it out, or a piezoelectric method, using a vibrating element to push ink out. Inkjet printers use cartridges containing CMYK (cyan, magenta, yellow, black) inks to produce color and monochrome output, making them ideal for high-quality photos and graphics.



- iii. **Laser Printer:** A laser printer is a type of printer that uses a laser beam to produce high-quality text and graphics on paper. It works by using a combination of electrostatically charged toner and a heated fuser to transfer the toner onto the paper.



- 6. Speakers:** A speaker is an electroacoustic transducer that converts electrical audio signals into sound waves. It functions as a computer output device, allowing users to hear audio from various sources like smartphones, computers, and TVs.



- 7. Scanner:** A scanner is a device that converts physical documents, images, or objects into a digital format that can be used by a computer. It uses a light source and a sensor to capture the content as light patterns, which are then transformed into a digital signal or image file. This process allows users to view, edit, and store the content digitally, with various types of scanners such as
- Drum Scanner**
 - Flatbed Scanner**
 - Handheld Scanner**

- a) Drum Scanner:** A drum scanner is a high-resolution device for digitizing images and film, known for its superior detail and dynamic range. It works by mounting the original on a rotating drum and illuminating it with a laser, then using highly sensitive photomultiplier tubes (PMTs) to capture the reflected light, which is split into red, green, and blue beams.



- b) Flatbed Scanner:** A flatbed scanner is a common digital imaging device that converts physical items like documents, photographs, and even 3D objects into digital files. It features a flat glass surface where you place the item, a moving light source, and a sensor that passes beneath it to capture the image line by line. This process creates a digital image, such as a PDF or JPEG, that can be stored, shared, or edited on a computer.



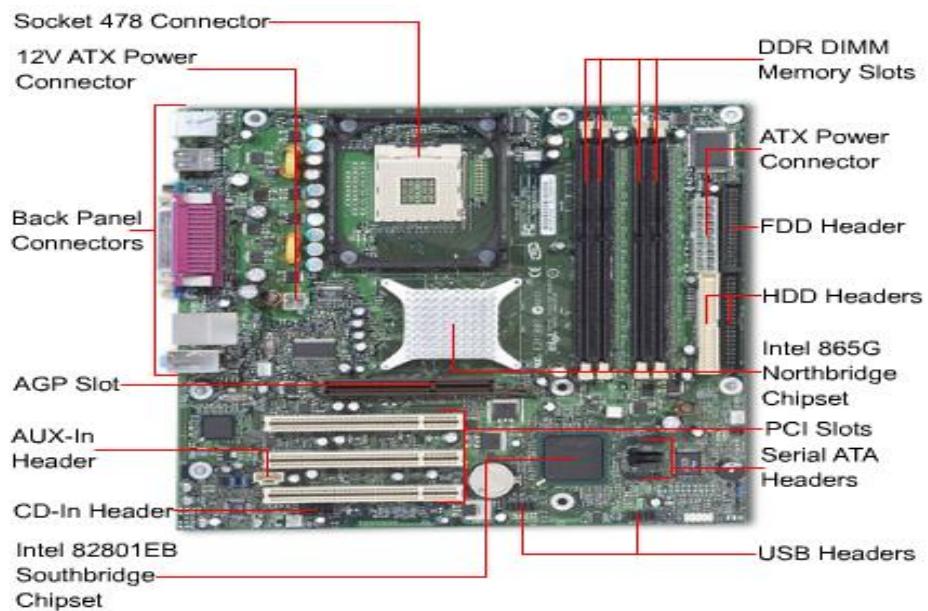
- c) **Handheld Scanner:** A handheld scanner is a portable electronic device that captures information from physical sources, such as barcodes, QR codes, or documents, and converts it into digital data. These devices range from basic barcode readers to sophisticated mobile computers, and are used in logistics, retail, manufacturing, and healthcare to improve efficiency by automating data entry, tracking inventory, and streamlining processes.



8. **LCD Projectors:** An LCD projector is a device that uses Liquid Crystal Display technology to produce images on a screen or surface. Unlike traditional projection methods, it splits light into its constituent colours and then recombines them to form a full-colour image.



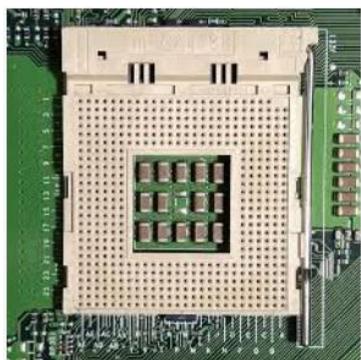
9. **System board/Motherboard** which holds the Processor, Random Access Memory and other parts, and has slots for expansion cards



10. CPU: The central processing unit contains the heart of any computer, the processor. The processor is fitted on to a Mother Board. The Mother Board contains various components, which support the functioning of a PC.



11. Socket 478: It is a CPU socket designed by Intel for its Pentium 4 and Celeron processors, featuring a 478-pin pin grid array (PGA) design that provides electrical and physical connectivity to the motherboard.



12. Main Memory

The main memory is used for the following purposes:

1. Storage of the copy of the main software program that controls the general operation of the computer. This copy is loaded on to the main memory when the computer is turned on, and it stays there as long as the computer is on.
2. Temporary storage of a copy of application program instruction, to be received by CPU for interpretation and processing or execution.
3. Temporary storage of data that has been input from the key board, until instructions call for the data to be transferred in to CPU for processing.
4. Temporary storage of data, which is required for further processing or transferred as output to output devices such as screen, a printer, a disk storage device.

RAM (Random Access Memory)-

- Used for program execution and short term data-storage, More RAM can contribute to a faster PC.
- The main memory of the computer is called as Random Access Memory (RAM).
- The name derives from the fact that data can be stored in and retrieved at random, from anywhere in the electronic main memory chips in approximately the same amount of time, no matter where the data is.
- Main memory is in a volatile state. When the computer is off, main memory is empty, when it is on it is capable of receiving and holding a copy of the software instructions, and data necessary for processing.
- When electric power go off during processing, users save their work frequently on to non-volatile secondary storage devices such as diskettes or hard disk.

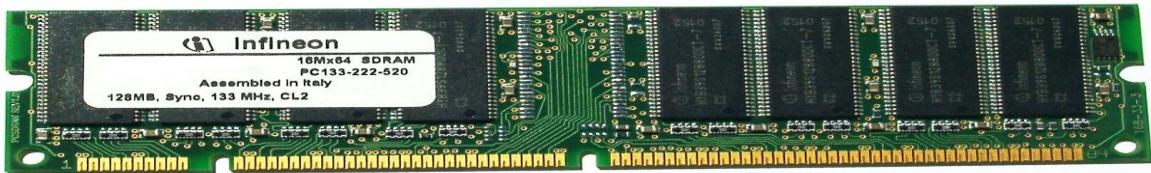
Dynamic RAM (DRAM)

- Stores data in a cell consisting of a transistor and a capacitor, which must be constantly recharged (refreshed) to retain data.
- Used for the computer's main memory (RAM modules)
- Slower than SRAM and requires constant refreshing.



Synchronous DRAM (SDRAM)

- SDRAM is a type of computer memory that syncs with the system's clock, allowing for faster data transfer and higher bandwidth than older DRAM technologies.
- It works by allowing the memory controller to know when requested data will be ready.
- Enabling faster and more efficient access through features like internal burst counters and multi-bank structures.



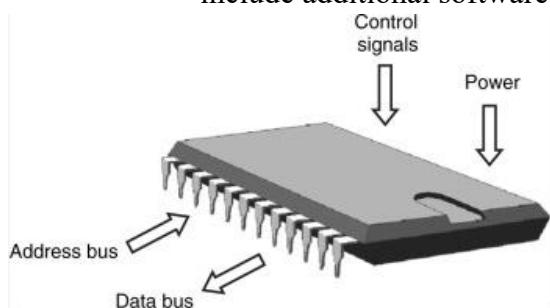
Static RAM (SRAM)

- Uses latching circuitry (like a flip-flop) to store each bit, so it doesn't need constant refreshing to maintain data.
- High speed makes it ideal for CPU cache memory.
- Faster than DRAM, no refresh needed.



ROM (Read Only Memory)

- Instructions which are critical to the operation of a computer are stored permanently on ROM chip installed by the manufacturer inside the computer.
- This ROM chip is also called firm ware, retains instructions in a permanently accessible nonvolatile form.
- When the power in the computer is turned off, the instructions stored in ROM are not lost.
- Until recently the process of manufacturing ROM chips and recording data on them was more expensive than the process of producing RAM chips.
- ROM chips have lowered the cost to the point where manufacturers are beginning to include additional software instructions.



In addition to ROM, three additional categories of non-volatile memory are used in some computer systems. They are PROMs, EPROMs, and EEPROMs.

PROM(Programmable Read Only Memory):

- It works similar to that of ROM.
- PROM chips are custom made for the user by the manufacturer.
- The user determines what data and instructions are to be recorded on them.
- The data on PROM is permanent and cannot be erased.

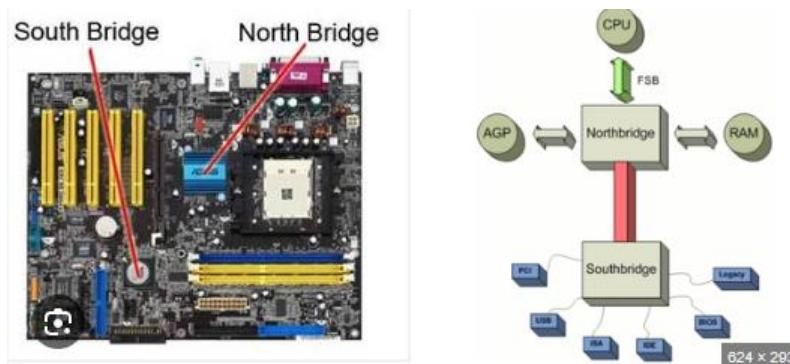
EPROM (Erasable programmable read only memory):

- It is developed as an improvement over PROM.
- The data on the EPROM can be read with the help of a special device that uses ultra violet light.
- The data or instructions on the EPROM are erasable and new data can be entered in its place.
- EPROM functions exactly same as PROM.

EEPROM (Electronically erasable programmable read only memory):

- It avoids the inconvenience of having to take chips out of the computer to change data and instructions.
- Changes can be made electrically under software control.
- These are used in point of sale terminals to records price related data for products.
- The prices recorded on them can be easily updated as needed.

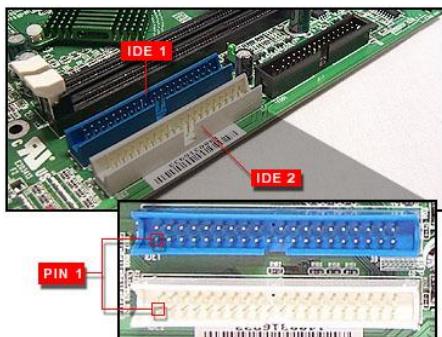
13. North Bridge and South Bridge: The Northbridge is a component of a traditional motherboard chipset that handles high-speed communication between the CPU, RAM, and Accelerated Graphics Port (AGP). The Southbridge handles slower-speed input/output (I/O) functions and connects peripherals like hard drives (SATA), USB devices, audio, and legacy buses like PCI. In essence, the north bridge manages high-bandwidth data transfer, while the south bridge manages slower peripheral operations, working together to facilitate data communication across the motherboard.



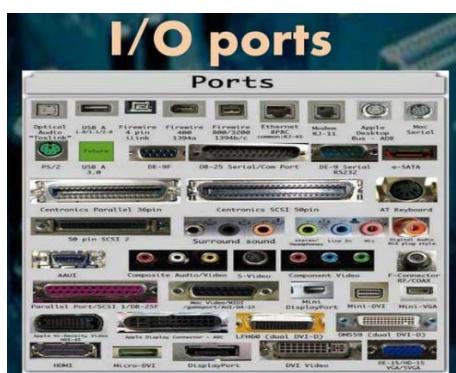
14. CMOS Battery: A CMOS battery is a small, coin-shaped battery on a computer's motherboard that provides power to the CMOS chip and the system's real-time clock (RTC). It maintains essential settings, such as the date, time, and hardware configurations, even when the computer is turned off.



15. Primary and Secondary [IDE 1 & IDE 2] : In a PC's Integrated Drive Electronics (IDE) system, the Primary (IDE1) and Secondary (IDE2) connectors on the motherboard are separate data channels, each supporting two devices (a master and a slave) configured via jumpers. The Primary channel has priority and is typically used for the boot hard drive, while the Secondary channel handles additional drives like CD/DVD-ROMs.



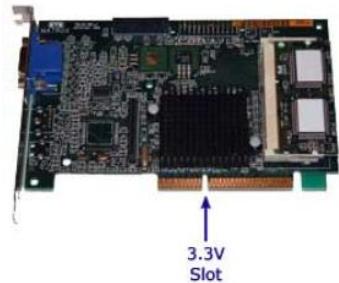
16. Input and Output Ports : Input and output (I/O) ports are connection points on a computer or device that enable data to flow in and out of the system to external devices or peripherals. Input ports receive data (e.g., from a keyboard), while output ports send data (e.g., to a monitor). Many ports, such as USB and Ethernet, are bidirectional, performing both input and output functions.



17. AGP slot & AGP Card , CI slots, PCI bus

AGP Slot : An AGP slot is a dedicated, high-speed port on a motherboard designed specifically to connect a graphics card, offering faster data transfer rates than older PCI slots for improved performance in graphics-intensive applications like 3D gaming.

AGP Card: An AGP card is a type of graphics card that connects to a computer's motherboard via a dedicated, high-speed AGP port, rather than the older, slower PCI slot.

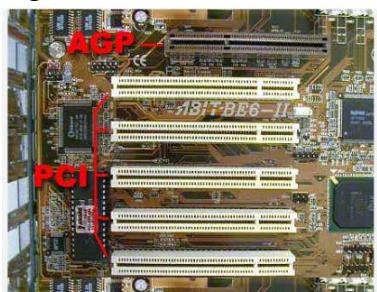


AGP Card Voltage Slots

CI Slots: A CI slot, or Common Interface slot, is a physical interface on a TV or set-top box that allows you to insert a Conditional Access Module (CAM) to receive encrypted, subscription-based pay-TV channels.



PCI bus : The PCI bus (Peripheral Component Interconnect) is a high-speed, parallel hardware interface developed by Intel in 1992 to connect internal computer components like graphics cards, sound cards, and network adapters directly to the motherboard. It functions as a local, processor-independent bus, allowing expansion cards to use shared resources and high-bandwidth data transfers while improving on older, slower bus standards like ISA.



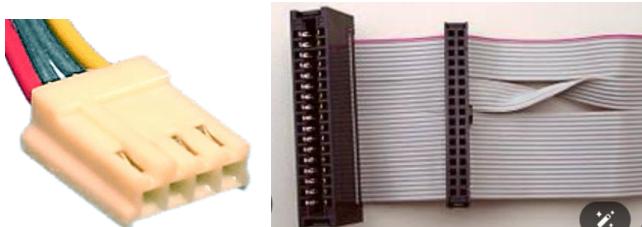
18. BIOS Chip: A BIOS chip is a small, flash memory or ROM chip on a computer's motherboard that stores the Basic Input/Output System (BIOS) firmware, the first software to run when a computer starts. It initializes hardware, runs the Power-On Self-Test (POST) to check component functionality, and then loads the operating system (OS) by finding a bootable device.



19. ATX Power Connector: An ATX power connector is a multi-pin cable that connects a computer's power supply unit (PSU) to the motherboard, delivering various DC voltages (+3.3V, +5V, +12V, etc.) to power components and enabling features like soft shutdown via the operating system.



20. Floppy Connector: A floppy connector is the 34-pin interface on a floppy disk drive (FDD) data cable that connects the drive to the computer's motherboard for reading and writing data from floppy disks.

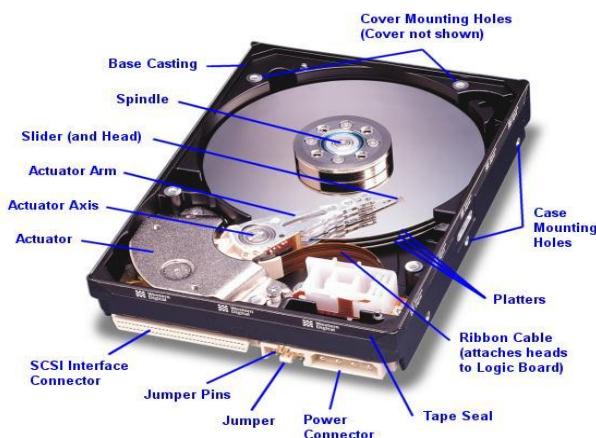


21. Bus Cables and Data Cables: A bus is a communication system of wires that transfers data, addresses, and control signals between components, while bus cables are physical cables used for these connections, such as SATA cables for internal components or network cables for a "bus topology" in networking. Data cables are a broader term for any cable that transmits data, including internal components (like hard drives to motherboards) and peripherals (like printers to computers).

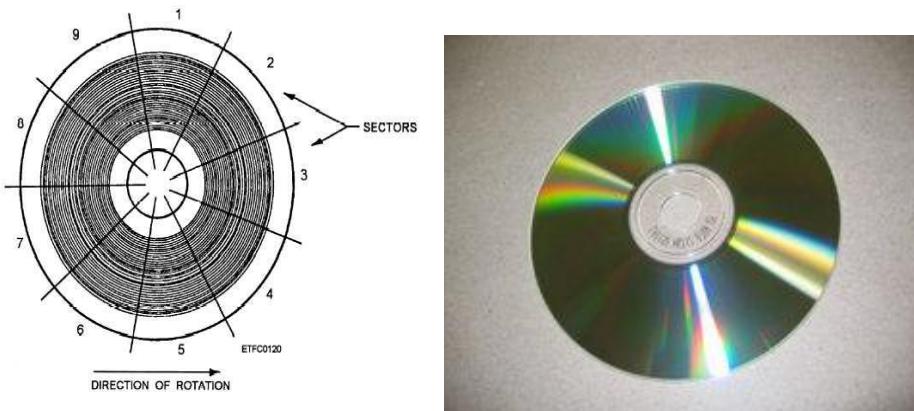


22. Hard Disk Drive: A Hard Disk Drive (HDD) is a non-volatile storage device that uses rapidly spinning magnetic platters to store and retrieve digital data. Data is written to and read from these platters by magnetic read/write heads, allowing for the permanent storage of

files, operating systems, and other information even when the power is off. HDDs remain a common and reliable option for bulk storage, especially for external drives.



- 23. CD ROM Drive & CD Writer** - A CD-ROM drive is a hardware device, also known as an optical drive, that uses a laser to read data from a CD-ROM disc. CD-ROM stands for Compact Disc Read-Only Memory, referring to a type of optical disc that contains pre-recorded, unalterable data. Ex: CD-ROM, CD-RW, CD-R



- 24. Floppy Disk Drive:** A floppy disk drive (FDD) is a device that reads and writes data to a floppy disk (diskette), a thin, flexible magnetic disk enclosed in a rigid plastic casing. Inside the FDD, a read/write head accesses the disk's magnetic surface to store or retrieve digital information, which is then interpreted by the computer.



Fig: Floppy

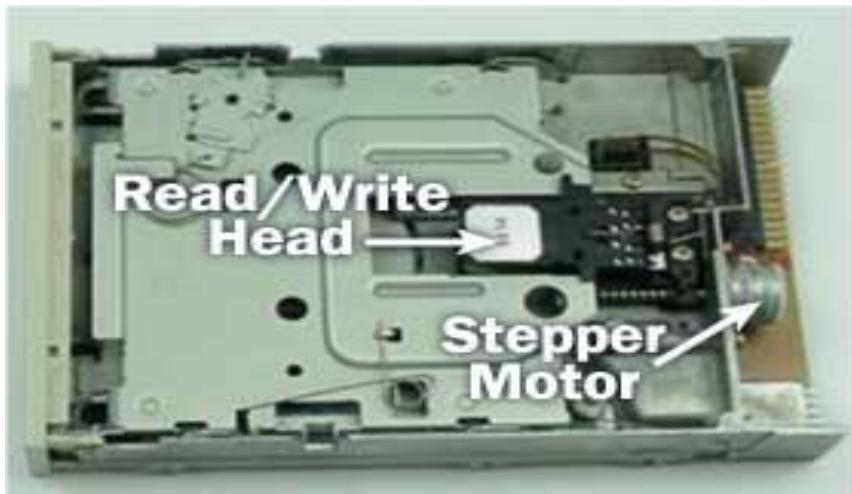


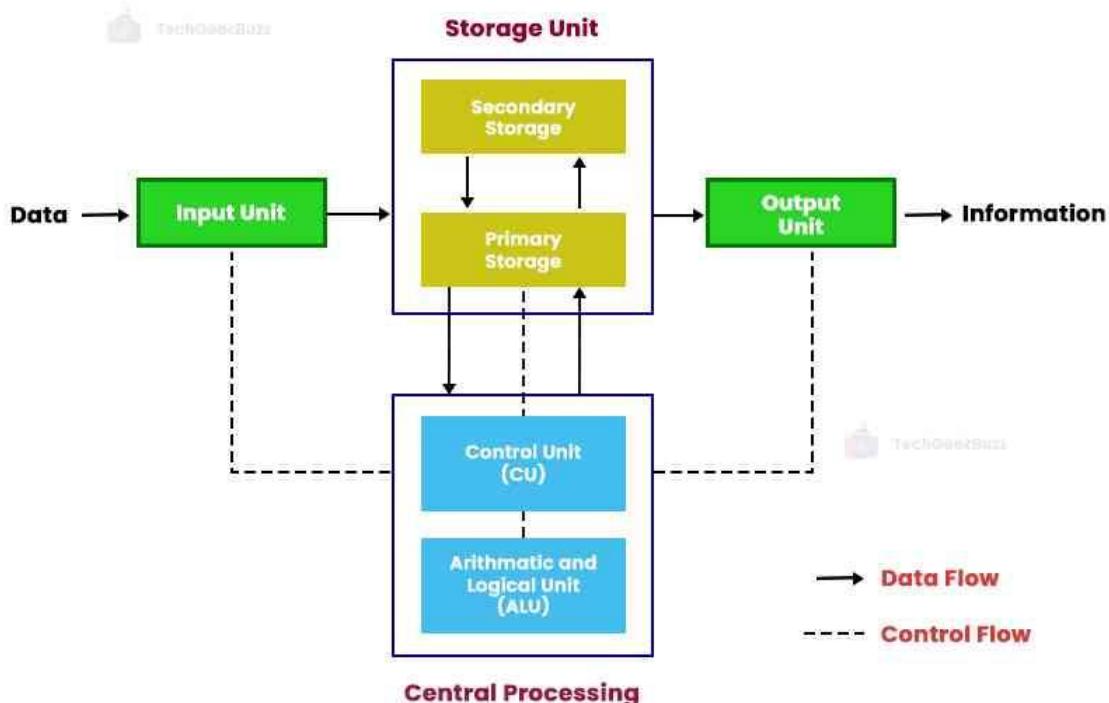
Fig: Floppy Disk Drive

25. SMPS - An (SMPS) Switched-Mode Power Supply, is an electronic power supply that efficiently converts electrical power from one form to another using a high-frequency switching regulator. It reduces power loss and heat generation by rapidly switching power on and off, allowing for smaller, lighter, and more efficient designs compared to older linear power supplies. It is a case that holds a transformer, voltage control and fan.



AIM: Draw the block diagram of the CPU along with the configuration of each peripheral.

Block Diagram of Computer



A computer can process data, pictures, sound and graphics. They can solve highly complicated problems quickly and accurately.

InputUnit:

Computers need to receive data and instruction in order to solve any problem. Therefore we need to input the data and instructions into the computers. The input unit consists of one or more input devices. Keyboard is the one of the most commonly used input device. Other commonly used input devices are the mouse, floppy disk drive, magnetic tape, etc. All the input devices perform the following functions.

1. Accept the data and instructions from the outside world.
2. Convert it to a form that the computer can understand.
3. Supply the converted data to the computer system for further processing.

Storage Unit:

The Storage Unit is used to store data and instructions that are entered through the input unit, before they are processed. It preserves the intermediate and final results before these are sent to the output

devices. It also saves the data for the later use. The various storage devices of a computer system are divided into two categories.

1. Primary Memory (Internal Memory): This includes RAM and ROM, which are directly accessible by the CPU. It stores and provides data very fast. This memory is generally used to hold the program being currently executed in the computer, the data being received from the input unit, the intermediate and final results of the program. The primary memory is temporary in nature. The data is lost, when the computer is switched off. In order to store the data permanently, the data has to be transferred to the secondary memory. The cost of the primary storage is more compared to the secondary storage. Therefore most computers have limited primary storage capacity.

2. Secondary Memory: This is used for permanent storage and includes devices like hard drives, optical disks, and magnetic tapes. Secondary storage is used like an archive. It stores several programs, documents, data bases etc. The programs that you run on the computer are first transferred to the primary memory before it is actually run. Whenever the results are saved, again they get stored in the secondary memory. The secondary memory is slower and cheaper than the primary memory.

Memory Size:

- All digital computers use the binary system, i.e. 0's and 1's.
- Each character or a number is represented by an 8 bit code.
- The set of 8 bits is called a byte.
- A character occupies 1 byte space.
- A numeric occupies 2 byte space.
- Byte is the space occupied in the memory.
- The size of the primary storage is specified in KB (Kilobytes) or MB (Megabyte) or GB(Gigabyte) or TB(Terabyte).
- 1 KB is equal to 1024 bytes
- 1 MB is equal to 1024KB.
- 1 GB is equal to 1024MB
- 1TB is equal to 1024GB

Output Unit:

The output unit of a computer provides the information and results of a computation to outside world. Printers, Visual Display Unit (VDU) are the commonly used output devices. Other commonly used output devices are floppy disk drive, hard disk drive, and magnetic tape drive.

Arithmetic Logical Unit:

All calculations are performed in the Arithmetic Logic Unit (ALU) of the computer. It also does comparison and takes decision. The ALU can perform basic operations such as addition, subtraction, multiplication, division, etc and does logic operations AND, OR, NOT, XOR etc. Whenever calculations are required, the control unit transfers the data from storage unit to ALU once the computations are done, the results are transferred to the storage unit by the control unit and then it is send to the output unit for displaying results.

Control Unit:

It controls all other units in the computer. The control unit instructs the input unit, where to store the data after receiving it from the user. It controls the flow of data and instructions from the storage unit to ALU. It also controls the flow of results from the ALU to the storage unit. The control unit is generally referred as the central nervous system of the computer that control and synchronizes its working.

Central Processing Unit:

The control unit and ALU of the computer are together known as the Central Processing Unit (CPU). The CPU is like brain performs the following functions:

- It performs all calculations.
- It takes all decisions.
- It controls all units of the computer.

A PC may have CPU-IC such as Intel 8088, 80286, 80386, 80486, Celeron, Pentium, Pentium Pro, Pentium II, Pentium III, Pentium IV, Dual Core, and AMD etc.

AIM: Disassemble and Assemble the PC back to working condition.

Safety Precautions:

1. Beware of electrostatic discharge (ESD)
2. Build computer on a hard surface, away from concepts.
3. Wear shoes and the short sleeved cotton wear.
4. Use Phillips, head screw driver.

5. Keep the components away from moisture.
6. Avoid using pressure while installing.

Steps for Dissembling

- Switch off the power supply
- Disconnect the power supply cable from monitor.
- Disconnect the power supply cable from CPU.
- Disconnect the LAN cable to NIC in CPU.
- Disconnect the other devices in CPU such as printers.
- Disconnect the mouse cable from CPU.
- Disconnect the keyboard cable from CPU.
- Disconnect data cable of monitor from CPU.
- Remove the doors of cabinet.
- Place the cabinet such that motherboard faces the ceiling.
- Disconnect the NIC and other cards from mother board by removing from slots and unscrewing from cabinet.
- Disconnect the wires of speakers from mother board.
- Remove power supply cables from HDD, FDD, CD-ROM drive etc.
- Disconnect the HDD, FDD, CD-ROM drive from mother board by removing flat ribbon cable.
- Remove CR-ROM from cabinet.
- Remove the FDD from cabinet by unscrewing it.
- Remove the HDD from cabinet by unscrewing it.
- Removing RAM cards from slots on mother board.
- Disconnect the power cables from processor fan.
- Remove the processor fan by unlocking clips on it.
- Disconnect the power cables from SMPS on power cabinet.
- Remove mother board from cabinet by unscrewing it.
- Remove the SMPS from cabinet of PC by unscrewing it.

Steps for Assembling

- Fix the SMPS on the cabinet of PC using the screws provided.

- Fix the motherboard on the cabinet of PC using the screws provided.
- Connect the power cables from SMPS to motherboard.
- Insert the preprocessor into the slot provided such that the corner with no pin coincide with corner without pinhole on motherboard.
- Apply the appropriate adhesive on the processor for fixing the processor fan.
- Fix the processor fan on the processor and use clips on it to keep it firm.
- Connect the power cable to the processor fan
- Insert the RAM card into the slots provided on the motherboard.
- Set the jumpers setting on the hard disc drive.
- Fix the hard disc drive in the space provided in the PC cabinet using screws provided.
- Fix the FDD in the space provided in the PC cabinet using screws provided.
- Fix the CD-ROM in the space provided in the PC cabinet using screws provided.
- Connect the FDD,HDD, CD-ROM drive to motherboard using flat ribbon.
- Connect power supply to the HDD, FDD, CD-ROM drive using the cables from the SMPS.
- Connect wires of speakers and lights of cabinet to the motherboard.
- Connect the network interface and other cards to motherboard by inserting in right slots and fix them in cabinet using the screws provided.
- Place the cabinet in right position.
- Fix the doors of the cabinet.
- Connect the data cable of monitor to the CPU.
- Connect the keyboard cable to the CPU.
- Connect the mouse cable to the CPU.
- Connect other devices to CPU.
- Connect the LAN cable to NIC in CPU.
- Connect the power supply to CPU.
- Connect the power supply to Monitor.
- Switch on the computer after giving the power supply.

Getting the Cabinet ready:-

1. Check how to open the cabinet and determine where to fix the components.
2. Determine if the case has the appropriate risers installed.

Preparing to fit the Components:

1. Network adapter drive.
2. Floppy disk drive.
3. Ribbon cables.
4. Hard disk.
5. CD-ROM Drive.
6. RAM
7. CPU
8. Heat sink / cooler / fan.
9. Mother board.
10. Screws.

Fitting the Mother board.

1. Line up the patch on the motherboard (ps/l, USB, etc) with the appropriate holes in the block panel I/O shield of the case.
2. Check the points where you and to install
3. Install them and make the mother board sit on them and fix screws if required.

Mother board parts:

1. ACR slot.
2. PCI Slot.
3. AGP Slot.
4. ATX Connectors.
5. CPU Fan.
6. Chipset North Bridge.
7. CPU socket.
8. Floppy.
9. System memory.
10. Chipset south bridge.
11. Panel connector.
12. Power supply.
13. IDE connectors.

ATX Connectors:

1. PS, Mouse.
2. Key board.
3. USB.
4. Parallel (Prints)
5. Serial COM1.
6. Serial COM 2.
7. Joystick.
8. Sound.

Fitting the processor:

1. Raise the small lever at the side of the socket.
2. Notice that there is a pin missing at one corner, determine the direction to fit in the processor.
3. You should not force the CPU. When inserting it. All pins should slide smoothly into the socket.
4. Lock the lever back down.
5. Install the heat sink over it (Different type for each processor). Heat sink / CPU fan.

Fitting the RAM:

1. The RAM must be suitable for motherboard.
2. There are currently 3 types of RAM available.
 - a) SD RAM.
 - b) DDR SD RAM.
 - c) RD RAM.
3. The mother board's chipset determines which type of RAM may be used.

Installing the PCI Cards:

1. Most of the cards are inbuilt these days.
2. NIL, Sound Cards etc. are fitted into PCI slots.

Fitting the hard disk and Floppy disk:

1. Place the floppy and hard disks in their slots.
2. Leave some space above HDD to prevent heat building.
3. Check the jumper configuration.

4. Fix the screws.

Installing the CD-ROM Drives:

1. CD-ROM drive is similar to installing a hard disk.
2. 1ST check that the jumper configuration is correct.
3. Fix the screw.

Connecting the ribbon Cables:-

1. Attach the long end of the cable to the IDEU connector on the motherboard first.
2. The red stripe on the IDE cable should be facing the CD Power.

Powering the driver and motherboard:

Connecting the cables for the case front pane

1. SD, SPK or SPEAK: The loud speakers o/p. it has 4 pins.
2. RS, RE, RS or RESET: Connect the two pin Reset cable here.
3. PWR, PW, PWSW, PS or power SW: Power switch, the pc's on (switch, the plug is two pin).
4. PWLED, PWRLED or Power LED: The light emitting diode on the front panel of the case illuminates when the computer is switched on. It's a 2-pin cable.
5. HD, HDD, and LED: These two pins connect to the cable for the hard disk activity LED.

Final Check:-

1. Mother board jumper configurations are the settings for the processor operator.
2. Drive jumper settings, master/ slave correct?
3. Are the processor, RAM modules and plug in cards finally seated in there sockets?
4. Did you plug all the cables in? Do they all fit really?
5. Have you tightened all the screws in plug- in cards or fitted the clips?
6. Are the drive secure?
7. Have u connected the power cables to all driver?

Powering up for the first time:

1. Ensure that no wires are touching the CPU heat sink fan.

2. Plug your monitor, mouse and keyboard.
3. Plug in power card and switch the power supply.
4. If everything is connected as it should be
 - All system, fans should start spinning.
 - You should hear a single beep and after about 5-10 sec.
 - Amber light on monitor should go green.
 - You will see computer start to boot with a memory check.
 - Now check front LED'S to see if u plugged them in correctly.
 - Check all other buttons.
 - Power afford change any wrong settings.

Module – 2

Software Installations:

1. Install operating systems like LINUX and MS windows on a personal computer.
2. The system should be configured as dual boot with both MS windows and LINUX.

Aim : To Install operating systems like MS windows on a personal computer.

System requirements for installing Windows 10

To install Windows 10, you need to make sure your PC meets the minimum system requirements:

Processor: 1GHz or faster

RAM: 1GB for 32-bit OS or 2GB for 64-bit OS

Storage: 16GB for 32-bit OS or 20GB for 64-bit OS

Graphics card: DirectX 9 graphics device with WDDM (Windows Display Driver Model) driver

Display: 800x600 resolution

Network: Internet connection

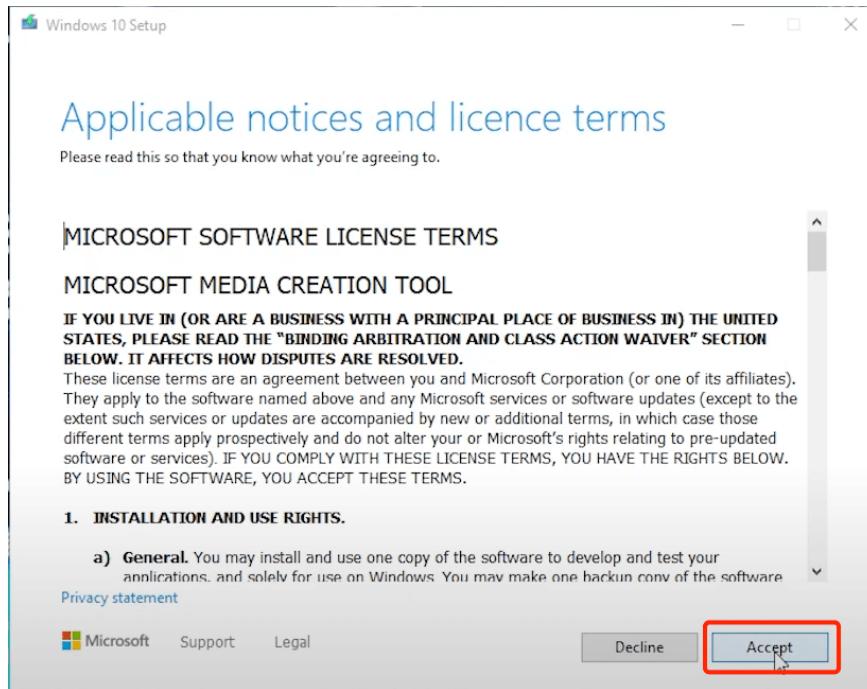
To install Windows 10

Before you start: Make sure that you have a stable internet connection.

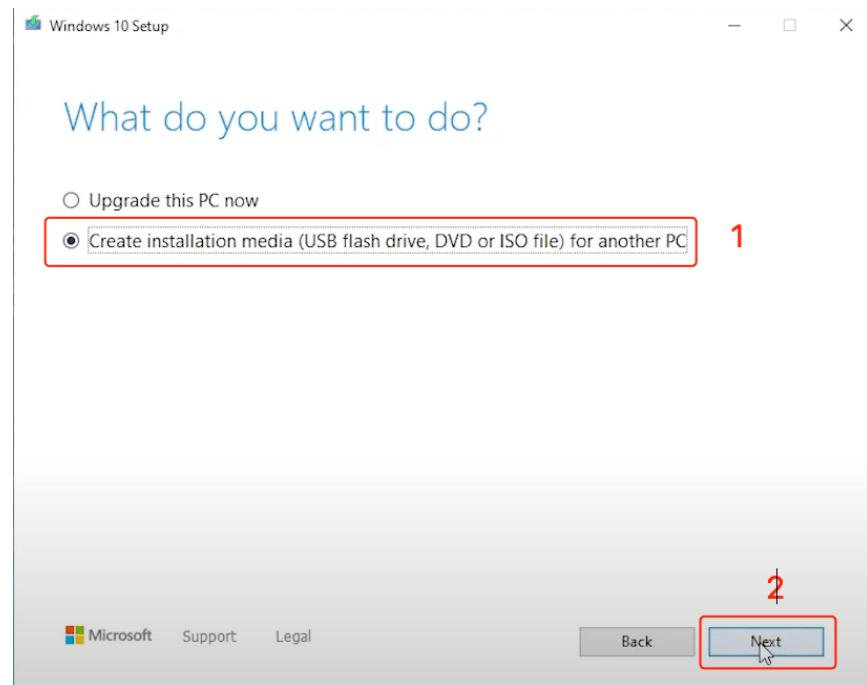
Get a blank USB drive with at least 8GB of storage space. You'll need to erase everything on the drive, so use a blank one if you can.

Step 1: Download and Open Windows 10 installation media from [Microsoft's website](#).

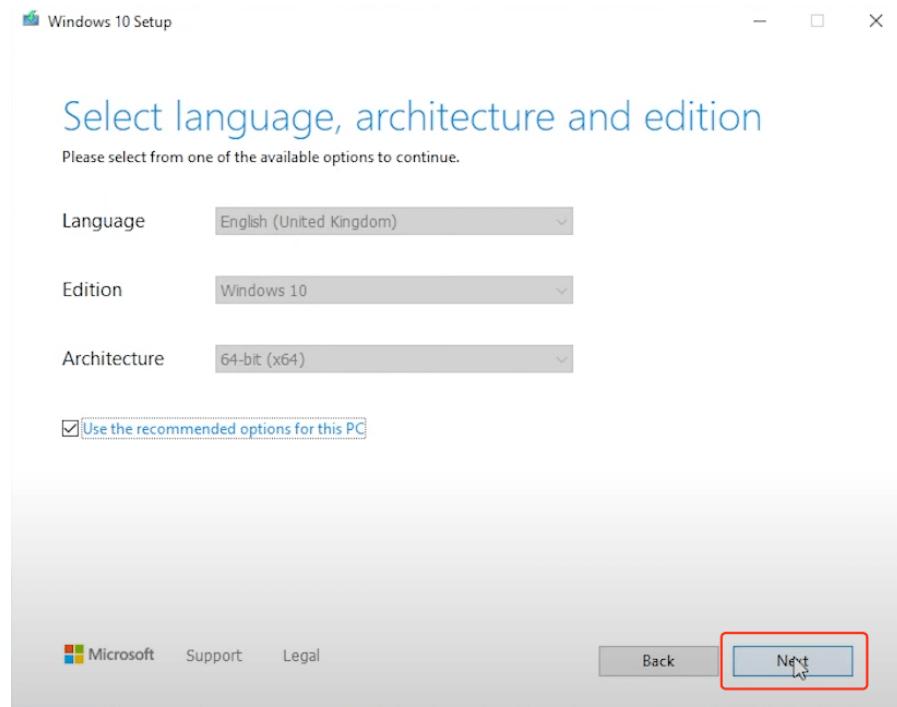
Step 2: Accept license terms by choosing Accept.



Step 3: Choose Create installation media and click Next.

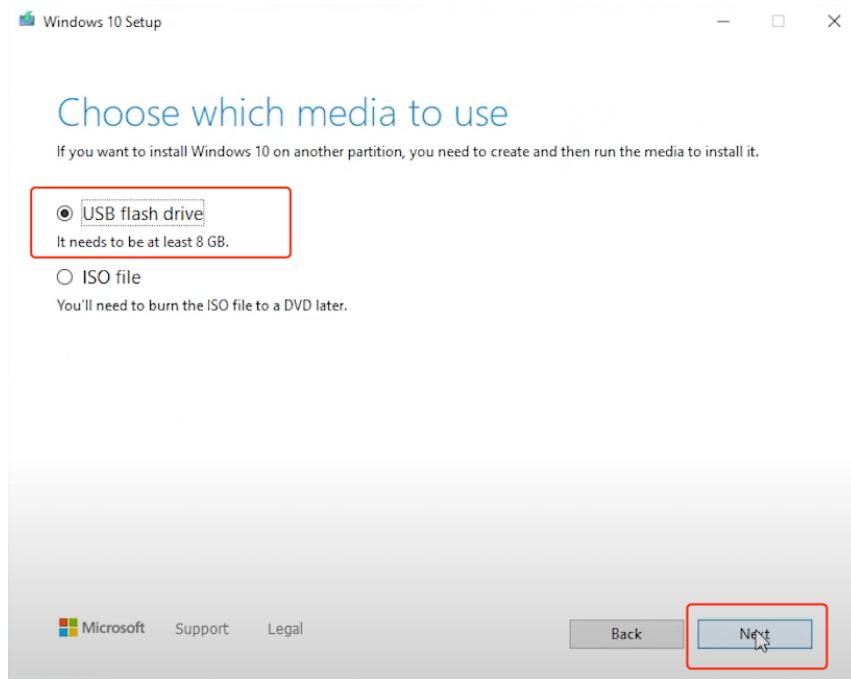


Step 4: Click Next.



Recommended options for this pc before installing windows 10

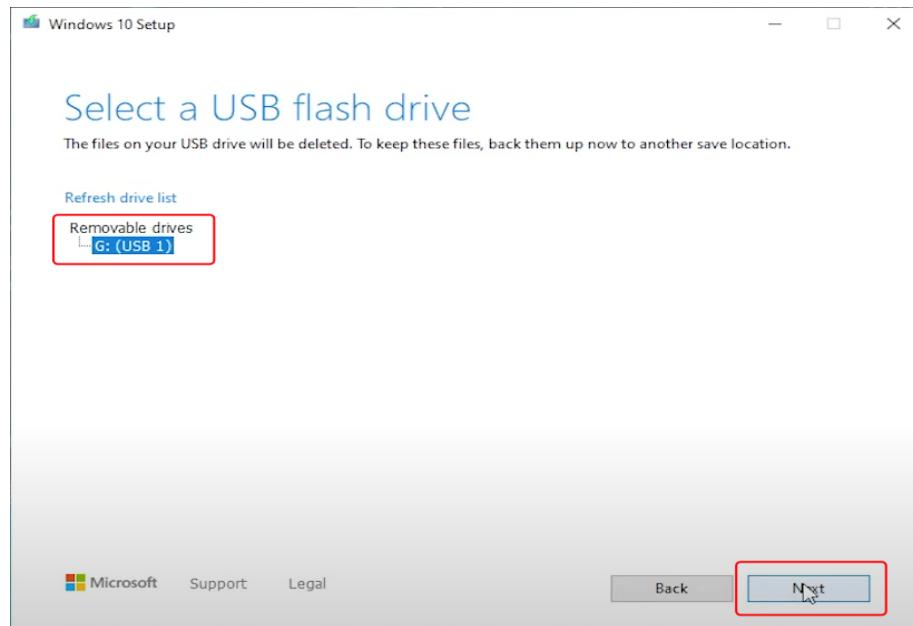
Step 5: Choose USB flash drive and click Next to proceed.



Choose USB flash drive to boot windows 10

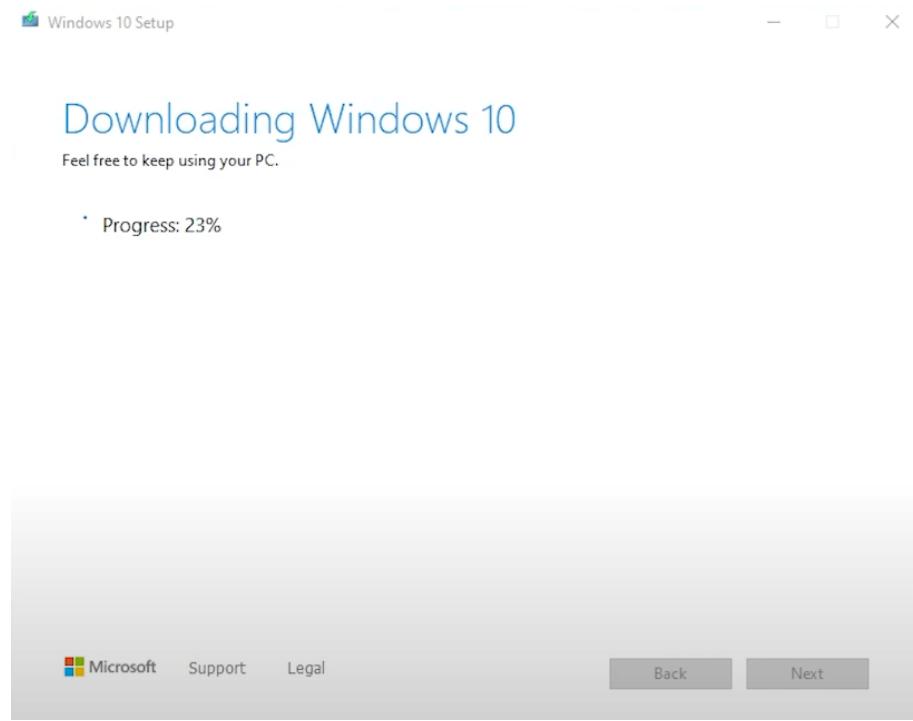
Step 6: Plug your USB Device into the PC

Step 7: Select the drive to install Windows and click Next. This will erase and reformat the drive.



Select a USB flash drive to install windows 10

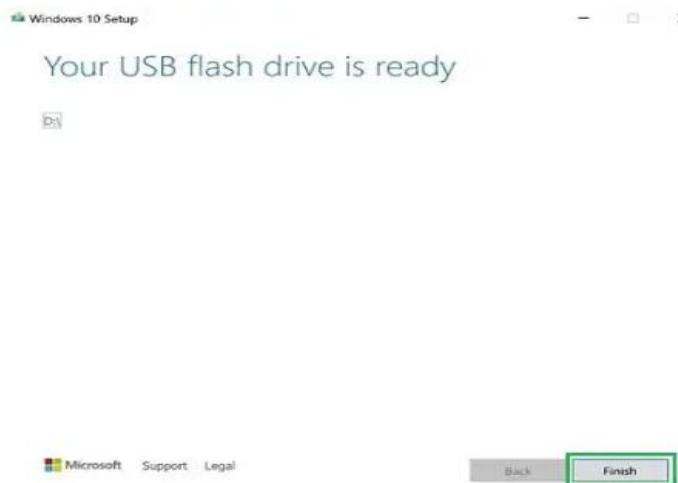
Step 8: Windows 10 is now being downloaded into your USB device. Wait until this process finishes and close the setup window.



download windows 10

Step 8: Finish the Setup

After waiting a bit, click on **Finish** to complete the process.



Hence, we have successfully configured the USB drive for installing Windows 10 on a desktop or laptop.

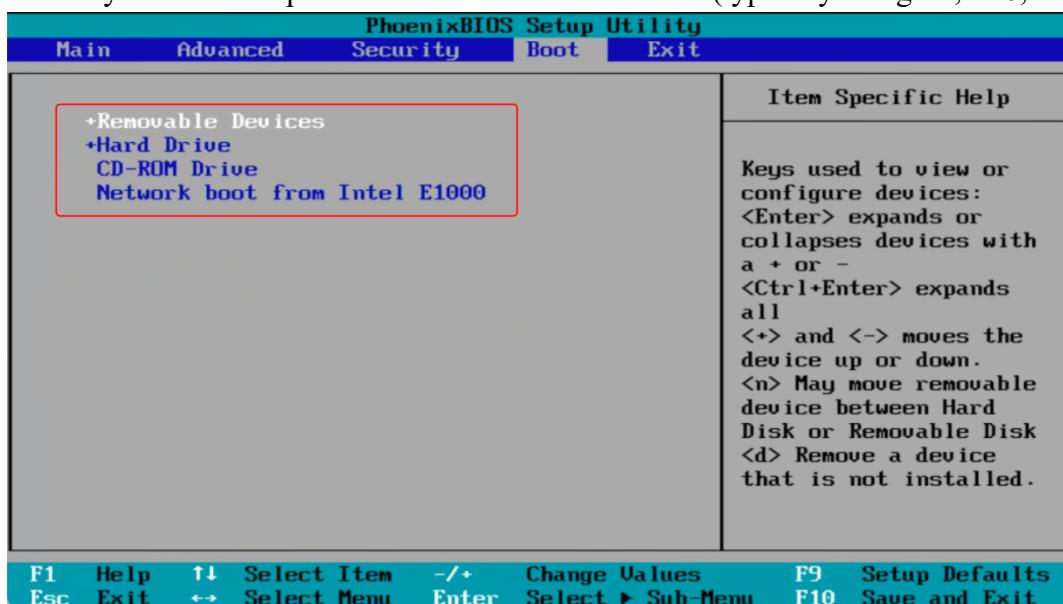
Steps to Configure Your Computer to Boot from the USB Drive

The steps to install Windows 10 from USB are as follows:

Step 1: Insert the Bootable USB Drive and Restart the Device

Plug your USB Device (as a bootable device now) with Windows 10 installer into a new PC.

Step 2: Turn on your new computer and access the BIOS/UEFI (typically using F2, F10, or Del).



change boot order

Step 3: In BIOS/UEFI, set the USB flash drive as the first boot option.

Step 4: Save changes and exit. Your PC will reboot from the USB drive.

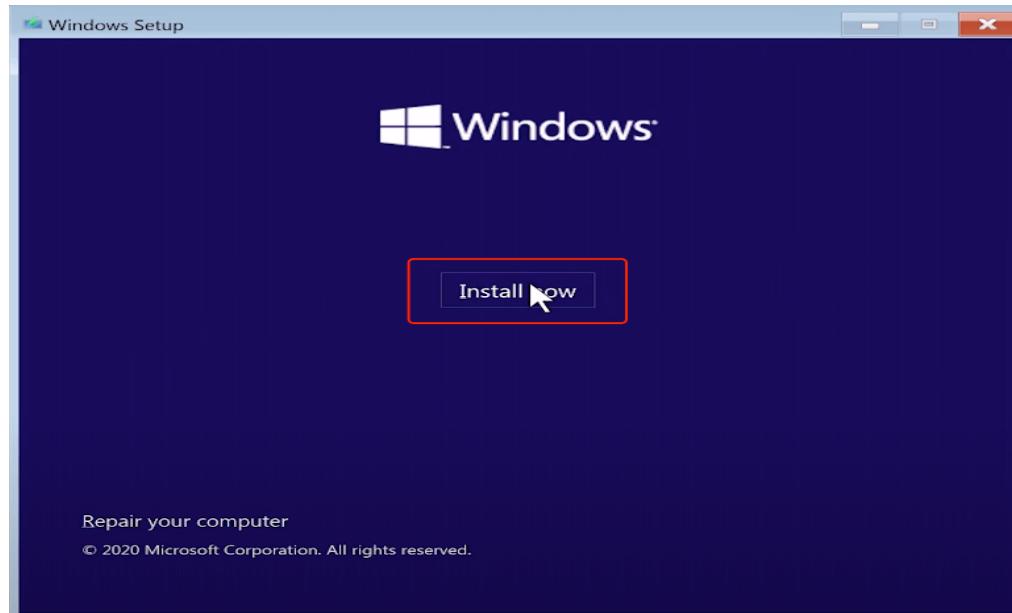
Step 5: Choose Language and Settings

Once the Windows 10 setup loads, choose your preferred language, timezone, currency, and keyboard settings. Click "Next." Note: You can change these settings later after the installation is complete.



Step 6: Start Installation

Click "Install Now" and select the edition of Windows 10 you have. Click "Next" to begin the installation process.



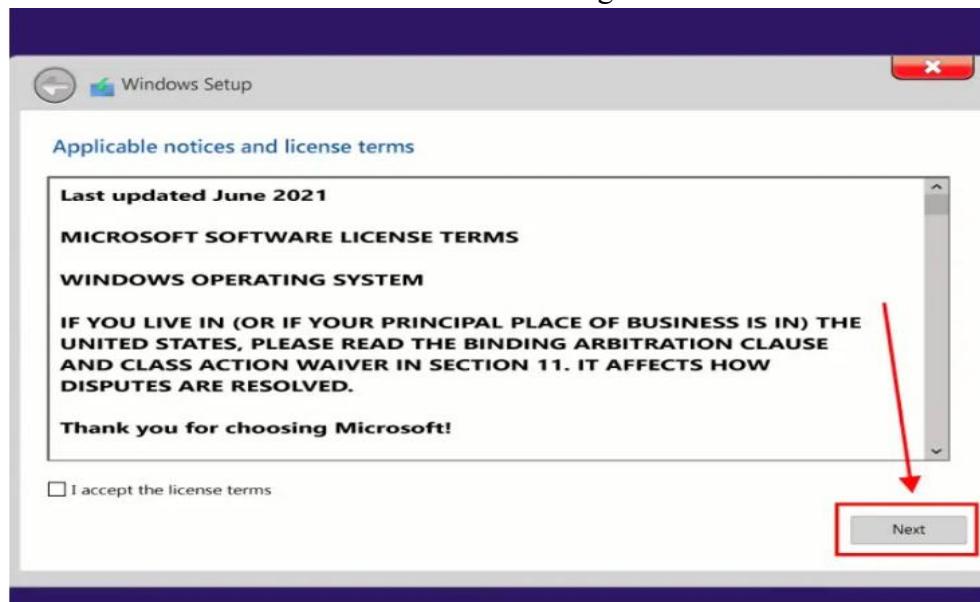
Step 7: Proceed ahead with or without Product Key

In the next window, it will ask for the Product Key. Enter your Windows 10 key, then click Next or Click on the option below to move ahead without Product Key.



Step 8: Proceed with the License

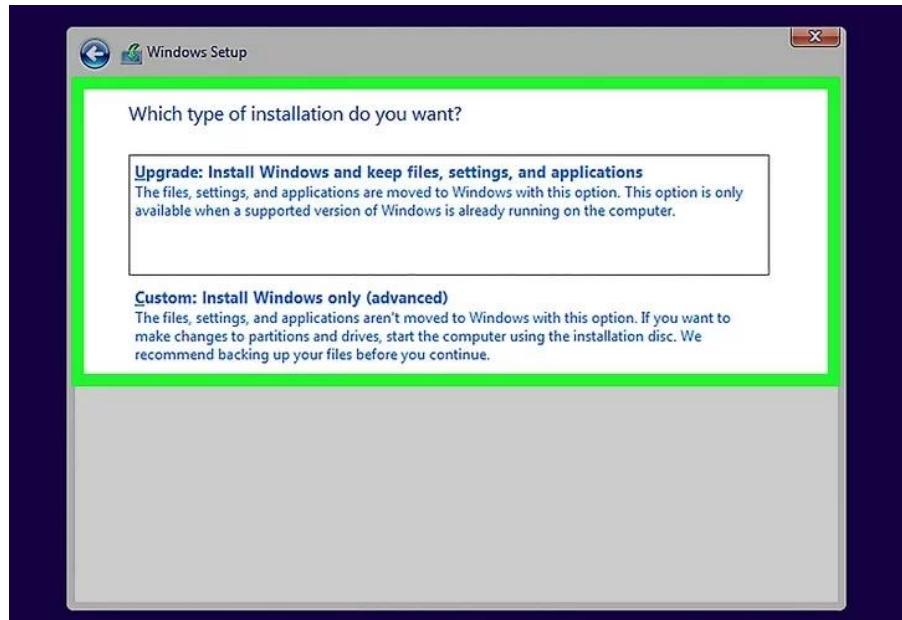
Click on the **Checkbox** as consent for the terms & conditions. And click on the **Next** button. It is advisable to read all the items & conditions before moving ahead.



Step 9: Choose Installation Type

Upgrade: Keep your current files, settings, and apps.

Custom: Perform a fresh installation. In this example, we'll select "Custom" for a clean installation.



Step 10: Create or Select Partitions To install Windows, you need a partition on your hard drive where the system files will be stored (usually the C: drive). You can:

Select an existing partition and format it.

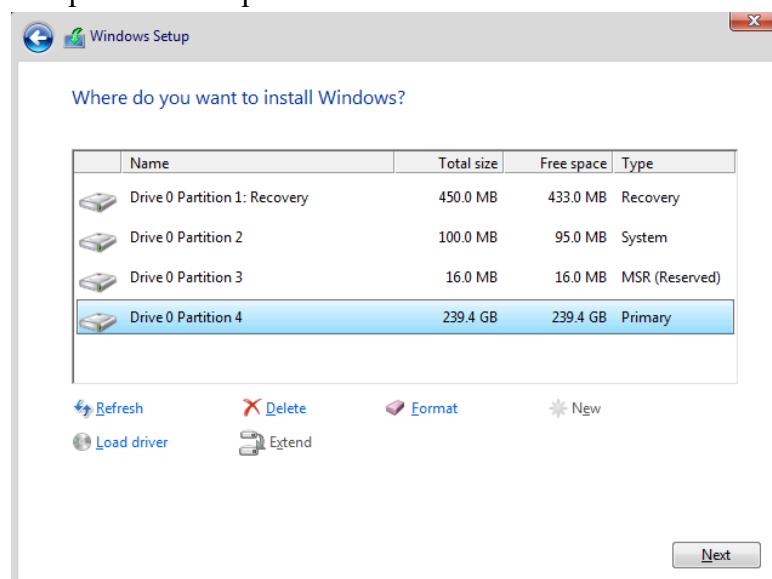
Delete existing partitions and create new ones. Note: If you haven't backed up your data, be cautious as deleted partitions can't be recovered.

Step 11: Create New Partitions (if needed)

If you need to create new partitions, click "Drive options (advanced)," then "New." Choose the partition size and click "Next." Windows will create the new partition.

Step 12: Format Partitions

Format each partition except for the one where you want to install Windows. Select a partition, click "Format," then "OK." Repeat for each partition.

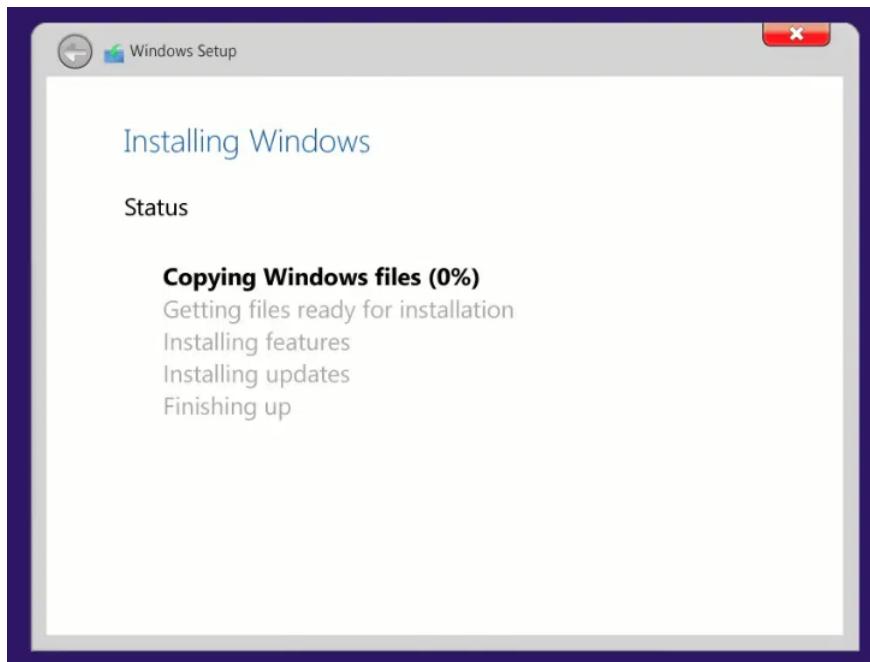


Step 13: Select Installation Partition

Select the partition where you want to install Windows and click "Next." Windows 10 installation will commence, and your computer may reboot several times during this process.

Step 14: Finish Setting up Windows 10

Now, the installation process is started. Wait till the installation is completed.



Aim : To Install operating systems like LINUX on a personal computer.

Instructions to Install Ubuntu Linux 12.04 (LTS) along with Windows

Step -1 Back Up Your Existing Data!

This is highly recommended that you should take backup of your entire data before start with the installation process.

Step -2 Obtaining System Installation Media

Download latest Desktop version of Ubuntu from this link:
<http://www.ubuntu.com/download/desktop>

Step -3 Booting the Installation System

There are several ways to boot the installation system. Some of the very popular ways are, Booting from a CD ROM, Booting from a USB , and Booting from TFTP.

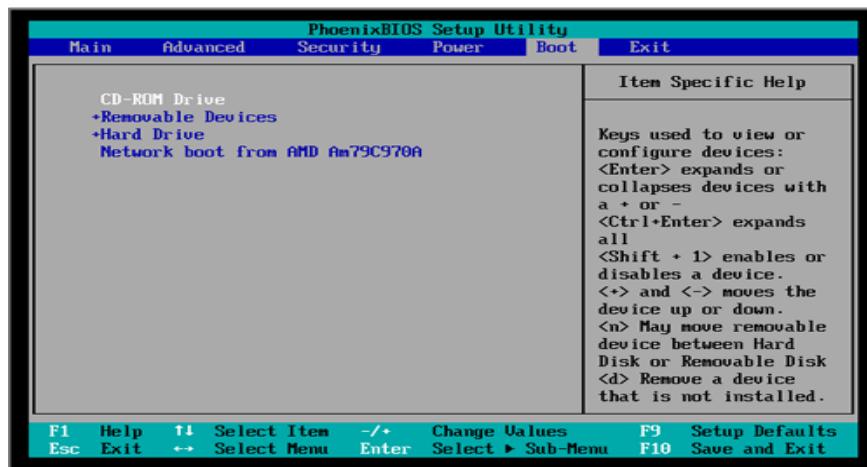
Here we will learn how to boot installation system using a CD ROM.

Before booting the installation system, one need to change the boot order and set CD-ROM as first boot device.

Step -4 Changing the Boot Order of a Computer

- As your computer starts, press the DEL, ESC, F1, F2, F8 or F10 during the initial startup screen. Depending on the BIOS manufacturer, a menu may appear.
- Find the Boot option in the setup utility. Its location depends on your BIOS.

- Select the Boot option from the menu, you can now see the options Hard Drive, CD-ROM Drive, Removable Devices Disk etc.
- Change the boot sequence setting so that the USB is first. See the list of “Item Specific Help” in right side of the window and find keys which are used to toggle to change the boot sequence order.
- Save the changes and exit the BIOS/UEFI settings.



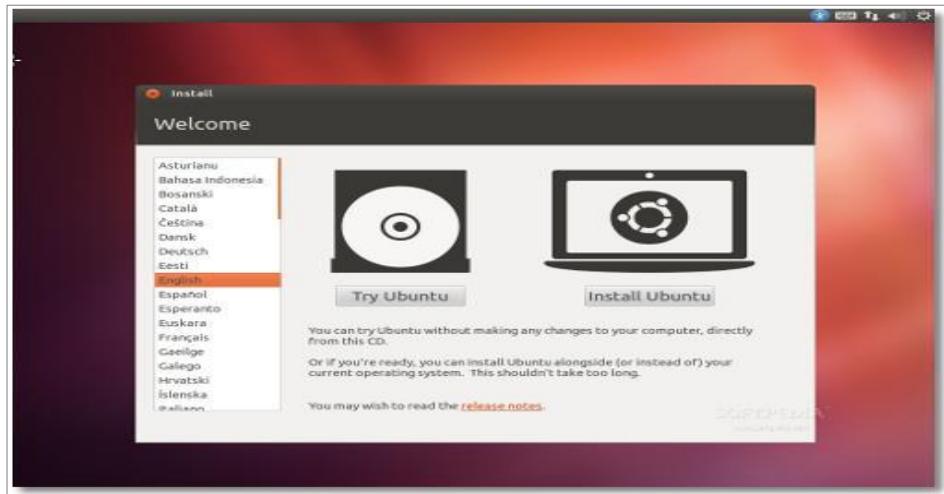
Step-5 : Insert Ubuntu Disk in CD/DVDdrive.

Save your changes. Instructions on the screen tell you how to save the changes on your computer. The computer will restart with the changed settings.

Machine should boot from CDROM, Wait for the CD to load...



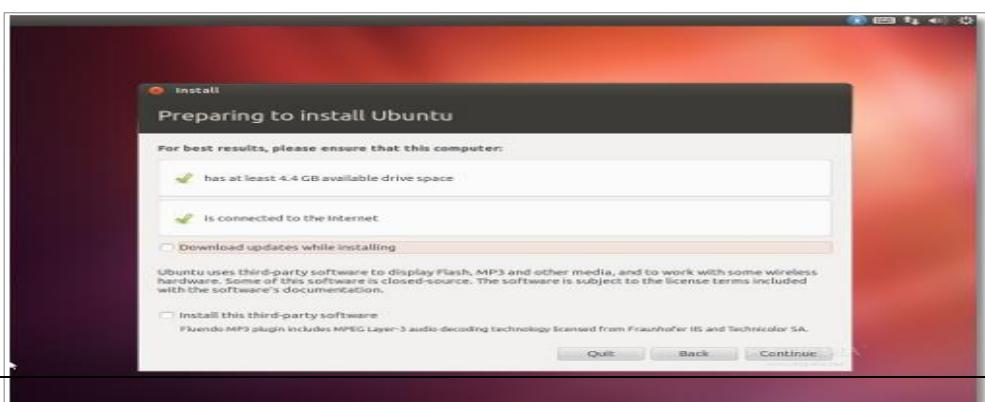
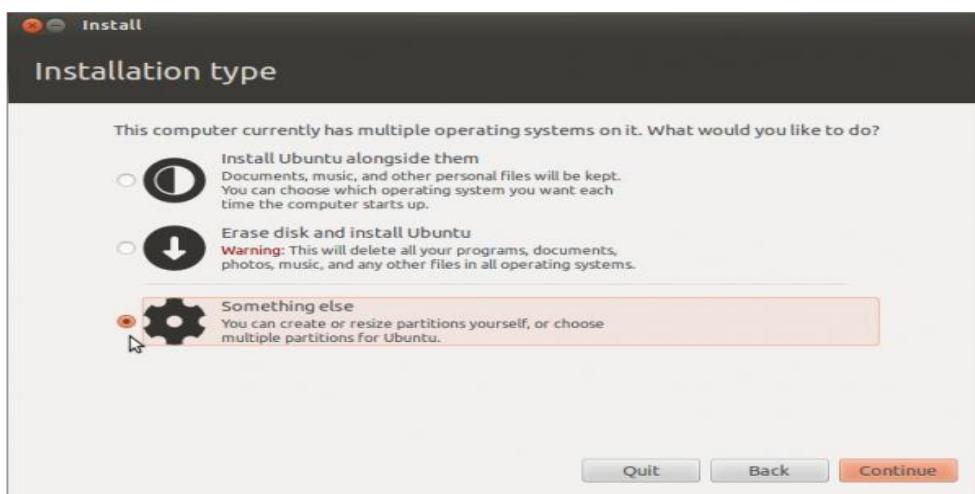
Step- 6: In a few minutes installation wizard will be started. Select your language and click the "Install Ubuntu" button

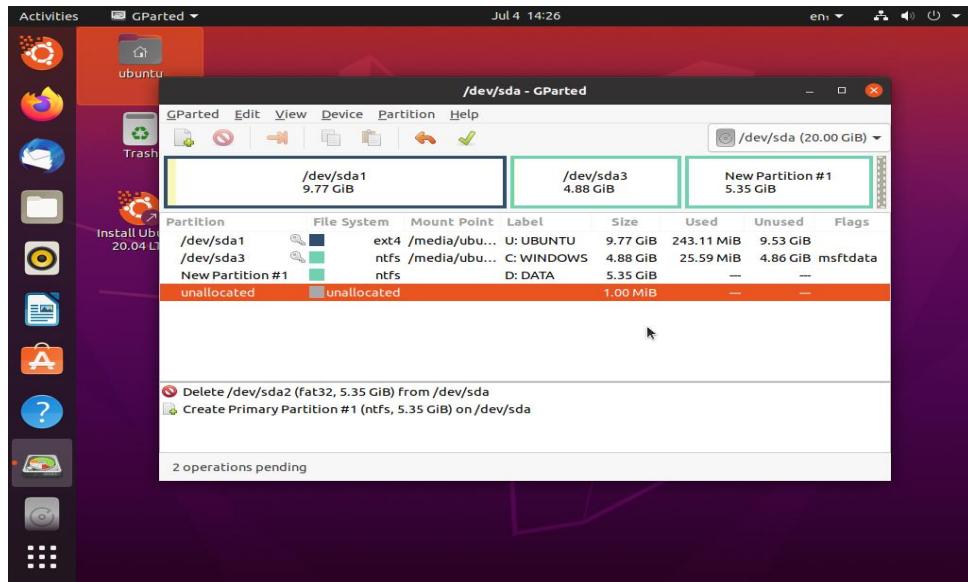


continue...

Step- 7: Optionally, you can choose to download updates while installing and/or install third party software, such as MP3 support. Be aware, though, that if you select those options, the entire installation process will be longer!

Step- 8: Since we are going to create partitions manually, select Something else, then click Continue. Keep in mind that even if you do not want to create partitions manually, it is better to select the same option as indicated here. This would insure that the installer will not overwrite your Windows , which will destroy your data. The assumption here is that sdb will be used just for Ubuntu 12.04, and that there are no valuable data on it.



**Step- 9:Where are you?**

Select your location and Click the "Continue" button .

Step- 10: Keyboard layout

Select your keyboard layout and UK (English) and Click on “Continue” button

**Step- 11: Who are you?**

Fill in the fields with your real name, the name of the computer (automatically generated, but can be overwritten), username, and the password.

Also at this step, there's an option called "Log in automatically." If you check it, you will automatically be logged in to the Ubuntu desktop without giving the password.

Option "Encrypt my home folder," will encrypt your home folder. Click on the "Continue" button to

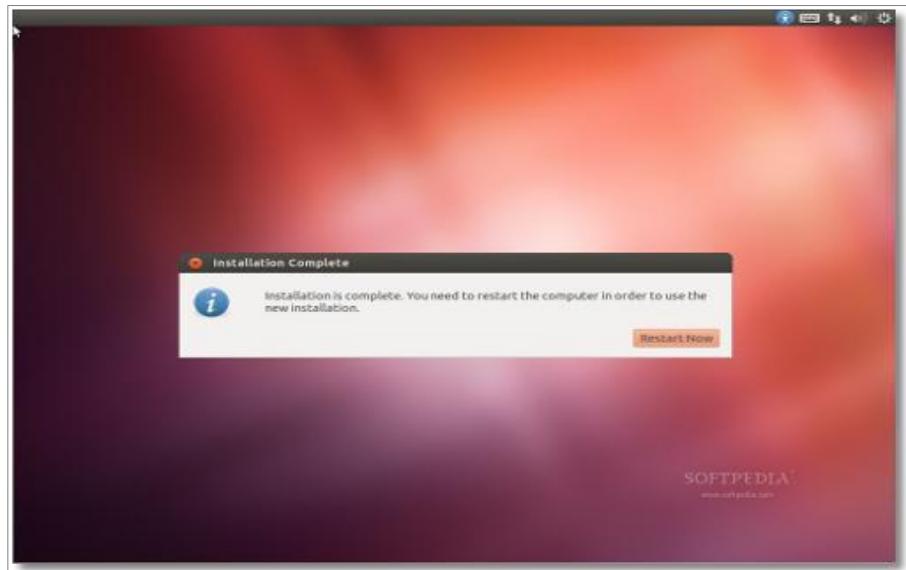


continue...

Step- 12: Now Ubuntu 12.04 LTS (Precise Pangolin) operating system will be installed.

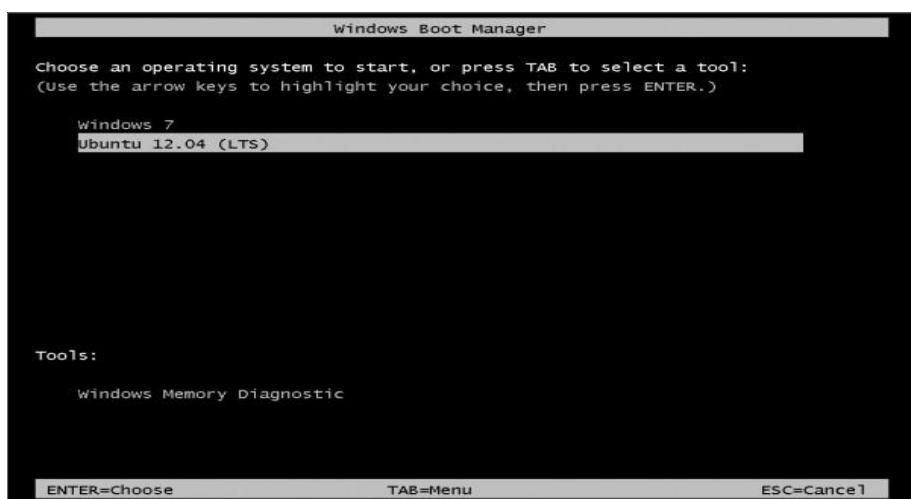


Step- 13: It will take approximately 10-12 minutes (depending on computer's speed), a pop-up window will appear, notifying you that the installation is complete, and you'll need to restart the computer in order to use the newly installed Ubuntu operating system. Click the "Restart Now" button.

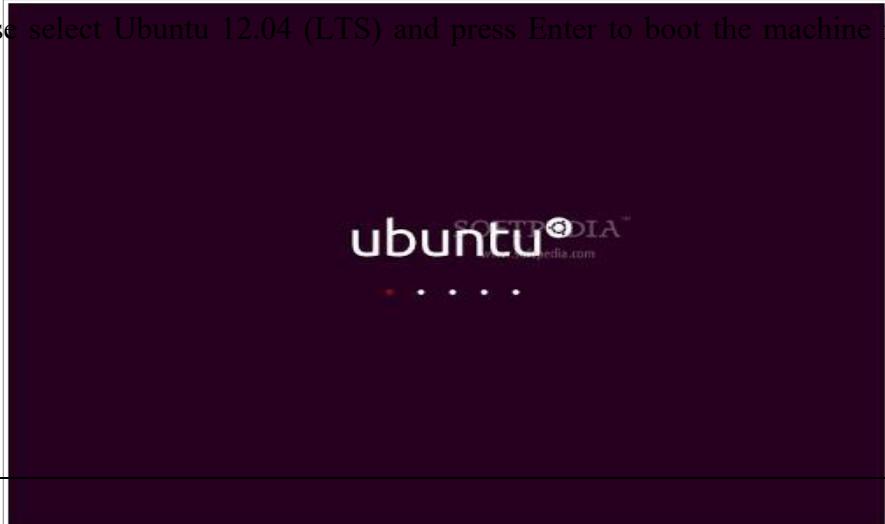


Step- 14: Please remove the CD and press the "Enter" key to reboot. The computer will be restarted. In a few seconds,

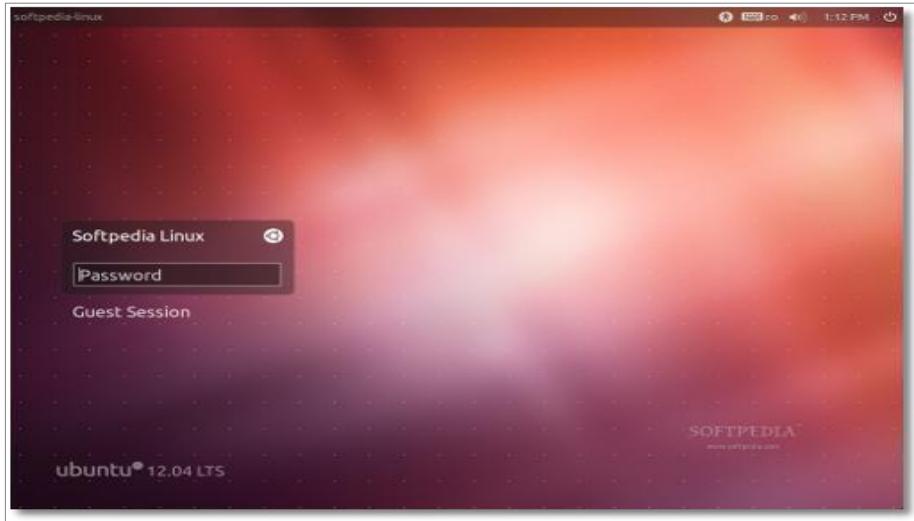
You should see Windows 7's boot menu with two entries listed – Windows 7 and Ubuntu 12.04 (LTS). Then you may choose to boot into Windows 7 or Ubuntu 12.04 using the UP/Down arrow key.



Step- 15: Please select Ubuntu 12.04 (LTS) and press Enter to boot the machine in Ubuntu 12.04 Linux.



Here you can see the users on the machine, Click on the user name and enter the password and press Enter key to login.



We have successfully installed and logged into Ubuntu 12.04 LTS.



Module-3

Office Suite.

1. **Creating Documents:** Formatting Fonts/Texts, page layout, Applying Text effects, Character Spacing, Borders and Colours, Inserting Header and Footer, equation editor.

2. **Spreadsheet Orientation:** Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler, Gridlines, Format Cells, Summation, auto fill, Formatting Text, Renaming and Inserting worksheets, Hyper linking.
3. **Excel Calculation:** Calculating Average, Cell Referencing, Excel Formula, std. deviation, Charts, Count Function, Sorting, Conditional formatting, Excel Advanced-sumif, VLOOKUP, and Pivot Table.
4. **Creating Power Point:** Student should work on basic power point utilities and tools to create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.
5. **Software as a service (SaaS):** Usage of online office suite.

1. **Creating Documents:** Formatting Fonts/Texts, page layout, Applying Text effects, Character Spacing, Borders and Colours, Inserting Header and Footer, equation editor.

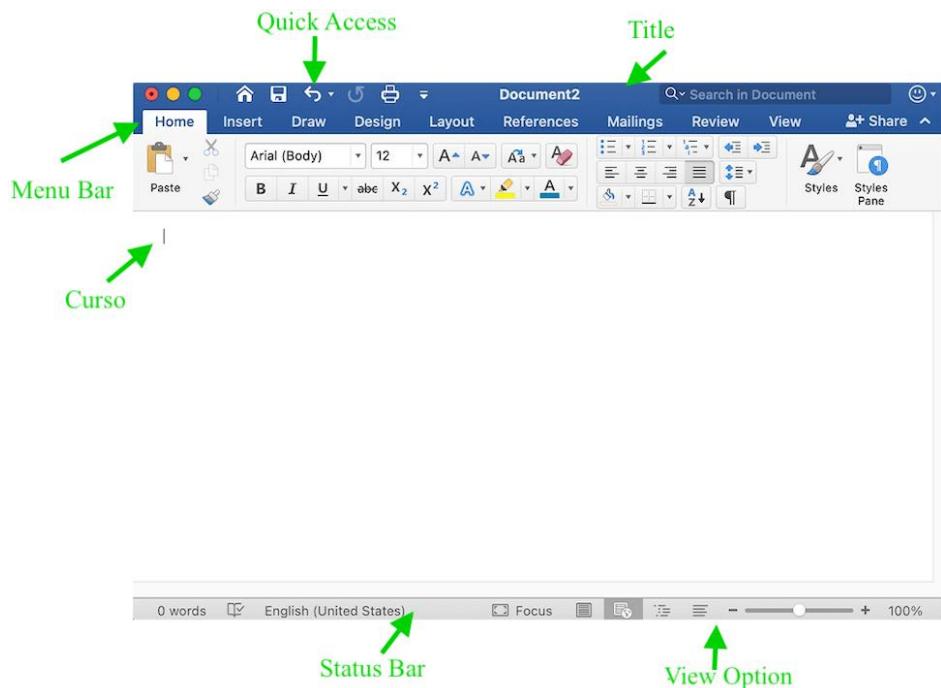
Introduction to Microsoft Word

Microsoft Word is one of the most widely used word processing programs, known for its flexibility and ease of use in creating, editing, and formatting documents. With features like **text formatting in Word**, **inserting tables and images**, **page layout options**, and built-in templates, users can handle a wide range of document tasks efficiently. With Microsoft Word, users can easily create everything like resumes, letters, and reports to essays, invoices, and brochures.

Microsoft Word Interface

The Microsoft Word interface is designed for document creation and editing:

- **Title Bar:** Displays the document title and quick access to minimize, maximize, and close options.
- **Ribbon Tabs:** Organized into functional tabs such as Home, Insert, Layout, and Review—each containing related tools and commands.
- **Workspace:** The main area where users type and format the document content.



Microsoft Word Tabs

Using these tabs, you can perform different types of operations on your documents, like you can create, delete, style, modify, or view the content of your document.

1. File

It contains options related to the file, like New(used to create a new document), Open(used to open an existing document), Save(used to save document), Save As(used to save documents), History, Print, Share, Export, Info, etc.

2. Home

It is the default tab of MS Word and it is generally divided into five groups, i.e., Clipboard, Font, Paragraph, Style and Editing. It allows you to select the color, font, emphasis, bullets, position of your text. It also contains options like cut, copy, and paste.

3. Insert

Add content such as tables, images, hyperlinks, charts, word art, date/time, header/footer, shapes, text boxes, equations, and more to your document.

6. Page Layout

It holds all the options that allow you to arrange your Microsoft Word document pages just the way you want them. It includes options like set margins, display line numbers, set paragraph indentation, and lines apply themes, control page orientation and size, line breaks, etc.,

7. References

The references tab lets you add references to a document, then create a bibliography at the end of the text. The references are generally stored in a master list, which is used to add references to further documents. It includes options like, Table of Contents, Footnotes, Citations & Bibliography, Captions, Index, Table of Authorities, smart look, etc.

8. Mailings

It is a least used tab in the menu bar. This tab is where you would create labels, print them on envelopes, do mail merge, etc.

9. Review

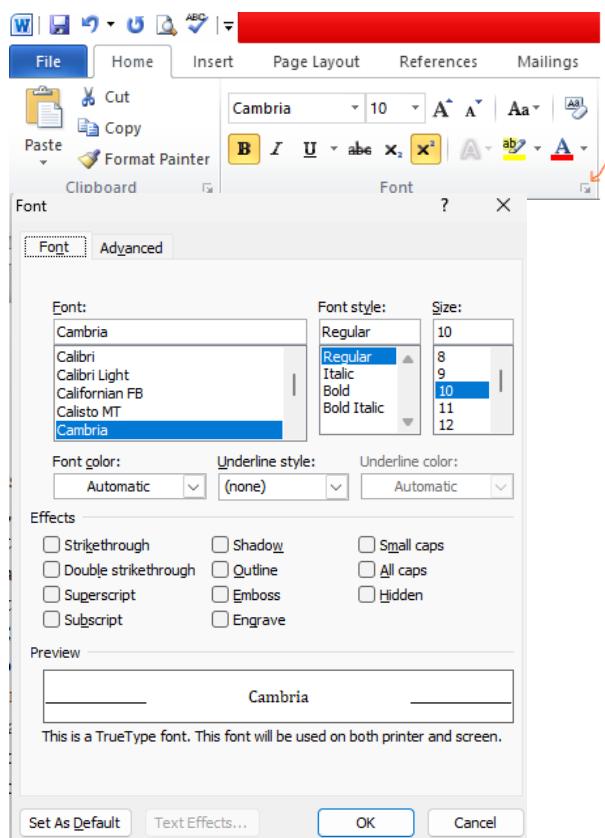
The review tab contains, commenting, language, translation, spell check, word count tools. It is good for quickly locating and editing comments.

10. View

View tab allows you to switch between single page or double page and also allows you to control the layout tools. It includes print layout, outline, web layout, task pane, toolbars, ruler, header and footer, footnotes, full-screen view, zoom, etc.

➤ Formatting Fonts/Texts

In MS Word, there are multiple types of formatting we can apply to a given text, such as **Fonts**, **Font Styles**, **Font Colors**, **Font Sizes**, **Text Highlight Colors**, **Clearing Formats**, **Change Cases**, etc. Let us apply these techniques to some texts in the Word Processor and see what results it produces.



➤ Font

Fonts are used to change the display of the text or Word Document, look more appealing, and as per the requirements of the situation. There are multiple types of fonts available in MS Word-like: *Cambria*, *Times New Roman*, *Algerian*, *Arial*, *Century*, etc.

➤ Font Style

Font Styles are used to change the Look ability of the text or give more emphasis on some texts in the Word Document. There are three types of font styles in MS Word: **Bold**, **Italics**, and **Underline**.

➤ Font Color

Font Colors have wide use in real life when using the Word Document. Be it highlighting the main points of the document or want to convey some important information. There are multiple types of Font Colors available in MS Word-like: *Red, Blue, Yellow, Orange, Light blue, etc.*

➤ **Font Size**

Font Sizes are used to display the text in the Word Document larger or smaller according to our needs. We generally display a heading with a Font Size of 15, Subheadings with a Font Size of 14 or 13, and paragraphs with a Font Size of 12. Many Font Sizes are available in MS Word-like: 8, 9, 10, 11, 12, 14, 16, etc.

➤ **Text Highlight Color**

As the name itself suggests, the Text Highlight Color is used to highlight text in the Word Document. There are many Text Highlight Colors available in MS Word-like: *Yellow, Bright Green, Turquoise, Pink, Red, etc.*

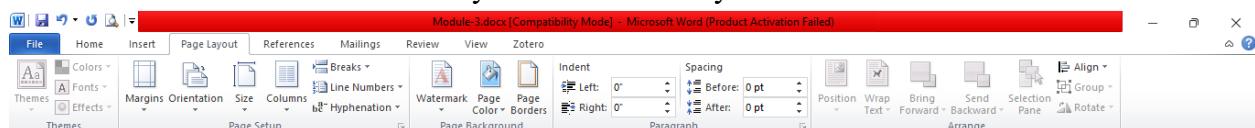
➤ **Change Case**

Change Case is used to display the text in the way we want in our Word Document. There are five types of Change Cases available in MS Word-like: *Sentence case, Lowercase, Uppercase, Capitalize each word, and toggle case.*

➤ **Clear Formats**

MS Word provides a feature to clear the pre-formatted text. When we copy some text or information from somewhere it has some formatting applied already, so to remove it and use it according to our need in our Word Document we have to clear the Formatting.

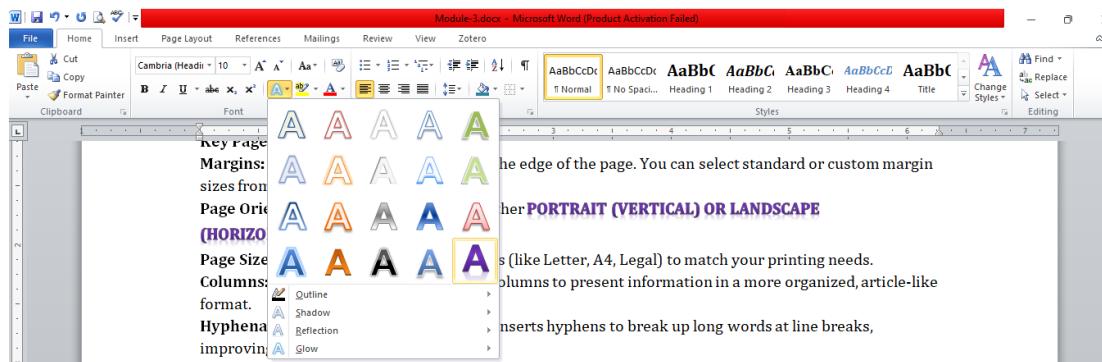
- **Page layout:** In MS Word, page layout controls the look and arrangement of your document by modifying margins, page orientation (portrait or landscape), and page size, all accessible from the Layout tab. You can also add columns, apply hyphenation, and number lines from this tab to further customize your document's layout.



Key Page Layout Options:

- **Margins:** The space between the text and the edge of the page. You can select standard or custom margin sizes from the Layout tab.
- **Page Orientation:** This sets the page to either Portrait (vertical) or Landscape (horizontal).
- **Page Size:** Choose from various paper sizes (like Letter, A4, Legal) to match your printing needs.
- **Columns:** Divide your page into multiple columns to present information in a more organized, article-like format.
- **Hyphenation:** Automatically or manually inserts hyphens to break up long words at line breaks, improving text flow.
- **Line Numbers:** Adds numbers to each line, useful for tracking changes or referencing specific lines.
- **Indents:** Adjust the spacing before or after the first line of a paragraph to create visual hierarchy.

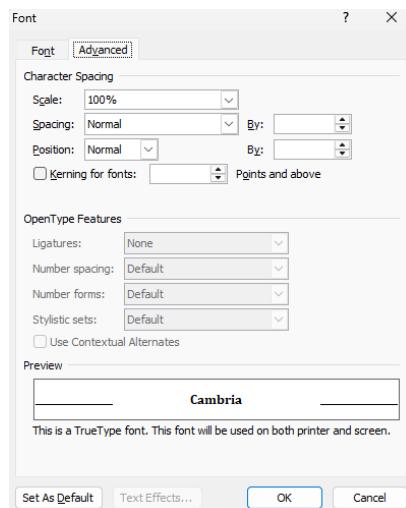
- **Applying Text effects:** Text effects let us add special visual styles to your text, like shadows, reflections, glows, and 3D effects. These can make your text stand out and look more attractive.



Steps to Apply Text Effects:

- Select Text:** Highlight the specific text or words you want to enhance.
- Locate Text Effects:** On the Home tab, find the Font group and click the Text Effects and Typography button (it looks like a letter 'A' with an outline).
- Choose a Style:** From the menu that appears, you can select a built-in style.
- Customize Effects:** For more control, hover over Outline, Shadow, Reflection, or Glow to open a sub-menu where you can customize the color, weight, and other attributes of the effect.
- Apply the Effect:** Click the specific effect you desire, and it will be applied to your selected text.

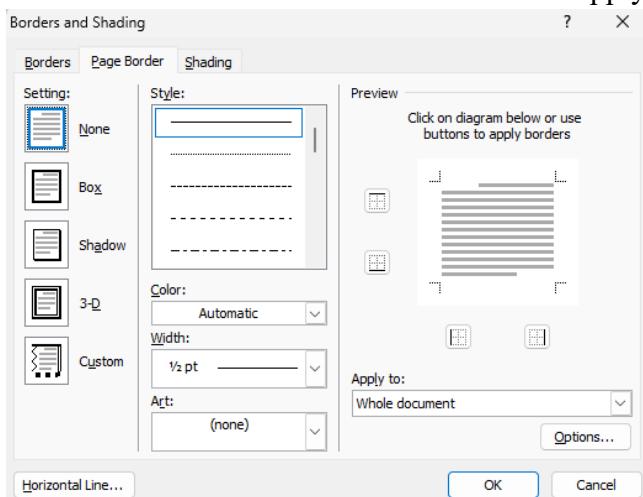
- **Character Spacing :** To change character spacing in MS Word, select the text, then go to the Home tab, click the Font dialog box launcher (the small arrow in the bottom-right of the Font group), go to the Advanced tab, and use the Spacing options (Expanded or Condensed) along with the By field to adjust the space between characters, then click OK to apply the changes.



- **Borders and Colours :** Borders let you add lines around text, paragraphs, pages, or tables to highlight or separate content.

To add borders and color in MS Word,

- **select the text, shape, or table** you want to modify
- Then **go to the Home tab** and find the **Borders** button.
- Choose the option to customize your border in the **Borders and Shading** dialog box.
- Within this dialog box, you can select a **border style**
- Choose a **color** from the color palette
- And then set the **width** of the line to apply it to your selection.

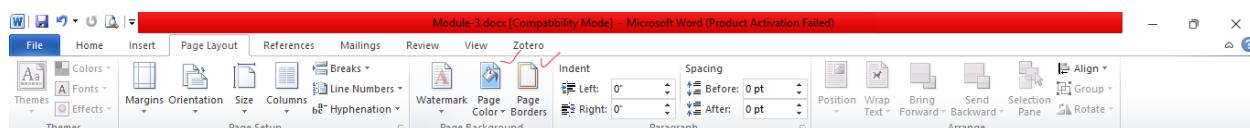


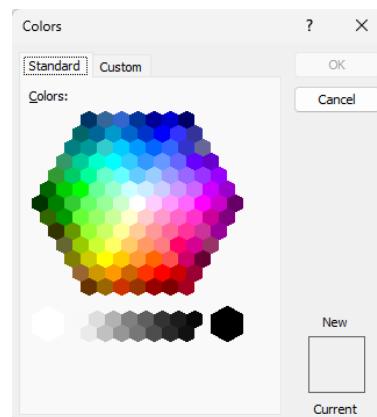
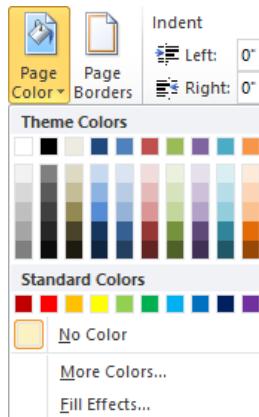
For Page Borders

1. Go to the **Design** tab/Page layout tab.
2. Click on **Page Borders** on the right side of the ribbon.
3. In the Borders and Shading dialog box, select **Page Border**.
4. Choose your desired **setting** (e.g., Box), **style**, **color**, and **width**.
5. Click **OK** to apply the border to your document.

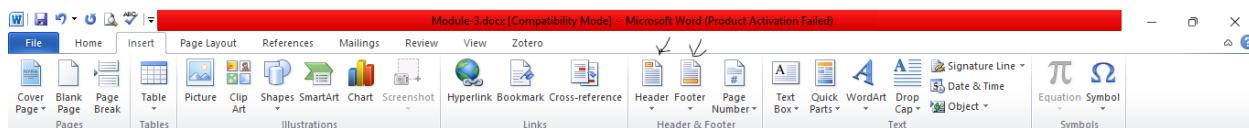
For Page Color

1. **Open:** your Word document.
2. Navigate to the Design tab/Page Layout tab on the ribbon.
3. Click the Page Color button.
4. **Select:** a color from the Theme Colors or Standard Colors options.
5. For a wider range of options, click More Colors to open the color dialog box or choose Fill Effects for textures, patterns, gradients, or pictures.





- **Inserting Header and Footer :** To insert a header or footer in Microsoft Word, go to the Insert tab on the ribbon, then click Header or Footer and choose a built-in style or select Edit Header/Footer to create your own. The header or footer area will become editable, and a new Design tab will appear with options for customization, such as making headers and footers different for odd and even pages. To finish, close the header/footer area by clicking the Close Header and Footer button or pressing the Esc key.



Steps to Insert a Header or Footer

- Go to the Insert Tab:** On the Microsoft Word ribbon, click the Insert tab.
- Select Header or Footer:** In the "Header & Footer" group, click the Header or Footer command.
- Choose a Style or Edit:** From the drop-down menu, you can select a built-in header or footer format, or choose Edit Header or Edit Footer to create one from scratch.
- Edit the Header or Footer:** Once you've selected a style, the header or footer area will become editable, and a Design tab will appear on the ribbon. Type the text or information you want to include.
- Exit the Header/Footer Area:** When you are finished, select the Close Header and Footer button on the Design tab or press the Esc key on your keyboard.



- **Equation Editor**

Microsoft Word's Equation Editor simplifies inserting mathematical equations into documents. It supports a wide range of symbols and formats, including fractions, integrals, matrices, and more, covering fields like mathematics, physics, and chemistry. Use this feature to easily create or add equations to your document. It allows you to create a wide variety of mathematical and scientific notations. You can build equations using templates for specific structures, or by typing out a recognized code and pressing the spacebar to convert it.

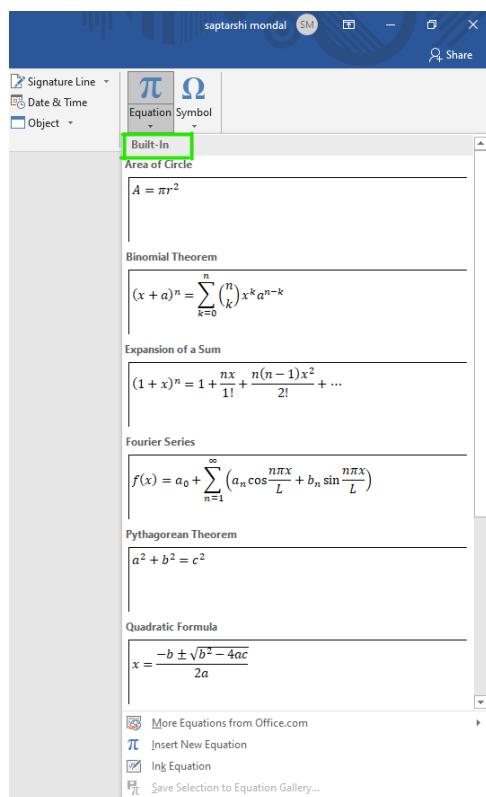
Steps to Insert Equations in MS Word

Step 1: On the navigation menu, click on the **insert** option.

Step 2: Under **Equation** tools click on the **drop-down arrow** button

Step 3: A **built-In** dialog box will open where you can select the different types of equations.

Step 4: There are multiple sets of equations in the list, Select the equation as per your requirement

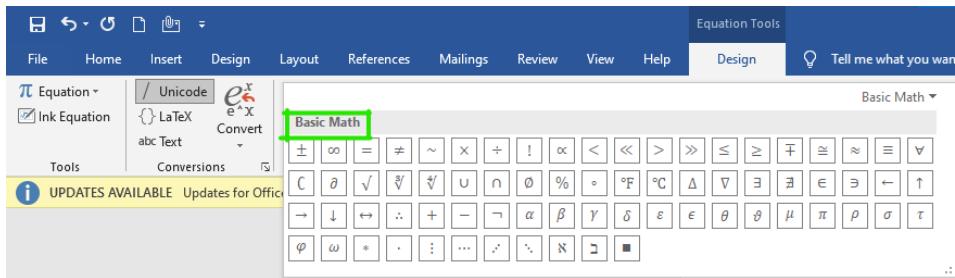


Step 5: Now click on the **equation** to edit or modify the Symbols or Structures of the equation.

$$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} - \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} + b_n \sin \frac{n\pi x}{L} \right)$$

Step 6: A **design** menu bar will open which contains different types of **symbols**, **equation structure**, **fractions**, **integration**, and many more.

Step 7: A **basic math** dialog box will open where you can choose different types of symbols for the equation.



General algebra and pre-calculus

- **Fractions:** Type a/b and press the spacebar.
- **Exponents and subscripts:** Use ^ for superscripts (exponents) and _ for subscripts.
- **Square roots:** Type \sqrt followed by the expression in parentheses, and then press the spacebar.
- **Quadratic formula:** Combines fractions, square roots, and the plus-minus symbol (\pm).

Example equations you can directly try in an Equation Editor (like in **MS Word**, **Google Docs**, or **LaTeX**).

1. Simple Algebra

- Command: $x^2 + y^2 = z^2$
- Result:

$$x^2 + y^2 = z^2$$

2. Fraction

- Command: \frac{a}{b}
- Result:

$$\frac{a}{b}$$

3. Quadratic Formula

- Command: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- Result:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

4. Summation

- Command: $\sum_{i=1}^n i = \frac{n(n+1)}{2}$
- Result:

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

5. Integral

- Command: `\int_0^\infty e^{-x} dx = 1`
- Result:

$$\int_0^\infty e^{-x} dx = 1$$

6. Matrix

- Command:

```
\begin{bmatrix}
a & b \\
c & d
\end{bmatrix}
```

- Result:

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

7. Greek characters, subscripts and superscripts

If you type

`log<space>(\lambda) = \beta_0<space> + \beta_1<space>(X) + \beta_2<space>(X^2<space>)`

- Result:

$$\log(\lambda) = \beta_0 + \beta_1(X) + \beta_2(X^2)$$

8. Accents

For these you need to hit the space key twice, so

`x\hat<space><space> = y\bar<space><space>`

- Result:

$$\hat{x} = \bar{y}$$

9. Plain text within equation

`Y = -1\cdot log("Property Crime"<space>) + (not pretty text)`

- Result:

$$Y = -1 \cdot \log(\text{Property Crime}) + (\text{not pretty text})$$

10. Sum

example for the sum:

$$n^{-1} \cdot \sum_{i=1}^n x_i = \bar{x}$$

- Result:

$$n^{-1} \cdot \sum_{i=1}^n x_i = \bar{x}$$

11. Square root

An example of Euclidean distance,

$$d_{ij} = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2}$$

- Result:

$$d_{ij} = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2}$$

12. Fractions

Back slash followed by forward slash does the inline fraction:

$$1/n = 1\!/n$$

- Result:

$$\frac{1}{n} = 1/n$$

13. Numbering an equation (we use #)

$$E = mc^2 \#(30) \langle \text{enter} \rangle$$

- Result:

$$E = mc^2 \tag{30}$$

14. Multiple lines of equations (we use @)

$$\begin{array}{l} 10x = 4y \\ 5x = 2y \end{array} \langle \text{space} \rangle \langle \text{backspace} \rangle$$

- Result:

$$\begin{array}{l} 10x = 4y \\ 5x = 2y \end{array}$$

Use case 1 : Create a Resume in MS Word.

Use case 2 : Creating Newsletters in MS Word.

Use case 3 : Creating Certificates in MS Word.

Use case 4 : Creating feedback form in MS Word.

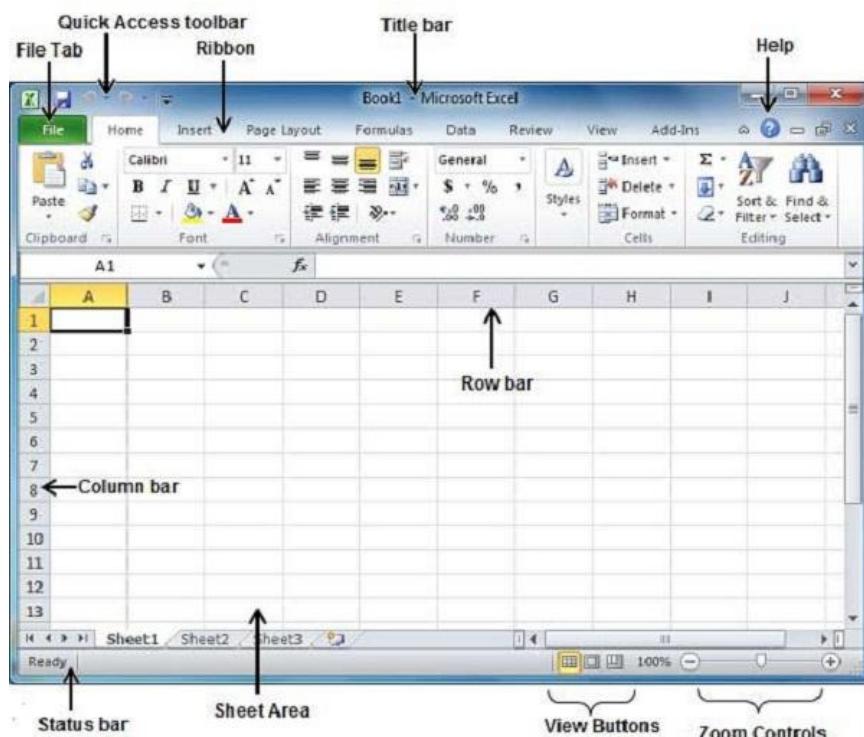
Use case 5 : Creating math equations (manually) in MS Word.

2. **Spreadsheet Orientation:** Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler, Gridlines, Format Cells, Summation, auto fill, Formatting Text, Renaming and Inserting worksheets, Hyper linking.

Introduction to MS Excel

Microsoft Excel, a versatile spreadsheet tool from the Microsoft Office suite that organizes data into rows and columns. Whether we're managing budgets, creating charts, or analyzing datasets, Excel helps us handle tasks efficiently. For example, we can list project tasks, calculate totals, and visualize data all in one file.

Excel uses the **Ribbon interface**, and each tab groups related commands.

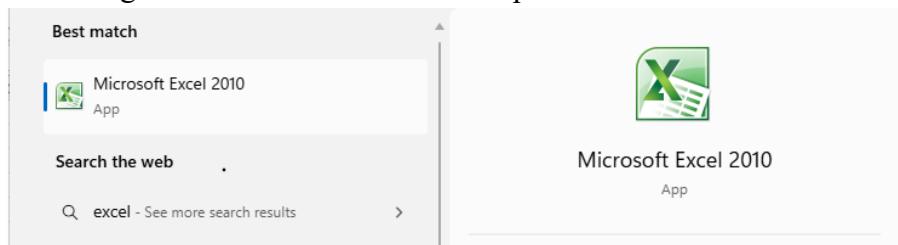


- The **File tab** opens the Backstage View, which contains commands for file management such as creating a new workbook, opening existing files, saving in different formats, printing, sharing, and adjusting Excel options.
- The **Home tab** is the most frequently used, offering clipboard commands like cut, copy, and paste, along with options for font formatting, alignment, number formatting, styles, inserting or deleting cells, and quick editing tools such as AutoSum and Find & Select.
- The **Insert tab** allows users to add elements into their worksheet including tables, PivotTables, charts, sparklines, pictures, shapes, SmartArt, hyperlinks, text boxes, headers and footers, and symbols.

- The **Page Layout tab** focuses on how the worksheet appears on the page, giving access to themes, margins, page orientation, size, print area, page breaks, scaling options, background settings, and object arrangement.
- The **Formulas tab** contains tools for working with functions and formulas, including the Function Library with categories like financial, logical, text, date and time, lookup, and math; it also includes options for naming ranges, auditing formulas, and controlling calculation modes.
- The **Data tab** is dedicated to handling data, with features for importing from external sources, managing connections, sorting and filtering, validating entries, removing duplicates, performing what-if analysis, and outlining data.
- The **Review tab** provides tools for proofreading and collaboration, including spelling check, research, thesaurus, translation, inserting and managing comments, and features to protect worksheets, protect workbooks, share workbooks, and track changes.
- The **View tab** controls how the workbook is displayed, offering different view modes such as Normal, Page Layout, and Page Break Preview, options to show or hide gridlines, headings, rulers, and the formula bar, zoom settings, window arrangement, freeze panes, and macro management.

➤ Accessing

To access Microsoft Excel, use the Windows Start Menu to navigate to All Programs > Microsoft Office > Microsoft Excel, or use the Windows Search bar to type "Excel" and click the Excel icon. Excel is a spreadsheet program for storing, organizing, and analyzing data, featuring a "Backstage view" for commands like Open and Print.

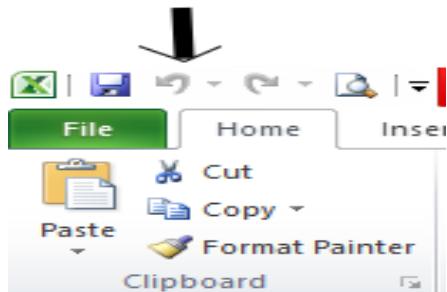


➤ Overview of toolbars:

In Microsoft Excel, the concept of traditional toolbars is replaced by the Ribbon and the Quick Access Toolbar (QAT). This design allows users to customize their experience by placing their most-used tools in one easy-to-access location, like Quick Access Toolbar or by selecting the appropriate tab on the Ribbon.

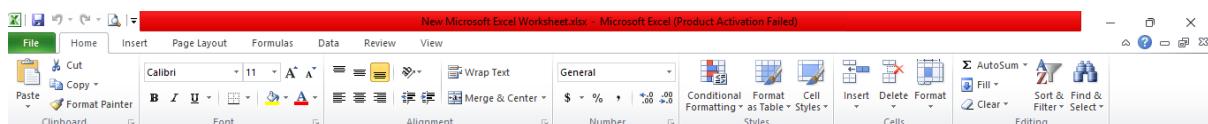
1. Quick Access Toolbar

- Found at the very top left corner of the Excel window.
- Contains frequently used commands like **Save**, **Undo**, **Redo** by default.
- Users can **customize** it by adding more commands such as Print Preview, New Workbook, Sort, etc.



2. Ribbon Toolbar

- The Ribbon replaced the old “classic menus” in Excel 2010.
- It is divided into **Tabs** (like Home, Insert, Page Layout, Formulas, Data, Review, View).
- Each Tab contains **Groups** (like Font, Alignment, Number in the Home tab).
- Each Group has **Commands** (buttons, menus, and dialog box launchers).



3. Mini Toolbar

- Appears **automatically** when you select text or cells and right-click.
- Provides quick access to formatting commands like **Font, Size, Bold, Italic, Border, Fill Color**.
- It saves time by showing commonly used formatting tools right next to the selection.



➤ Saving spreadsheet files :

Steps to Save a New or Existing File

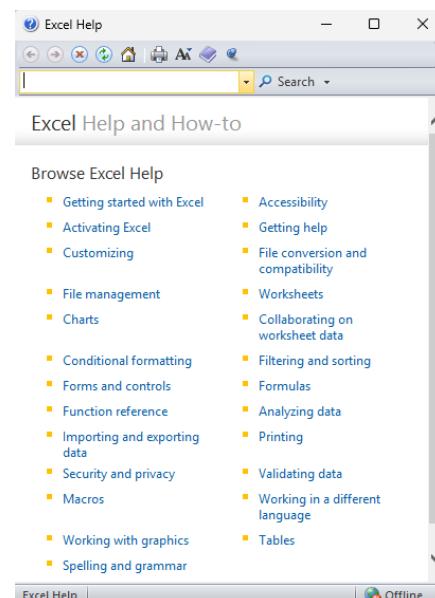
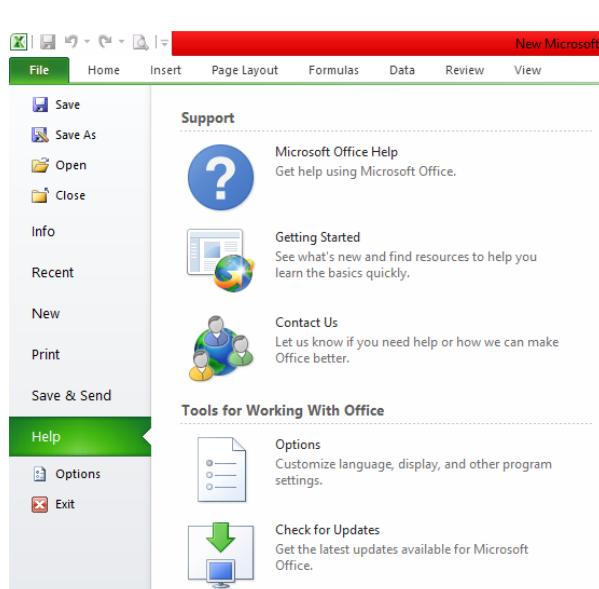
- Click the File Tab:** Located in the top-left corner of the Excel window, this opens the Backstage view.
- Select Save As:** In the menu that appears, choose the "Save As" command.
- Choose a Location:** Select where you want to save your workbook, such as your computer's Documents folder or another preferred location.
- Enter a File Name:** In the "File name" box, type a name for your spreadsheet file.
- Select a File Format:** By default, Excel 2010 saves files as Excel Workbook (.xlsx). You can choose a different format by using the "Save as type" drop-down menu if needed.
- Click Save:** Click the "Save" button to finalize the saving process and store your workbook.

Saving an Existing File (Using Ctrl+S)

- To quickly save any changes to a file you have already saved, you can press Ctrl + S on your keyboard.
- If you are working on a new, unsaved workbook, this action will also prompt you to provide a file name and location.

➤ Using help and resources

In MS Excel, the primary help resources are available through the Help Viewer, which can be accessed from the Backstage view (File) or by pressing the F1 key. The Help function offers a comprehensive database of information, including tutorials, articles, and step-by-step instructions for performing tasks.



➤ Creating a Scheduler

One can create a Scheduler to plan and track activities, tasks, or events by making use of rows, columns, and formatting tools.

1. Layout Design

- **Columns:** Usually represent dates, days of the week, or time slots (e.g., 8:00 AM, 9:00 AM, etc.).
- **Rows:** Represent tasks, activities, or names of people.
- You can also reverse this (rows for dates, columns for activities) depending on the need.

2. Formatting Tools

- Use **Merge & Center** to create headers like “Weekly Schedule” or “Monthly Scheduler.”
- Apply **Borders** to separate days and time slots clearly.
- Use **Cell Fill Colors** to highlight important tasks, deadlines, or meetings.
- **Conditional Formatting** can automatically highlight overdue or upcoming tasks.

3. Data Entry

- Input **tasks, appointments, or activities** in the corresponding date and time cells.
- Insert details such as **Task Name, Start Time, End Time, Assigned Person, and Status.**

4. Using Formulas

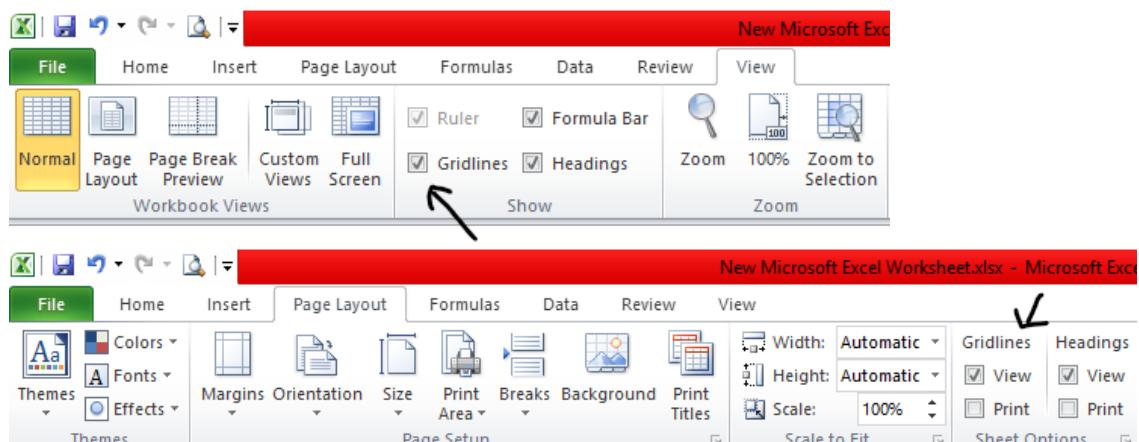
- Excel's formula capabilities can be used to add automation.
- **Example:**
 =Sum() can calculate the total hours worked per employee to prevent overscheduling.
 =AVERAGE() to find the average of n marks.

5. Sorting and Filtering

- With the **Data tab**, you can sort tasks by date, priority, or person.
- **AutoFilter** helps to quickly view only specific tasks, e.g., pending or completed.

➤ Gridlines

Gridlines are the horizontal and vertical faint lines that divide a worksheet into cells, acting as visual aids for organizing and aligning data, making the spreadsheet more presentable and readable. These lines are enabled by default but can be shown or hidden by checking or unchecking the gridlines option in the View or Page Layout tabs, or by changing their color via the Options dialog. Unlike cell borders, gridlines apply to the entire worksheet and typically do not print unless specifically enabled in the print settings, differentiating them from user-applied cell borders.



➤ Format Cells

"Format Cells" is a feature that lets you change the visual appearance of cells, affecting how numbers, text, alignment, fonts, and borders are displayed. You access the [Format Cells dialog box](#) to customize settings like number formats (currency, dates), font styles, cell colors, and borders to make data easier to read and highlight key information.

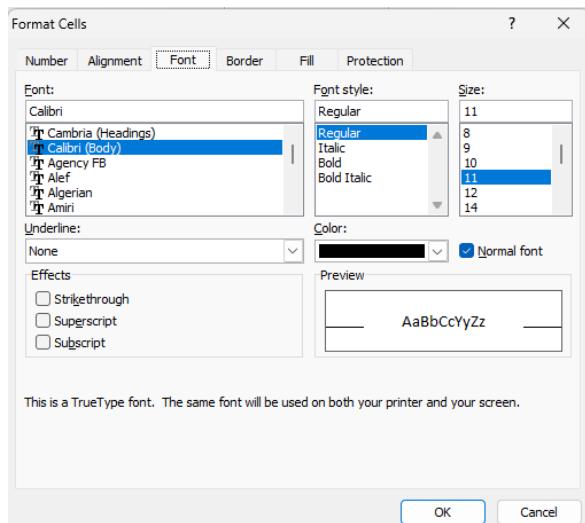
How to Access and Use Format Cells

1. **Right-Click Menu:** Select your cell(s), right-click, and choose Format Cells... from the context menu.
2. **Keyboard Shortcut:** Press Ctrl + 1 on your keyboard after selecting the desired cell(s).

3. **Dialog Box Launcher:** On the Home tab, in the Font, Alignment, or Number groups, click the small arrow (the Dialog Box Launcher) at the bottom right corner to open the respective tab of the Format Cells dialog box.

Once the dialog box is open, you can adjust various aspects of your cells:

- **Number:** Change how numbers, percentages, currency, dates, and other data are displayed.
- **Font:** Modify the font style, size, color, and apply effects like bold or italics.
- **Alignment:** Adjust the horizontal and vertical alignment of text within a cell, as well as text orientation.
- **Border:** Add borders to cells or cell ranges to define their boundaries.
- **Fill:** Set the background color or pattern for your cells.
- **Protection:** Lock cells to prevent their contents from being changed or restricted.



➤ Summation

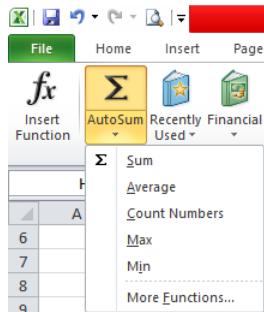
"Summation" refers to the process of adding numbers using the SUM function or the AutoSum feature to quickly calculate the total of a range of cells. You can manually type a formula like =SUM(A2:A10) to add the values in the specified cells, or click the AutoSum button on the Home tab to automatically insert the SUM formula and select the cells to total.

Using the SUM Function

1. **Select a cell:** where you want the result to appear.
2. **Type an equals sign (=),** followed by the word SUM, and an opening parenthesis (.
3. **Enter the cell range:** you want to add, such as A2:A10, or select the cells by clicking and dragging.
4. Type a closing parenthesis): and press Enter to see the sum.
 - o Example: =SUM(A2:A10, C2:C10) will add the values in both the A2:A10 range and the C2:C10 range.

Using the AutoSum Feature

- Click on the cell:** immediately below the column or to the right of the row of numbers you want to sum.
- Go to the Home tab:** on the ribbon.
- In the Editing group, click the AutoSum button:** (it looks like a Greek sigma Σ).
- A formula will appear:** in the selected cell, and Excel will highlight the cells it's summing.
- Press Enter:** to get the total.



➤ Auto fill

AutoFill is a feature that automatically populates adjacent cells with data that follows a detected pattern, such as a sequence of numbers, dates, or the days of the week, or with a formula copied from another cell. To use it, you select a cell or range, then drag the fill handle (+) at the bottom-right corner of the selection to fill the data.

Key functionalities of AutoFill

- Extends data series:** You can create quick series of numbers (e.g., 1, 2, 3...), dates, months, or days of the week.
- Copies formulas:** AutoFill automatically copies formulas to other cells in the worksheet.
- Copies values:** It can also copy static values to adjacent cells.
- Custom sequences:** Excel can recognize and continue patterns you've defined, allowing for custom sequences.

➤ Formatting Text

Formatting text refers to changing its appearance and presentation by modifying the font (style, size, color), alignment (horizontal and vertical), and applying effects like bold, italic, underline, or superscript/subscript. You can find these options on the Home tab within the Font and Alignment groups, or by using the Format Cells dialog box.

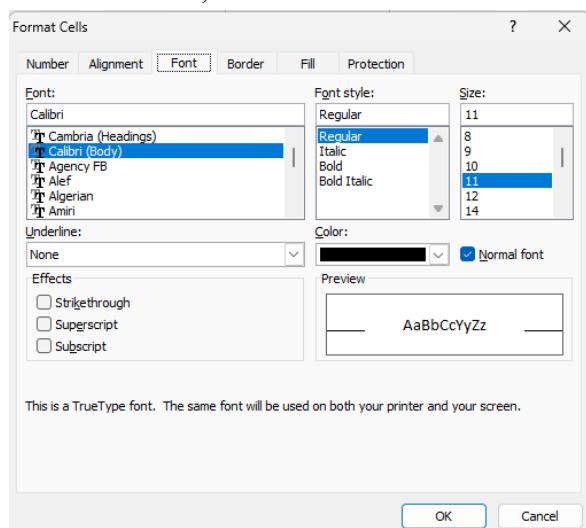
Key Formatting Options

- Font:** Change the font style (e.g., Arial, Calibri), size, and color. You can also apply bold, italic, or underline styles directly from the ribbon.
- Alignment:** Control the text's positioning within cells, both horizontally (left, center, right) and vertically (top, middle, bottom).
- Effects:** Apply special formatting like superscript or subscript by opening the Font Settings dialog box (Ctrl+1 or right-click > Format Cells) and selecting the desired effect under the Effects section.

- **Fill and Border:** You can also add fill colors to cells and apply borders to enhance the visual organization of your data.

How to Format Text

1. **Select:** the cell or range of cells you want to format.
2. **Go to the Home tab:** on the Excel Ribbon.
3. **Use the Font group:** for basic changes like font style, size, and color.
4. **Use the Alignment group:** for text positioning.
5. **Access the Format Cells dialog box:** by pressing Ctrl+1 or right-clicking the selected cell(s) and choosing Format Cells. This provides more comprehensive options, including effects, borders, and fill colors.

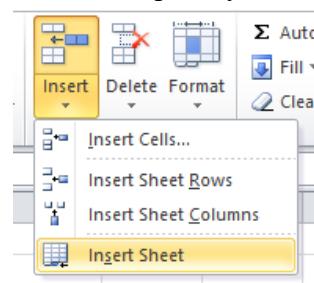
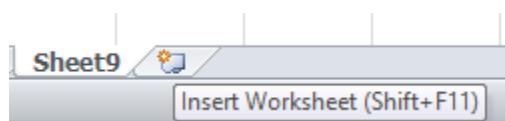


➤ Renaming and Inserting worksheets

We can insert a new worksheet by clicking the New Sheet plus icon at the bottom of the workbook or selecting Home > Insert > Insert Sheet. To rename a worksheet, you can double-click the sheet name tab to highlight it and then type a new name, or you can right-click the sheet tab and select Rename from the menu.

Inserting a Worksheet

1. **Using the plus icon:** At the bottom of the Excel window, click the New Sheet icon (a plus sign) to the right of the last sheet tab.
2. **Using the ribbon:** Go to the Home tab, then in the Cells group, click Insert, and then select Insert Sheet from the dropdown menu.
3. **Using a keyboard shortcut:** Press Shift + F11 to insert a new worksheet quickly.

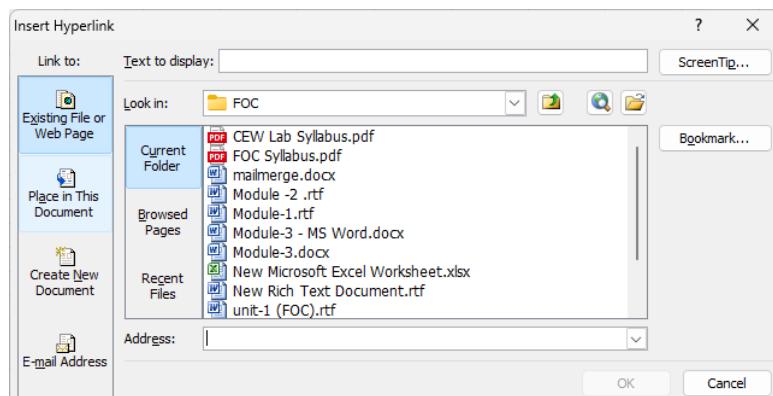


Renaming a Worksheet

1. **Double-click the tab:** Double-click on the name of the sheet tab you want to rename. The text will be highlighted, allowing you to type a new name.
2. **Right-click the tab:** Right-click the sheet tab you want to rename.
3. Select Rename from the context menu that appears.
4. Type the new name for the worksheet and press Enter or click anywhere outside the tab.

➤ Hyper linking

A hyperlink is a clickable text, image, or objects that, when clicked, jumps to another location, opens a file or webpage, or starts an email program. To create Hyperlink go to **Insert** tab and select **Hyperlink** option or press **Ctrl+K** to open Insert Hyperlink command () or the [HYPERLINK function](#). Here we can link to locations within the current workbook, other documents, web pages, or email addresses.



Types of Links You Can Create

- **Other locations in the workbook:** Link to specific cells or named ranges within the same Excel file.
- **Web pages:** Navigate to a webpage on the internet or an intranet.
- **Documents:** Open another Excel file, a Word document, or another supported file type stored locally or on a network.
- **Email addresses:** Create a new email message, pre-populating the "To" address.
- **New files:** Create a new Excel file from within the current workbook.

How to Use the HYPERLINK Function

The HYPERLINK function provides a more dynamic way to create links.

- **Syntax:** HYPERLINK(link_location, [friendly_name]).
- **link_location:** The target of the link (URL, file path, etc.).
- **friendly_name:** The optional text that appears in the cell.

Example

- To link to a webpage: =HYPERLINK("http://www.example.com", "Visit Example.com").
- To link to a cell in another sheet: =HYPERLINK("#Sheet2!A1", "Go to Sheet2 A1")

3. Excel Calculation: Calculating Average, Cell Referencing, Excel Formula, std. deviation, Charts, Count Function, Sorting, Conditional formatting, Excel Advanced-sumif, VLOOKUP, and Pivot Table.

Excel Calculation:

In Microsoft Excel, calculations are performed using formulas, which are equations starting with an equals sign (=) to manipulate data in cells. You can enter simple arithmetic like $5+2$ or more complex operations using cell references, mathematical operators (+, -, *, /), and predefined functions like SUM or AVERAGE to quickly process data. Formulas can be applied to a single cell, a range of cells, or even cells across different worksheets.

➤ **Calculating Average**

To calculate an average in Excel, you can use the built-in AVERAGE function, the AutoSum feature, or by creating a manual formula. The standard AVERAGE function calculates the arithmetic mean of a set of numbers by adding the values together and dividing by the count of those values.

The AVERAGE function can include arguments supplied as numbers, cell references, or ranges. It will automatically ignore empty cells, text, and logical values (TRUE/FALSE) but will include cells containing the number zero.

Methods for calculating an average

1. Using the AVERAGE function

1. Click on the cell where you want the average to appear.
2. Type =AVERAGE(
3. Select the range of cells you want to average by clicking and dragging your mouse, or type the cell range manually (e.g., A1:A5).
4. Type a closing parenthesis) and press **Enter**.

2. Using the AutoSum feature

5. Select the range of cells you want to average.
6. On the **Home** tab, go to the **Editing** group.
7. Click the arrow next to the **AutoSum** button and select **Average**.
8. Excel will automatically place the average in the cell below a column or to the right of a row of numbers.

3. Averaging non-adjacent cells

1. Click the cell where you want the average displayed and type =AVERAGE(.
2. Hold down the **Ctrl** key and select each non-adjacent cell you want to include in the calculation.
3. Type a closing parenthesis) and press **Enter**.

➤ **Cell Referencing**

Cell reference is a unique address, such as A1, that identifies a cell's location on a worksheet and is used in formulas to specify the data to be calculated. Cell references can be relative (changing when

copied, like A1), absolute (remaining fixed, like \$A\$1), or mixed (a combination of both, like \$A1 or A\$1).

Types of Cell References

- **Relative Reference:** This is the default reference type. When a formula with a relative reference is copied to another cell, the reference automatically adjusts to the new location. Example: The formula =SUM(A1:C5) is copied to next location it will change to =SUM(A2:C6).
 - **Absolute Reference:** An absolute reference uses dollar signs to "lock" the row and column, meaning the reference will not change when copied. For example, \$A\$1 will always refer to cell A1.
 - **Mixed Reference:** This is a combination of relative and absolute references.
 - A\$1: The column reference (A) is relative, but the row reference (1) is absolute.
 - \$A1: The column reference (A) is absolute, but the row reference (1) is relative.

How to Create or Change a Cell Reference

1. **Using the Dollar Sign (\$):**

Manually type the dollar sign before the column letter and/or row number to create an absolute or mixed reference.

2. **Pressing F4:**

When the cell with the formula is selected, pressing the F4 key will cycle through the reference types (relative, absolute, mixed).

➤ **Excel Formula**

An Excel formula is an equation that performs calculations, always starting with an equals sign (=) and containing cell references, numbers, and operators to compute a result. Using cell references, such as A1+B1, instead of directly inputting numbers allows the formula to automatically update if the referenced cell's value changes. Formulas can also incorporate functions, which are pre-defined formulas to perform complex calculations quickly, like finding the sum or average of a range of cells.

How to Create a Formula

1. **Select a cell:** where you want the result to appear.
2. **Type the equals sign (=):** to signal that you are entering a formula.
3. **Enter your calculation,** which can include:
 - **Constants:** Numbers (e.g., 5 + 2).
 - **Cell References:** The address of the cell containing the data you want to use (e.g., A1 + B1).
 - **Operators:** Symbols for performing calculations, such as + for addition, - for subtraction, * for multiplication, and / for division.
 - **Functions:** Pre-defined formulas like SUM(A1:A5) or AVERAGE(B1:B10).
4. **Press Enter:** to complete the formula and display the calculated result.

➤ Std. deviation

In Excel 2010, standard deviation measures the dispersion or spread of a dataset from its average (mean) using functions like STDEV.S for samples or STDEV.P for entire populations. The functions calculate the standard deviation of a given range of numbers, with STDEV.S being used for a subset of data and STDEV.P for the whole dataset. A higher standard deviation indicates greater variability in the data, while a lower value means the numbers are closer to the average.

Key Functions

- $=\text{STDEV.S}(\text{range})$: Calculates the standard deviation for a sample of a population.
- $=\text{STDEV.P}(\text{range})$: Calculates the standard deviation for an entire population.

How to Use

1. **Select a cell:** in your Excel worksheet.
2. **Type the formula:** into the formula bar, such as $=\text{STDEV.S}(A1:A10)$ to calculate the standard deviation for cells A1 through A10.
3. **Press Enter:** to get the standard deviation value.

➤ Charts

In Microsoft Excel, a chart is a graphical representation of numerical data from a spreadsheet, used to easily identify patterns, trends, and comparisons within the data. Users can choose from various chart types, such as column, bar, line, and pie charts, to visually communicate information.

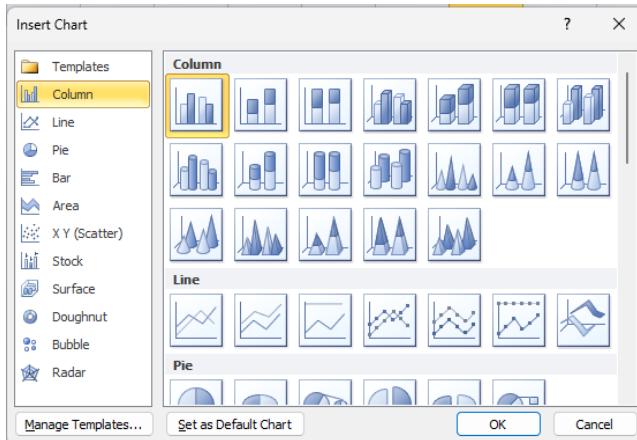
Charts are created by

- Selecting the desired data from the worksheet
- Then choosing a chart type from the Insert tab on the ribbon.

Once created, a chart can be customized using the Chart Tools tab to adjust elements like titles, labels, colors, and styles

Common Chart Types in Excel

- **Column Chart:** Compares values across different categories using vertical bars.
- **Bar Chart:** Similar to a column chart but uses horizontal bars to represent data.
- **Line Chart:** Displays trends and changes in data over a period of time.
- **Pie Chart:** Shows the proportion or contribution of each value to a whole.
- **Combo Chart:** Combines multiple chart types, such as a column and line chart, in a single chart.



➤ Count Function

The COUNT() function counts the number of cells in a specified range that contain numerical data, ignoring text, logical values, and empty cells.

Syntax :

=COUNT(value1, [value2], ...) where value1, value2, etc., can be individual numbers, cell references, or cell ranges.

Example

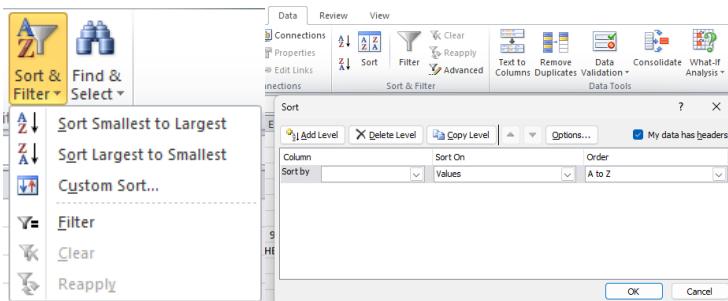
=COUNT(A1:A20) will return the number of cells within the range A1 to A20 that contain numbers.

➤ Sorting

Sorting rearranges data in a range or array into a specified order, such as ascending or descending. This process is performed using the Sort command, accessible from the Data tab or the Home tab within the Sort & Filter group. It can organize both text and numbers, allowing users to sort by one or multiple columns. Beyond value-based sorting, Excel also provides options to sort by cell color, font color, or cell icons.

How to Sort Data

1. **Select the data:** you want to sort.
2. Go to the **Data** tab on the Excel ribbon and click **Sort**.
3. Alternatively, on the **Home** tab, locate the **Sort & Filter** button in the Editing group and click it.
4. From the menu, you can choose Sort A to Z (ascending), Sort Z to A (descending), or Custom Sort for more advanced options.
5. If choosing Custom Sort, a dialog box will appear where you can add or remove sort levels, specify which column to sort by, and choose the sort order (ascending or descending).
6. You can also choose to sort by values, cell color, font color, or cell icons.
7. Ensure you select the option to "Expand the selection" if your data includes multiple columns, to maintain the relationship between related data points.
8. Click **OK** to apply the sort.



➤ Conditional formatting

Conditional Formatting in Excel is a feature that applies specific formatting (like colors, fonts, or data bars) to cells based on rules you create, allowing you to visually highlight important data, identify trends, and quickly spot patterns or outliers in your spreadsheet. You define criteria, such as a cell's value being greater than a certain amount or containing specific text, and Excel automatically applies the chosen format to the cells that meet these conditions, making data analysis and comprehension easier.

Common Uses

- **Highlighting Key Values:**

Emphasize cells with values above or below a certain threshold, or identify cells that are within a particular range.

- **Identifying Data Patterns:**

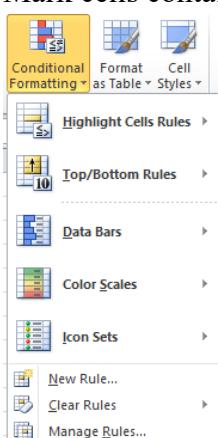
Visualize trends, such as using a color scale to show the highs and lows in a data set.

- **Spotting Duplicates:**

Easily identify duplicate entries within a data range.

- **Marking Important Data:**

Mark cells containing specific text, dates, or even blank cells to indicate missing information.



➤ Excel Advanced-sumif

The SUMIF function adds up a range of cells that meet a single, specific condition or criterion.

Syntax

=SUMIF(range, criteria, [sum_range]),

Function Breakdown:

- **range (Required):** The group of cells you want to check against your condition.

- **criteria (Required):** The condition that determines which cells in the range will be summed. This can be a number, text, a date, a cell reference, or an expression like ">5" or "<>0".
- **[sum_range] (Optional):** The actual cells that will be summed. If you don't specify this, the function sums the cells in the range that meet the criteria.

How it Works:

1. **Applies a Condition:** The function goes through the range and checks each cell against the criteria.
2. **Finds Matches:** It identifies all the cells in the range that meet the specified criteria.
3. **Sums Values:** For each matching cell, it then sums the corresponding values from the sum_range (or the range itself if sum_range wasn't provided).

Example:

If you have a list of sales in column C and want to sum only the sales that are greater than \$100, you would use: =SUMIF(C2:C100, ">100") This formula would look in the range C2 to C100, find all the cells with values greater than 100, and add them up.

➤ VLOOKUP

VLOOKUP (Vertical Lookup) is a function that searches for a specific value in the first column of a table and returns a corresponding value from a different column in the same row. It is used for retrieving specific data points from large datasets by matching a value, similar to looking up a phone number in a directory.

Syntax

=VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])

1. **lookup_value:** The value you want to search for.
2. **table_array:** The range of cells containing the data, where the lookup_value must be in the first column.
3. **col_index_num:** The column number within the table_array from which to retrieve and return the value (e.g., column A is 1, column B is 2).
4. **range_lookup:** An optional argument that specifies the type of match you want:
 - **FALSE:** (or 0): Finds an exact match for the lookup_value.
 - **TRUE:** (or 1, or omitted): Finds an approximate match, requiring the first column of the table_array to be sorted in ascending order.

Example

To find an employee's name based on their ID, you might use a formula like =VLOOKUP(D2, A1:B50, 2, FALSE).

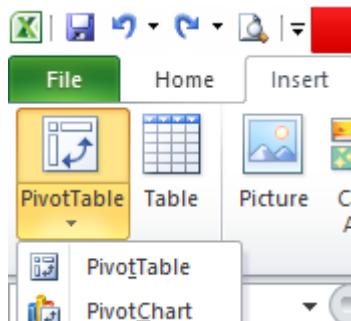
- D2 is the cell containing the Employee ID you are looking for.
- A1:B50 is the table range where the employee IDs (in column A) and names (in column B) are listed.
- 2 tells Excel to return the value from the second column (the employee name).
- FALSE ensures an exact match for the ID.

➤ Pivot Table

A PivotTable in Excel is an interactive tool that summarizes and analyzes large, complex datasets by grouping and aggregating data into a user-friendly report format. It allows you to quickly change how the data is presented by pivoting rows and columns, filtering, sorting, and performing calculations like sums or averages without altering the original data. This makes it easier to extract insights, discover trends, and answer questions from your data.

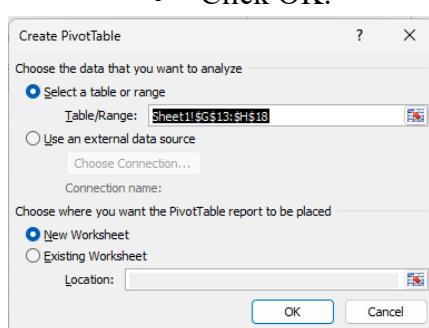
Key Features and Functions:

- Summarization:** Condenses large spreadsheets into concise, manageable reports.
- Analysis:** Allows for detailed analysis of numerical data, identifying patterns and trends.
- Interaction:** You can interactively rearrange data by moving fields between rows, columns, and filter areas.
- Filtering and Sorting:** Enables you to focus on specific subsets of your data.
- Calculations:** Performs aggregations such as sums, counts, and averages on the data.



How to use:

- Prepare Your Data:** Ensure your data is in a clean, tabular format with clear headers at the top.
- Select Your Data:** Click on any single cell within your data range or table.
- Insert PivotTable:**
 - Go to the Insert tab in the Excel ribbon.
 - Click the PivotTable button in the Tables group.
 - This will open the "Create PivotTable" dialog box.
- Choose Location:**
 - Excel will automatically select your data range.
 - Under the "Choose where you want the PivotTable report to be placed" section, select either New Worksheet (the default) or Existing Worksheet and specify a cell.
 - Click OK.



Use Case 1: Prepare mark list for minimum 10 students in 5 subjects use different functions for evaluation.

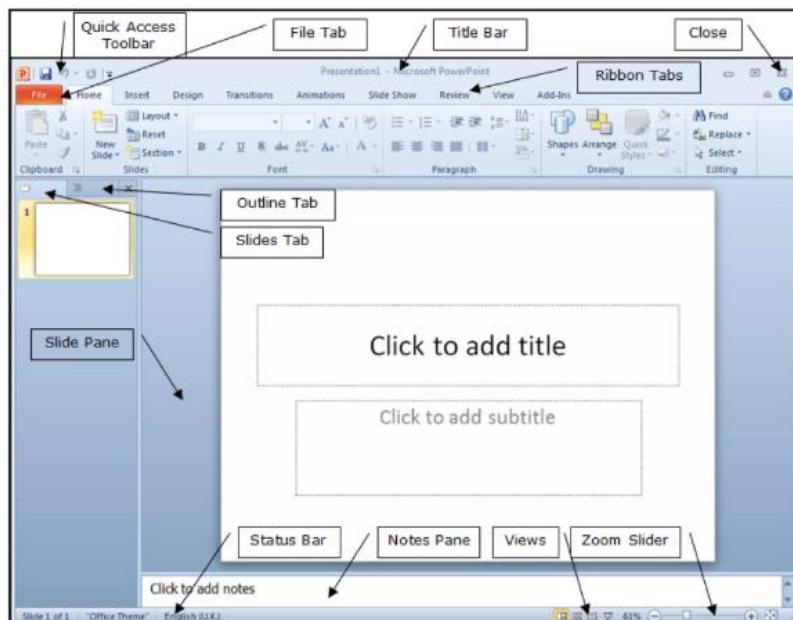
Use Case 2: Prepare Dataset of your choice and generate different graphs.

Use Case 3: Prepare Dataset of your choice and generate a Pivot Table.

6. **Creating Power Point:** Student should work on basic power point utilities and tools to create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and charts.

Introduction to MS PowerPoint

An MS PowerPoint presentation is a slideshow created with Microsoft PowerPoint, a program within the Microsoft Office suite that uses electronic slides to display information with multimedia elements like text, images, and videos. Users can create presentations from scratch, use pre-designed templates for various purposes, or leverage AI features for design and content generation.



1. File Tab

The File tab provides access to the Backstage view, which manages the entire presentation file rather than slide content. Key functions include opening, saving, printing, and sharing presentations, as well as setting PowerPoint options and permissions. This tab is crucial for file management and configuration.

2. Home Tab

The Home tab contains the most commonly used commands related to slide editing and formatting. It includes tools for clipboard operations (cut, copy, paste), creating and organizing slides, formatting text (font style, size, color, alignment), and inserting basic shapes. This tab is the primary workspace for constructing the presentation's core content.

3. Insert Tab

The Insert tab allows users to add various objects to slides to enrich the presentation's content and visual appeal. Users can insert tables, pictures, clip art, shapes, charts, hyperlinks, text boxes, WordArt, and multimedia elements such as audio and video clips.

4. Design Tab

The Design tab is dedicated to the overall appearance and style of the presentation. It provides access to slide themes, background styles, color schemes, and font sets. Users can customize the visual design to ensure consistency and aesthetic appeal across all slides.

5. Transitions Tab

The Transitions tab offers tools to apply and customize transition effects that occur between slides during a presentation. It includes a variety of effects and controls for their timing, speed, and sound effects to enhance the flow and engagement of the slideshow.

6. Animations Tab

This tab enables the application and management of animation effects to individual slide elements such as text and graphics. Animations can be used for emphasis, entrance, exit, or motion paths. The Animation Pane facilitates the sequencing and timing of multiple animations.

7. Slide Show Tab

The Slide Show tab contains tools to configure and run the presentation. Users can start the slide show from the beginning or the current slide, rehearse timings, record narrations, and set up multiple monitors for presenting. It controls how the presentation is delivered to the audience.

8. Review Tab

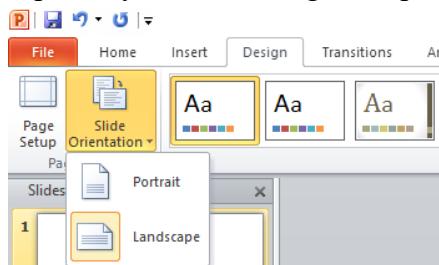
The Review tab supports collaboration and quality control. It includes proofing tools such as spell check and thesaurus, as well as features to add, view, and manage comments. The Compare function allows reviewing differences between multiple versions of a presentation.

9. View Tab

The View tab controls how the presentation is displayed to the user during editing. Options include Normal, Slide Sorter, Notes Page, and Reading views. It also provides zooming controls, guides, gridlines, and access to macros for automation.

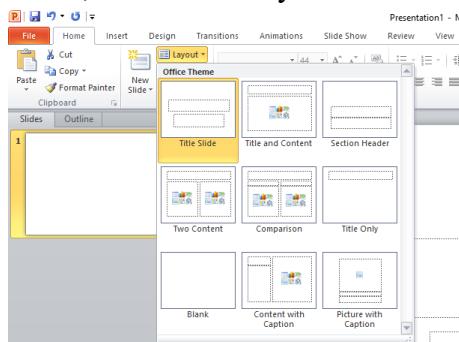
➤ PPT Orientation

PPT orientation or Slide Orientation refers to the layout of your slides, which can be set to Landscape (wider than tall), the default orientation, or Portrait (taller than wide). You can change the orientation of the entire presentation by going to the **Design** tab, clicking on **Slide Orientation** and then choose the desired orientation from the dialog box. Changing the orientation can affect how your content is displayed. You can also adjust orientations for other elements like notes and handouts separately under the Page Setup dialog.



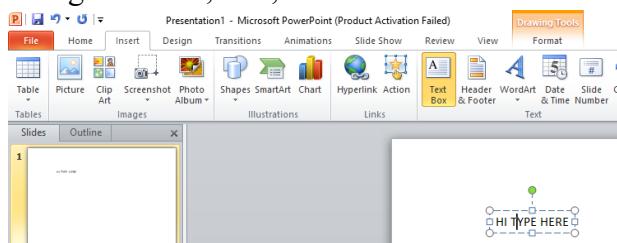
➤ Slide Layouts

Slide Layouts, are predefined arrangements of content placeholders to structure your slides, containing elements for titles, body text, pictures, tables, charts, and SmartArt graphics. You can choose from a set of built-in layouts to add new slides or apply a different layout to an existing slide. You can apply or change a slide's layout by selecting the slide on the left-hand pane, then going to the **Home** tab and clicking the **Layout** command to choose from the gallery of predefined layouts like Title Slide, Title and Content, or Blank. Placeholders within these layouts, such as content boxes, dictate where you can add text, images, and other media.



➤ Inserting Text

To insert text, you can type into a designated placeholder or by creating a new text box. To insert new text box go to **Insert tab** on the Ribbon, click the **Text Box** button, and then by clicking and dragging to draw the box on your slide before typing the text. Text can also be pasted into a slide from another source. Text in the text box, can be formatted by Font options on the **Home** tab to change the font, size, and color of the text.

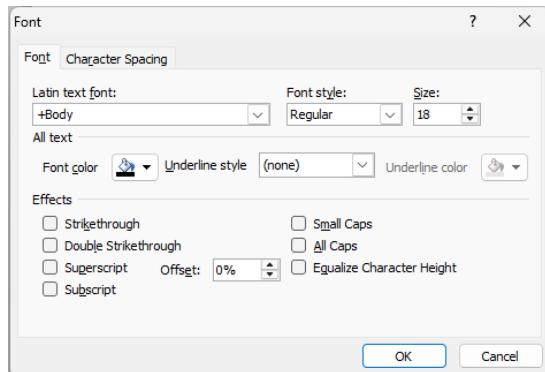


➤ Formatting Text

Formatting text refers to the process of changing its appearance by modifying its font, size, color, and style (like bold or italics), as well as its layout and structure, using options for alignment, spacing, bullet points, text boxes, change text alignment. It's how you make text visually appealing and easy to read on a slide, improving the overall presentation's readability and aesthetic.

To format text in PowerPoint,

- Select the text, then use the Font ribbon on the **Home** tab
- Open the Font dialog box by clicking the small arrow in the corner of the **Font** group.

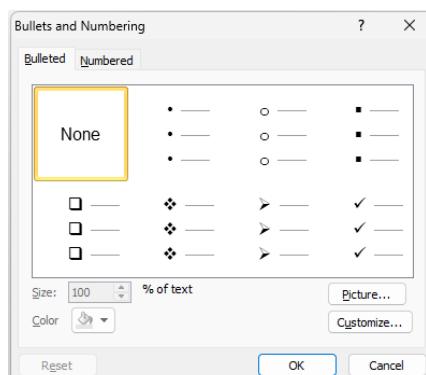


➤ Bullets and Numbering

"Bullets and Numbering" refers to features that format text into lists, with Bullets using symbols for unordered items (like a student list) and Numbering using sequential numbers or letters for ordered items (like steps in a recipe). These features help organize information, improve readability, and add emphasis to key points by creating visual distinctions for each list item.

Applying Bullets or Numbers

- Select Text:** Highlight the text you want to format by clicking and dragging your mouse over it, or select the entire text placeholder.
- Go to the Home Tab:** Click on the **Home** tab at the top of the PowerPoint ribbon.
- Use the Paragraph Group:** In the **Paragraph** group, locate the **Bullets and Numbering** buttons.
- Apply a Style:**
 - Click the dropdown arrow next to the **Bullets or Numbering** button to choose a style from the library.
 - To open the full dialog box for more customization, click the dropdown arrow and select the **Bullets and Numbering** option.



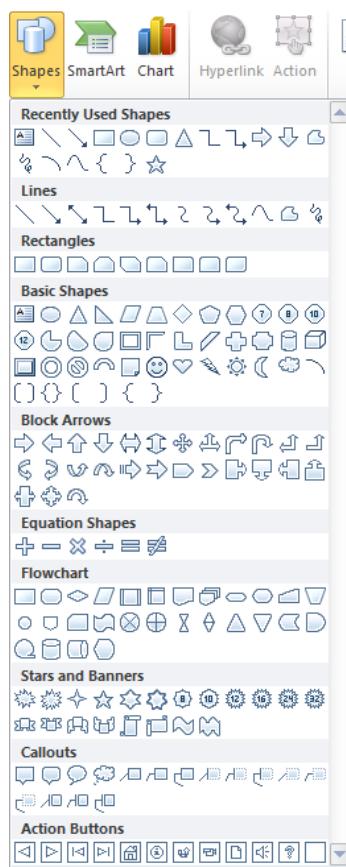
➤ Auto Shapes

AutoShape can be a useful graphical element. AutoShapes include lines, arrows, banners, stars, and other shapes you can add to your presentation

To add Auto Shapes in PowerPoint, go to the **Insert** tab, click on **Shapes**, and select the desired shape from the gallery. Click and drag on the slide to draw the shape, using the handles to adjust its size and the green handle to rotate it. You can also right-click the shape to access the Format tab or right-click and choose Format Shape to change its fill, outline, and effects.

Customizing shapes:

- **Sizing:** Click and drag the handles on the sides and corners of the shape to resize it.
- **Rotation:** Use the green handle to rotate the shape.
- **Color & Effects:** Select the shape, go to the **Format** tab (or right-click the shape and select **Format Shape**), and then choose options for fill, outline, and other effects.



➤ Lines and Arrows

Lines and arrows are graphical elements found under the **Insert** tab **Shapes** menu we can find Lines and Block arrows that allow you to visually represent direction, processes, timelines, and connections in your slides. They can be straight or curved, thick or thin, and come with a variety of arrowheads and customizable colors and styles to suit your presentation's design and convey information effectively.



➤ Hyperlinks

A hyperlink is a clickable link embedded in a slide that jumps to a different location such as another slide in the presentation, a web page, a different file on your computer, or even opens a custom email. Hyperlinks make presentations more interactive, allowing the audience to choose their own path through the content, creating a dynamic and engaging experience rather than a linear, one-way flow.

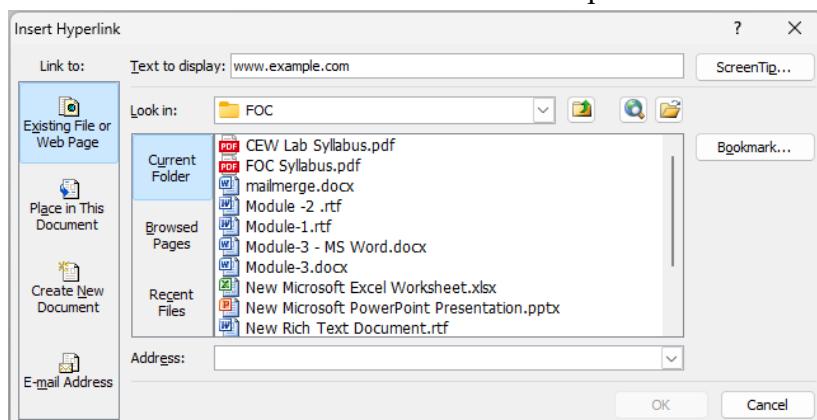
How to create a hyperlink:

1. **Select:** the text, shape, or image you want to make clickable.
2. Go to the Insert tab on the ribbon.
3. In the Links group, click the Hyperlink icon.
4. In the "Insert Hyperlink" dialog box, select the type of link you want to create (e.g., Place in This Document, Existing File or Web Page) and provide the destination URL, file path, or email address.
5. Click OK to create the hyperlink.



What you can link to:

- **Other slides:** Navigate directly to any specific slide within your presentation.
- **Web pages:** Open websites or online videos in a web browser by clicking the link.
- **Files on your computer:** Link to other documents, presentations, or various file types stored locally on your device.
- **Email addresses:** Create a link that opens a new email message to a specific recipient.



➤ Inserting Images

Images are visual elements like pictures, clip art, and screenshots that enhance a presentation. You can insert images from your computer or the web by going to the Insert tab, selecting Pictures, and then choosing your source and the desired image. Once inserted, you can manipulate the image using the "Picture Tools" ribbon that appears, which offers options to resize, move, crop, rotate, add artistic

effects, and more to make your presentation visually engaging and communicate your message effectively.



Types of Images You Can Insert

- **Pictures:** Photos and other graphics saved on your computer.
- **Clip Art:** A collection of digital images that you can search and insert to illustrate your points.
- **Screenshots:** Images of your computer screen or specific windows, useful for explaining software or websites.
- **Photo Album:** It is a feature that allows you to create a presentation by importing a collection of images at once, which are then arranged onto individual slides.

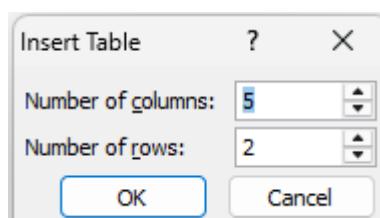
➤ Tables and charts

A table is a structured grid of rows and columns used to organize and present text or numerical data, while a chart (also known as a graph) is a visual tool that communicates data graphically, such as with bars or lines, to make comparisons and trends easier to understand for an audience.

How to Insert a Table

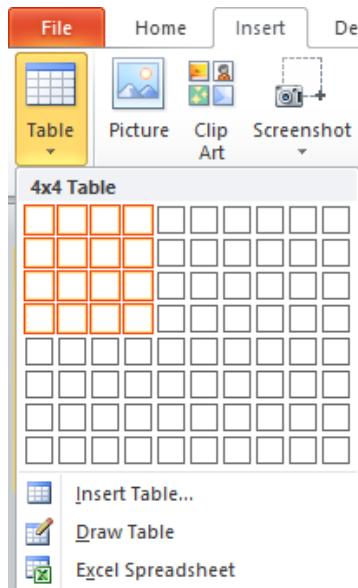
1. Using a Placeholder:

- Click the Insert Table icon in a content placeholder on your slide.
- A dialog box will appear where you can define the number of columns and rows.
- Click OK to insert the table.



1. Using the Insert Tab:

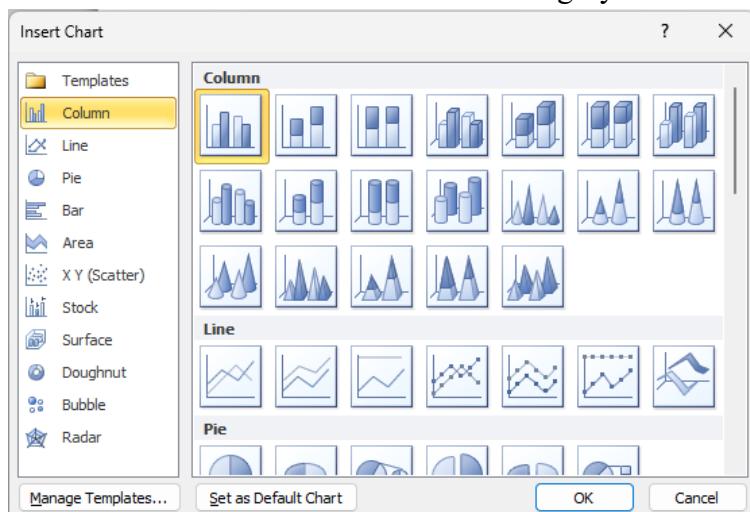
- Go to the Insert tab on the Ribbon.
- Click the Table command.
- Hover your mouse over the diagram squares to select the desired number of rows and columns.
- Click to insert the table.



How to Insert a Chart

1. From the Insert Tab:

- Go to the Insert tab and click on the Insert Chart command in the Illustrations Group.
- Select the desired chart category and chart type from the dialog box and click OK.



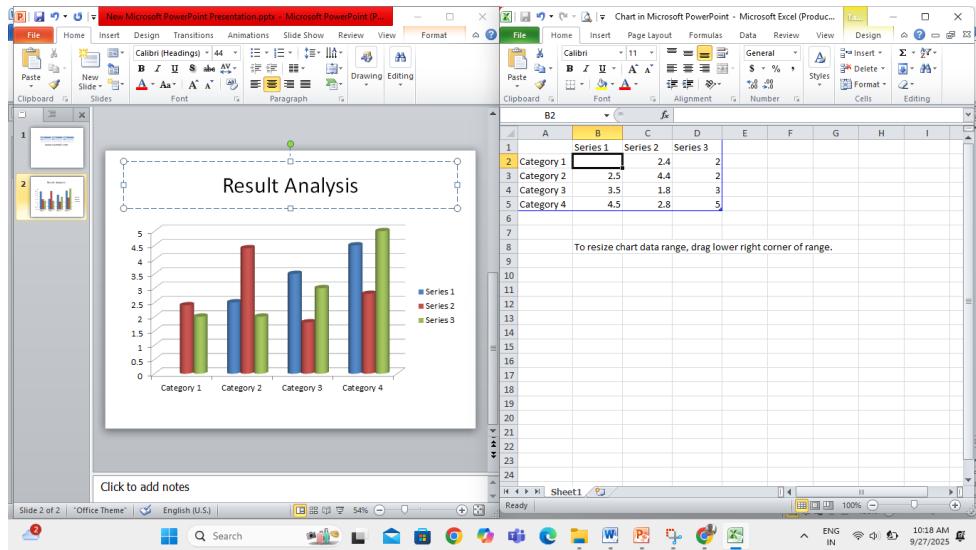
2. Using a Placeholder:

- Click the Insert Chart icon within a content placeholder on the slide.



3. Entering Data:

- Once the chart is inserted, an Excel spreadsheet opens for you to enter your data.
- The chart automatically updates as you edit the data in the spreadsheet.
- Close the Excel worksheet to return to PowerPoint.



Use case : Prepare a PPT of your choice with minimum 10 slides apply different text effects and animations.

7. Software as a service (SaaS): Usage of online office suite.

Software as a service (SaaS):

Software as a Service (SaaS) is a cloud-based delivery model where software applications are hosted by a provider and accessed by users over the internet, typically through a web browser. Instead of purchasing and installing software, users subscribe to the service on a pay-as-you-go basis, eliminating the need to manage hardware, maintenance, or updates, which are all handled by the provider. Examples include Google Docs, Microsoft 365, and Netflix, all offering remote access to their complete feature sets without user-side installation or maintenance.

Usage of online office suite

Online office suites are accessed via a web browser, enabling real-time, cloud-based collaboration on documents, spreadsheets, and presentations from anywhere, with features like simplified sharing, automatic cloud saving, cross-device access, and increased work performance. They offer a flexible alternative to traditional desktop software for both personal and professional use, with options ranging from free to subscription-based services.

Key Usages

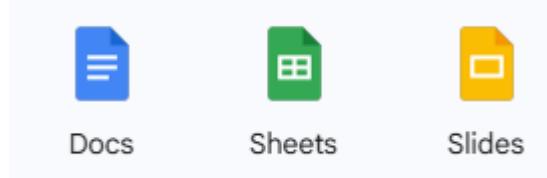
- **Real-Time Collaboration:** Work on documents simultaneously with colleagues, clients, or partners from different locations worldwide.
- **Cloud-Based Storage & Access:** Documents are saved in the cloud, allowing for automatic access from any device with an internet connection.
- **Remote Work & Flexibility:** Work from anywhere, not just in the office, providing flexibility for different working styles.
- **Simplified Document Management:** Eliminate the need to pass documents back and forth via email, streamlining the process.

- **Cross-Device Compatibility:** Access and edit documents using web browsers, iOS, and Android mobile devices.

Examples

- **Microsoft 365 for the web:** Offers web and mobile versions of Word, Excel, PowerPoint, and other apps.
- **Google Workspace (formerly G Suite):** A suite of cloud-based productivity and collaboration tools.
- **Zoho Office Suite:** A comprehensive suite that integrates with other Zoho business applications.
- **OnlyOffice:** A productivity suite with both online and on-premise deployment options.

Use case : Use Google Workspace and prepare a Document, Worksheet & PPT presentation.



Module-4: Unix / Linux Commands

1. Study and practice on file system, handling files with commands, syntax, usage, application.

Aim: Study of Linux general purpose utility commands and practice on file system / handling files.

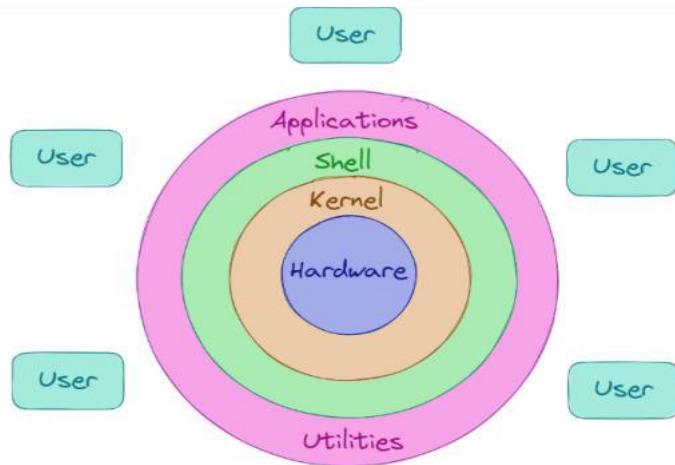
Hardware Requirements: Processor type: RAM:

Software Requirements: Linux OS: Shell:

Introduction: Linux is a family of open-source Unix-like operating systems based on the Linux kernel.

Basic Features:

- **Open Source** – Linux source code is freely available and it is community based development project.
- **Multi-User** – Linux is a multiuser system means multiple users can access system resources like memory/ ram/ application programs at same time.
- **Multiprogramming** – Linux is a multiprogramming system means multiple applications can run at same time.
- **Shell** – Linux provides a special interpreter program which can be used to execute commands of the operating system.
- **Security** – Linux provides user security using authentication features like password protection/ controlled access to specific files/ encryption of data.

**Fig1.Linux Architecture**

Kernel: It is the primary component of OS and is typically in charge of all important OS tasks including process management, device management, etc.

Linux Distributions:

Different parts of Linux are developed by different organizations. Different parts include kernel, shell utilities, X server, system environment, graphical programs, etc. Some of the popular Linux distros are as follows.

- Ubuntu Linux
- Red Hat Enterprise Linux
- Linux Mint
- Debian
- Fedora

Procedure:

Step1: Goto to Application App & launch the terminal window the logo is given below.



Step 2: It will open the shell that can be used to interpret the commands. The shell is shown in below.

```
Activities Terminal Tue 01:02
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~$ who
ubuntu :0 2023-04-18 00:48 (:0)
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~$ 
```

1.who command can list the names of users currently logged in, their terminal, the time they have been logged in, and the name of the host from which they have logged in.

Syntax :- **who [options] [file]**

Example1: \$who

```
File Edit View Search Terminal Help
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~$ who
ubuntu :0 2023-04-18 00:48 (:0)
```

option	Meaning
-H	To print the heading of the columns displayed,
-q	To print the login names and total number of logged on users
-m	To show only hostname and user associated with stdin

2.echo, It prints the given input string to standard output.

Syntax :- **echo string**

Example:- \$ echo "welcome to Linux lab"

welcome to Linux lab

3. cal: Displays a calendar

Syntax:- **cal [options] [month] [year]**

Description :- **cal** displays a simple calendar. If arguments are not specified, the current month is displayed. The switching options are as follows

-1	Display single (current) month output. (This is the default.)
-3	Display prev/current/next month output
-s	Display Sunday as the first day of the week (This is the default.)
-m	Display Monday as the first day of the week
-j	Display Julian dates (days one-based, numbered from January 1)
-y	Display a calendar for the current year

Example :

```
File Edit View Search Terminal Help
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~$ cal
        April 2023
Su Mo Tu We Th Fr Sa
      1
 2  3  4  5  6  7  8
 9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30
```

```
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~$ cal 3 2022
        March 2022
Su Mo Tu We Th Fr Sa
      1  2  3  4  5
 6  7  8  9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31
```

4. To find out the current shell we are working in

Syntax: **\$ echo \$0 or echo \$\$SHELL**

5. **clear** :- It clears the terminal screen.

Syntax :- **\$ clear**

6. **pwd** :- Displays path from root to current directory

Syntax :- **pwd**

Example:

```
File Edit View Search Terminal Help
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~$ pwd
/home/ubuntu
```

7. **mkdir**:- This command is used to create a new directory

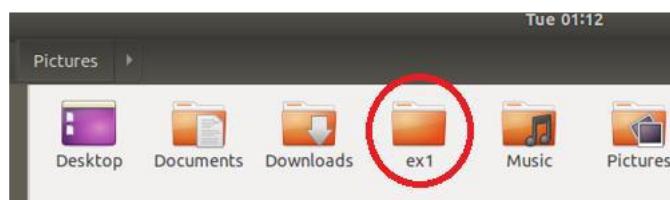
Syntax :- **mkdir [options] Directory**

Options:

-m	Set permission mode (as in chmod)
-p	No error if existing, make parent directories as needed.
-v	Print a message for each created directory
Directory	The name of the directory that you wish to create

Example:

```
File Edit View Search Terminal Help
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~$ mkdir ex1
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~$ █
```



Options Example: mkdir -m=rwx Directory name

mkdir -p parent directory /subdirectory

mkdir -v Ddirectory name

8. cd - It is used to change the directory.

Syntax :- cd [directory]

Example:

```
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~$ cd ex1
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~/ex1$ █
```

```
File Edit View Search Terminal Help
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~/ex1$ pwd
/home/ubuntu/ex1
```

9. cat:- It is used to create, display and concatenate file contents.

Syntax : - cat [options] [FILE]...

-A	Show all.
-b	Omits line numbers for blank space in the output.
-e	A \$ character will be printed at the end of each line prior to a new line.
-E	Displays a \$ (dollar sign) at the end of each line.
-n	Line numbers for all the output lines.
-s	If the output has multiple empty lines it replaces it with one empty line.
-T	Displays the tab characters in the output.
-v	Non-printing characters (with the exception of tabs, new-lines and form-feeds) are printed visibly.

Uses of the cat command.

- 1) Create new files.
- 2) Display the contents of an existing file.
- 3) Concat

Create new files

Syntax: cat > file1

- Above syntax creates file1 and allow us to insert content for this file.
- After inserting content you can use ctrl+d to exit the file.
- If file with same name exist then it will overwrite that filenate the content of multiple files and display

Display the contents of an existing file

Syntax: cat file1

- Above syntax will display the content of file1

Concat

Syntax: cat file1 >> file2

- It can concatenate the contents of two files.
- For this you have to use append output redirection operator.
- The contents of file2 will be appended to file1

10. **cp**:- cp command copy files from one location to another. If the destination is an existing file, then the file is overwritten; if the destination is an existing directory, the file is copied into the directory (the directory is not overwritten).

Syntax :- **cp Source file destination file**

Example:- \$ cp file1 file2

The above cp command copies the content of file1 to file2

11. **ls**:- Lists the contents of a directory

Syntax :- ls [options]

Options:

-a	Shows you all files, even files that are hidden (these files begin with a dot.)
-A	List all files including the hidden files. However, does not display the working directory (.) or the parent directory (..).
-d	If an argument is a directory it only lists its name not its contents
-l	Shows you huge amounts of information (permissions, owners, size, and when last modified.)
-p	Displays a slash (/) in front of all directories
-r	Reverses the order of how the files are displayed
-R	Includes the contents of subdirectories

Example:

```
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~/ex1$ ls
ubuntu@ubuntu-ThinkCentre-neo-50s-Gen-3:~/ex1$ █
```

12. **rm**:- It is used to remove/delete the file from the directory.

Syntax :- **rm [options] [file|directory]**

Example: rm file1

- Remove the file myfile.txt. If the file is write-protected, you will be prompted to confirm that you really want to delete it.

Example: rm *

- Remove all files in the working directory. If it is write-protected, you will be

13. **mv**:- It is used to move/rename file from one directory to another.

Syntax :- **mv [options] old name new name**

Example:

mv file1 file2

rename file1 to file2, If the destination file doesn't exist it will be created.

14. **touch**: creating a empty files.(Size of file would be zero)

Syntax: touch <file1>

15. **wc** – display the count of characters, words and lines of a file.

Syntax: **wc [option] [file]** Meaning
[file] option

-c	bytes
-m	characters

-l No of lines
-w No of words

Task:

Log into Linux system and perform following operations on files.

1. Create a directory called **your Roll No/ex1**
2. Change the directory to **your Roll No/ex1**
3. Create Five empty files **empty1, empty2, empty3, empty4 and empty5**.(page 21-T2)
4. Create a file called **file1** and store your Roll No, Name, DOB and mail.
5. Display the contents of **file1** on screen.
6. Make a copy of the **file1** into another **file2**.
7. Combine the content of **file1** and **file2** into another **file3**
8. Delete the file **file1**
9. Display the all files including hidden files.
10. Count the no of lines and words of **file2**.
11. Compare the **file2** and **file3**.
12. Move the directory to new directory called **dump**.
13. What happens when you Enter the command ls [aei]*.
14. What happens when you Enter the group command (wc file2;l –l file3) > file4
15. What happens when you Enter the command **bc**

for(1=1;1<=10;1++)

i

Module – 4

Task - 2: Practice on vi editor.

Aim: To use the vi editor to efficiently create, edit and save files in a terminal environment.

vi Editor in Linux : The default editor that comes with the Linux/UNIX operating system is called vi (visual editor).

Uses:

1. We can edit an existing file or create a new file from scratch.
2. We can also use this editor to just read a text file.
3. We can easily undo and redo.

How to Open VI Editor

To open vi editors, we just need to type the command mentioned below.

`vi [file_name]`

Here, [file_name] = this is the file name we want to create or to open the pre-existing file.

Example : `vi print`

Modes of Operation in the vi editor

There are three modes of operation in vi:

Vi Command Mode :

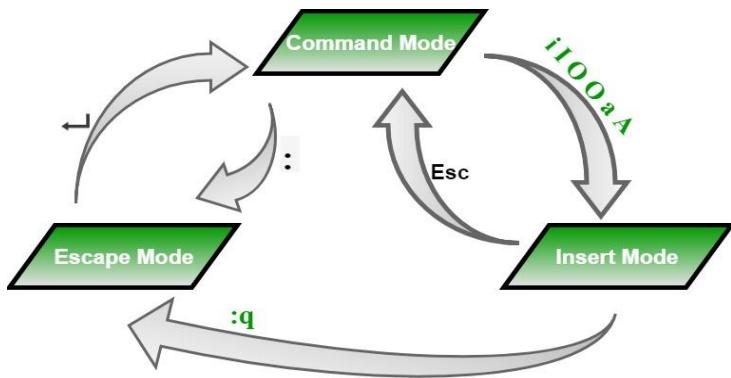
When vi starts up, it is in Command Mode. This mode is where vi interprets any characters we type as commands and thus does not display them in the window. This mode allows us to move through a file, and delete, copy, or paste a piece of text. Enter into Command Mode from any other mode, requires pressing the **[Esc]** key. If we press **[Esc]** when we are already in Command Mode, then vi will beep or flash the screen.

Vi Insert mode:

This mode enables you to insert text into the file. Everything that's typed in this mode is interpreted as input and finally, it is put in the file. The vi always starts in command mode. To enter text, you must be in insert mode. To come in insert mode, you simply type **i**. To get out of insert mode, press the **Esc** key, which will put you back into command mode.

Vi Last Line Mode (Escape Mode):

Line Mode is invoked by typing a colon **[:]**, while vi is in Command Mode. The cursor will jump to the last line of the screen and vi will wait for a command. This mode enables you to perform tasks such as saving files and executing commands.



Moving within a File (Navigation) in Vi Editor :

To move around within a file without affecting text must be in command mode (press Esc twice). Here are some of the commands that can be used to move around one character at a time.

Commands	Description
'k'	Moves the cursor up one line.
'j'	Moves the cursor down one line.
'h'	Moves the cursor to the left one-character position.
'l'	Moves the cursor to the right one-character position.

Inserting and Replacing text in Vi Editor :

To edit the file, we need to be in the insert mode. There are many ways to enter insert mode from the command mode.

Command	Description
i	Inserts text before current cursor location
a	Insert text after current cursor location
A	Insert text at the end of current line

Deleting Characters and Lines in Vi Editor :

Some commands which can be used to delete characters and lines in an opened file.

Command	Description
'X' (Uppercase)	Deletes the character before the cursor location.
'x' (Lowercase)	Deletes the character at the cursor location.
'Dw'	Deletes from the current cursor location to the next word

Save and Exit in Vi Editor in Linux:

Need to press [Esc] key followed by the colon (:) before typing the following commands:

Commands	Description
q	Quit
q!	Quit without saving changes i.e. discard changes.

Commands	Description
wq	Write and quit (save and exit).

Module-4

Task 3: Study and practice on shells/shell programming with relevant programming constructs, syntax, usage, application.

Aim: To study and practice on shells/shell programming with relevant programming constructs, syntax, usage, application.

Shell

A shell is a special user program that provides an interface for the user to use operating system services. A shell is a command-line interpreter that provides an interface for users to interact with the operating system kernel.

Types of shells:

1. The Bourne Shell (sh)

Bourne shell is regarded as the first UNIX shell ever. It is denoted as sh. By default, it uses the prompt # for the root user and \$ for the non-root users.

2. The GNU Bourne-Again Shell (bash)

The GNU Bourne-Again shell was designed to be compatible with the Bourne shell. It incorporates useful features from different types of shells in Linux such as Korn shell and C shell.

By default, it uses the prompt bash-Version Number# for the root user and bash- Version Number\$ for the non-root users.

3. The C Shell (csh)

It was developed to include useful programming features like in-built support for arithmetic operations and a syntax similar to the C programming language.

By default, it uses the prompt hostname# for the root user and hostname% for the non-root users.

4. The Korn Shell (ksh)

To improve the Bourne shell. It is denoted as ksh. The Korn shell is essentially a superset of the Bourne shell.

By default, it uses the prompt # for the root user and \$ for the non-root users.

What is Shell Script?

A **shell script** is a file containing a series of commands for the shell to execute. The shell itself is a command-line interpreter (CLI), while a shell script is a saved list of instructions (usually with .sh extension) like myscript.sh.

Understanding Shell Scripts: Structure, Syntax, and Usage

Shells are interactive, meaning they take user input and execute commands. But typing multiple commands repeatedly is inefficient.

Instead, you can store commands in a file a **shell script** and run them when needed. These scripts are similar to Windows batch files and typically have a .sh extension.

If you are familiar with languages like Python or C, you will find shell scripting easy to grasp. A shell script includes:

- **Shell Keywords:** if, else, break, etc.
- **Shell Commands:** cd, ls, echo, pwd, touch, etc.
- **Functions**
- **Control Flow:** if..then..else, case, loops, etc.

Why do we need shell scripts:

There are many reasons to write shell scripts –

1. To avoid repetitive work and automation
2. System admins use shell scripting for routine backups
3. System monitoring
4. Adding new functionality to the shell etc

Creating a shell program

Creating a shell program, also known as a shell script, involves several steps:

- **Create a new file:**

Use a text editor (like nano, vi, gedit, or VS Code) to create a new file. It's good practice to give it a .sh extension (e.g., myscript.sh), although it's not strictly required for execution.

- **Add the shebang line:**

The first line of your script should be the "shebang" line, which tells the operating system which interpreter to use to execute the script. For most common shell scripts, this will be `#!/bin/bash` or `#!/bin/sh`.

Code

```
#!/bin/bash
```

- **Write your commands:** Below the shebang line, add the shell commands you want your script to execute. These can be any commands you would normally type in your terminal, such as echo, ls, cd, mkdir, or more complex logic involving variables, loops, and conditional statements.

Code

```
#!/bin/bash
echo "Hello, world!"
ls -l
```

- **Save the file:** Save the file with your chosen name (e.g., myscript.sh).
- **Make the script executable:** Before you can run the script, you need to give it execute permissions using the chmod command.

Code

```
chmod +x myscript.sh
```

- **Run the script:** You can execute your script by typing its path in the terminal. If you are in the same directory as the script, you can use `./` followed by the script name.

Code

```
./myscript.sh
```

Programs to Practice

1. Sum of Two Numbers

```
#!/bin/bash num1=2
```

```
num2=10  
result=$((num1 + num2))  
echo "Sum: $result"
```

2. Sum of Integers from 1 to N

```
#!/bin/bash  
  
echo "Enter a number (N):"  
read N  
  
sum=0  
  
for ((i=1; i<=N; i++));  
do  
    sum=$((sum + i))  
done  
  
echo "Sum of integers from 1 to $N is: $sum"
```

3. Factorial of a Number

```
#!/bin/bash  
  
echo "Enter a number:"  
read num  
  
fact=1  
  
for ((i=1; i<=num; i++));  
do fact=$((fact * i))  
done  
  
echo "Factorial of $num is: $fact"
```

4. Check if File Exists

```
#!/bin/bash
```

```
echo "Enter filename:  
read file  
if [ -e "$file" ];  
then echo "File exists: $file" else  
echo "File not found: $file"  
fi
```

5. Check if Number is Even or Odd

```
#!/bin/bash  
echo -n "Enter number: "  
read n  
rem=$((n % 2))  
if [ $rem -eq 0 ];  
then  
echo "$n is even number"  
else  
echo "$n is odd number"  
fi
```

6. Find Largest of Two Numbers

```
#!/bin/bash  
echo "Enter two numbers:"  
read a b  
if [ $a -gt $b ];  
then  
echo "$a is larger"  
else
```

```
echo "$b is larger"
```

```
fi
```

7. Check if Number is Positive, Negative, or Zero

```
#!/bin/bash
```

```
echo "Enter a number:"
```

```
read n
```

```
if [ $n -gt 0 ];
```

```
then
```

```
echo "Positive number"
```

```
elif [ $n -lt 0 ];
```

```
then
```

```
echo "Negative number"
```

```
else
```

```
echo "Zero"
```

```
fi
```

8. Multiplication Table

```
#!/bin/bash
```

```
echo "Enter a number:"
```

```
read n
```

```
for ((i=1; i<=10; i++));
```

```
do
```

```
echo "$n x $i = $((n * i))"
```

```
done
```

9. Reverse a Number

```
#!/bin/bash

echo "Enter a number:"

read num

rev=0

while [ $num -gt 0 ];

do

rem=$((num % 10))

rev=$((rev * 10 + rem))

num=$((num / 10))

done

echo "Reversed number: $rev"
```

10. Check if Number is Palindrome

```
#!/bin/bash

echo "Enter a number:"

read num

temp=$num

rev=0

while [ $num -gt 0 ];

do rem=$((num % 10))

rev=$((rev * 10 + rem))

num=$((num / 10))

done

if [ $rev -eq $temp ];

then

echo "$temp is a palindrome number"

else
```

```
echo "$temp is not a palindrome number"
```

```
fi
```

Module-5: GIT Commands and LaTeX

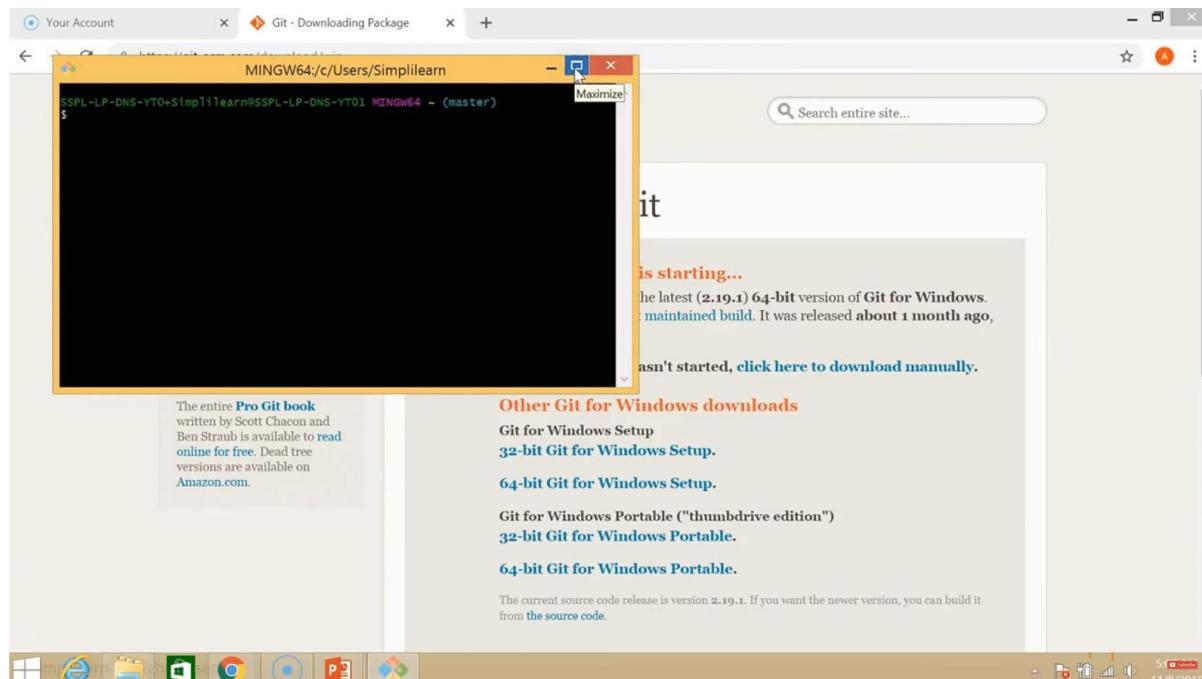
1. Installation of GIT, Branch in Git Basic GIT Commands.
2. Installation of LaTeX and preparing research articles by creating overleaf account.
3. Introduction to Scratch Programming - Introduction, Stage, Sprite, Script, Block Palette.

1. Installation of GIT, Branch in Git Basic GIT Commands.

AIM: Installation of Git and configure an application and Version control System using Git commands and version control operations.

a) GIT Installation

1. Download the latest version of Git <https://git-scm.com/download/win> from the link and choose the 64/32 bit version . After the file is downloaded, install it in the system. Once installed, select Launch the Git Bash, then click on finish. The Git Bash is now launched.



2. Check the git version: \$git --version

```
C:\Users\JAGADEESH SHIVA>git --version
git version 2.41.0.windows.3
C:\Users\JAGADEESH SHIVA>
```

3. For any help, use the command \$ git help config. This command will lead you to a browser of config commands. basically, the help the command provides a manual from the help page for the command just following it(here, it's config).Another way to use the command \$git config –help

b) Creating an application and Version Control System using Git Commands

Git is one of the most popular **Version Control Systems**(VCS), which helps to track the source code changes-what, who & when?

Git.scm.com -> Downloads -> Download for Windows



After installing by clicking a few next, go to search and search for **Git Bash** and execute the following commands. It creates a directory or an application.

```
$ cd c:
JayasreeT@DESKTOP-03UEF1J MINGW64 /c
$ cd users
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users
$ cd desktop
bash: cd: desktop: No such file or directory
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users
$ cd jayasreet
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet
$ cd desktop
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop
$ mkdir GitTutorial
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop
$ cd GitTutorial
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop/GitTutorial
$
```

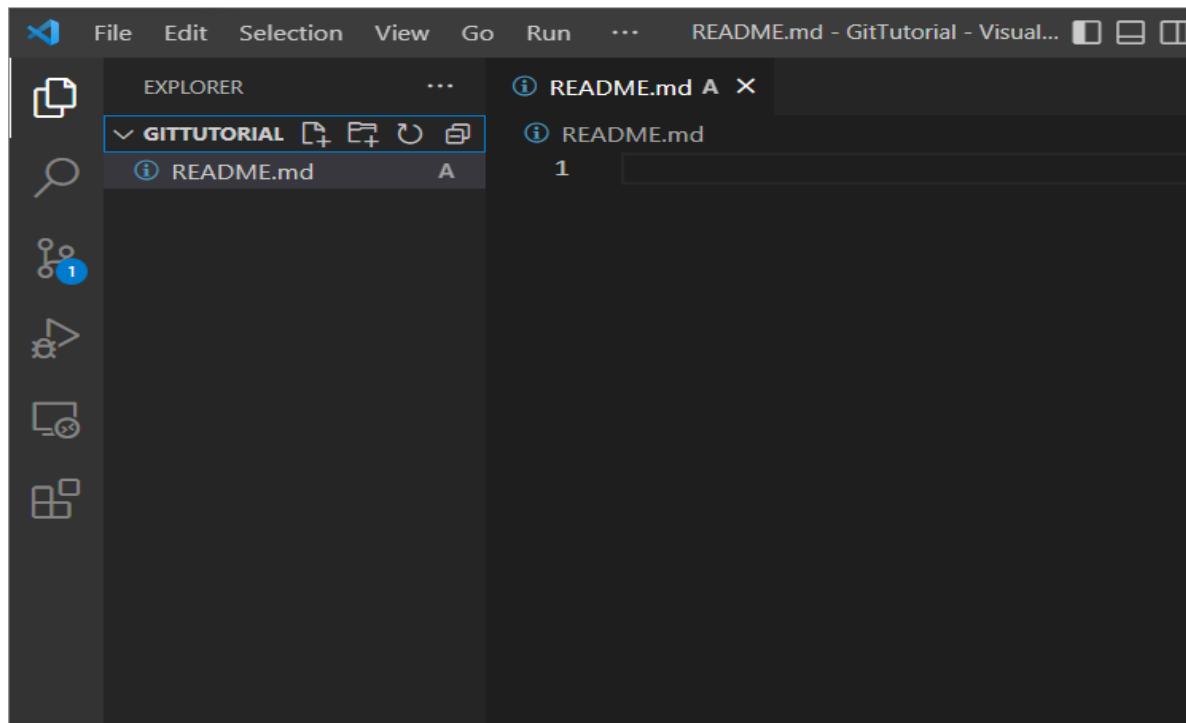
□ To check the version of the git, you can use:

git –version

```
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop/GitTutorial
$ code .
```

This command opens our application in Visual Studio Code.

Create a new file called README.md



You can also create as many files you need. For e.g., manage.py, main.py, sample.txt, etc. 17

- **git init** command initializes the repository.
- **git status** gives the status of all the files in your repo.
- **git add [file name]** tracks the respective files and are ready to be committed into the repo.

```
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop/GitTutorial
$ git init
Initialized empty Git repository in C:/Users/JayasreeT/Desktop/GitTutorial/.git/
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop/GitTutorial (main)
$ git add .

JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop/GitTutorial (main)
$ git status
On branch main

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
    new file:   README.md

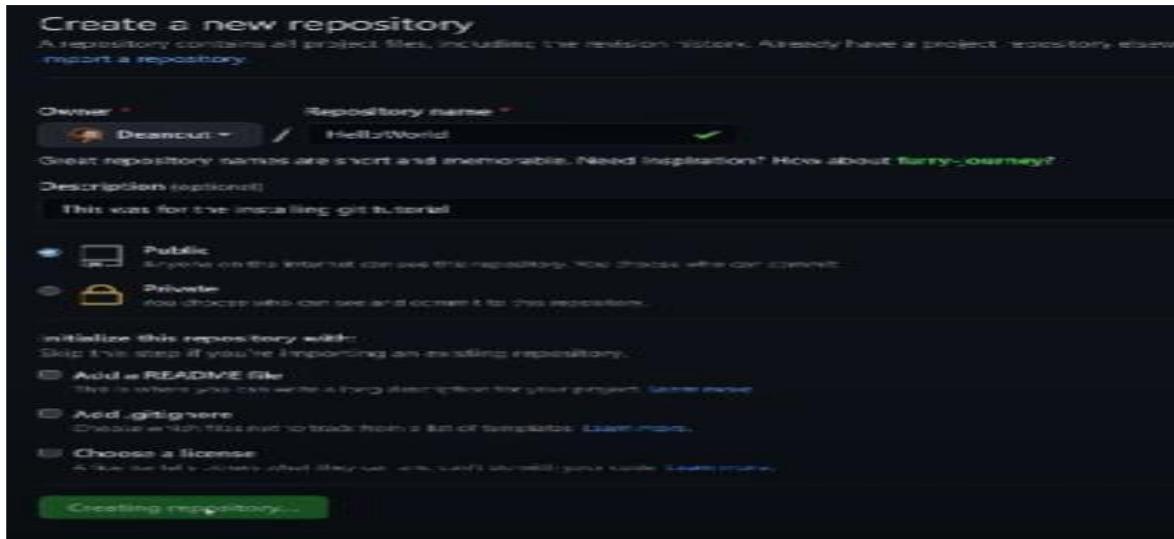
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop/GitTutorial (main)
```

- every time you make modifications to a particular file, you need to add it using **git add** command to make it ready to be committed.
- To commit changes, run **git commit -m “[commit message]”**
- **commit message**-should directly indicate what changes you have made to the code. Since it is our first commit, here we use, “Initial commit”

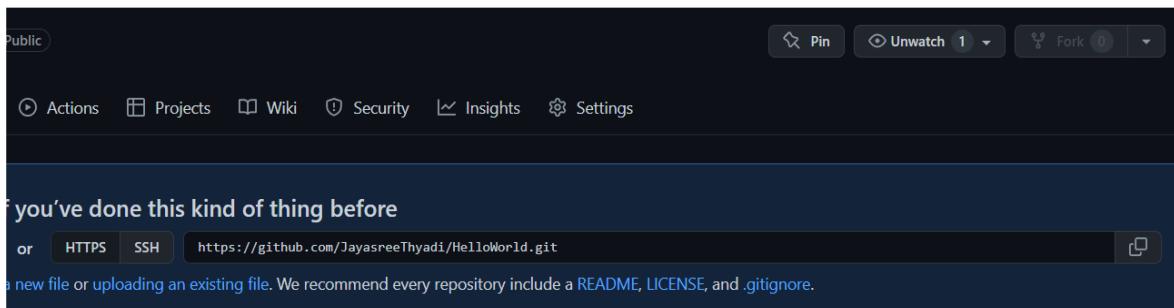
Once committed, the git creates a **new version** of the repository with the committed changes.

```
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop/GitTutorial (main)
$ git commit -m "Init commit"
[main (root-commit) 8ed20bb] Init commit
 1 file changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 README.md
```

- Until now, what we did is in our own **Local Git Repository** (individual laptops).
- Suppose, there is more than one person working on the same application and same source code and all the overall changes need to be committed. Then, **GitHub**, which is a server that hosts **Remote Git Repository** comes into action. There everyone can push the file they made changes to, and can later pull the updated file into their local systems.
- We need to create a remote repository, to push our code into it.
- Create a new repository in your **GitHub** naming, HelloWorld. (click on the + button on the right)



It will create a repo. Every repository has its own unique URL. Click on HTTPS and copy the link provided.



Now to push our code from our local repository to a remote repository, we must let the local repo know that there is a remote repo into which we want to push our code.

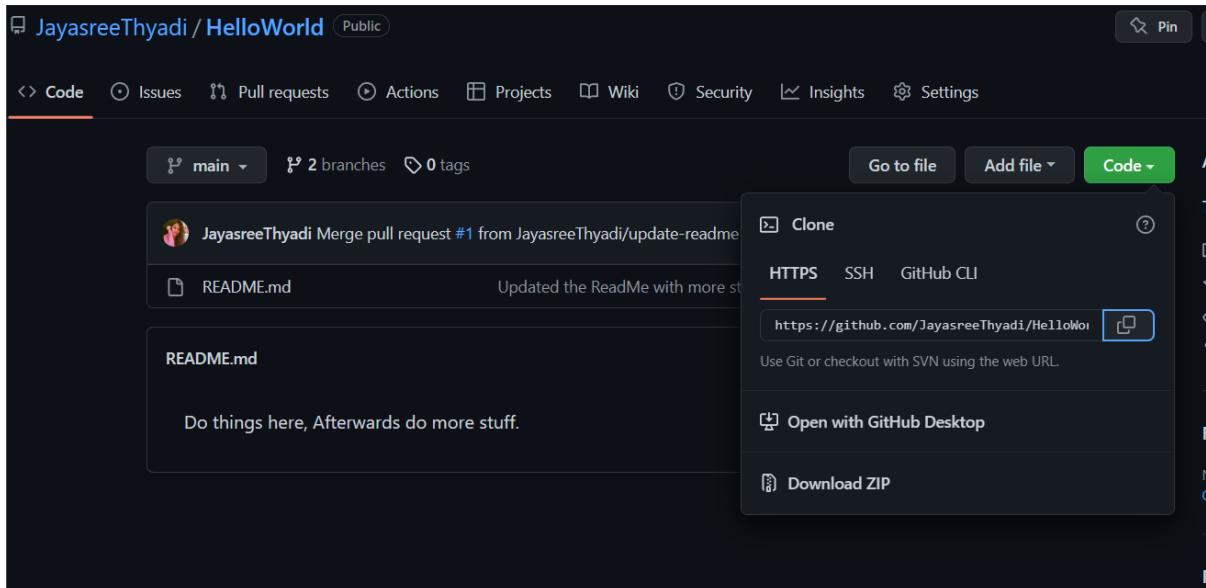
For that use the command followed by a name of the remote repo and then the url.

git remote add [name] [URL]

```
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop/GitTutorial (main)
$ git remote add original https://github.com/JayasreeThyadi>HelloWorld.git
```

Name: there is no need to be as the same name of the repo. We can put any name and it is just for our reference.

URL: The HTTPS link that we have copied after creating the repo. If you haven't copied it earlier, then you can find it by clicking on the code button, 19

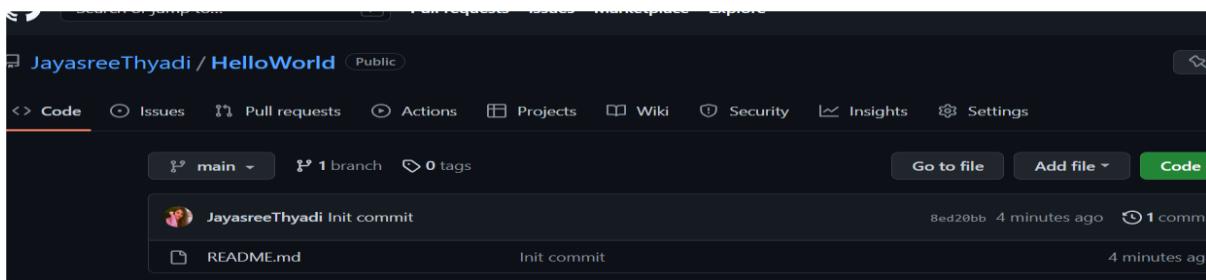


- Now to push the code run,

git add -u [name] main

```
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop/GitTutorial (main)
$ git push -u original main
Everything up-to-date
branch 'main' set up to track 'original/main'.
```

- Once after these commands, if we refresh our GitHub repo page, we will see that our README.md file has been pushed into that repo.



- To get the changed version from the remote repo to our local repo, we can run

git pull

```
JayasreeT@DESKTOP-03UEF1J MINGW64 /c/users/jayasreet/desktop/GitTutorial (main)
$ git pull
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 712 bytes | 25.00 KiB/s, done.
From https://github.com/JayasreeThyadi/Helloworld
 * [new branch]      update-readme -> origin/update-readme
Already up to date.
```

c) List of Git Commands and its version control operations

i) List of Git Commands:

1. Initializing a repository:

git init: Initializes a Git repository in the current directory.

2. Adding files to staging area: 20

git add [file-name]: Adds a specific file to the staging area.

git add -A: Adds all modified and new files to the staging area.

3. Committing changes:

git commit -m "[commit message]" : Creates a commit with the given message.

4. Viewing repository status:

git status: Shows what files are modified, staged, or untracked.

5. Working with branches:

- **git branch [branch-name]:** Creates a new branch.
- **git checkout [branch-name]:** Switches to an existing branch.
- **git merge [branch-name]:** Merges changes from another branch into the current branch.

6. Managing remote repositories:

- **git remote add [remote-name] [url]:** Adds a remote repository to your local repository.
- **git clone [url]:** Creates a local clone of a remote repository.

- **git fetch:** Downloads the latest changes from the remote repository.
- **git pull:** Downloads and merges the latest changes from the remote repository.
- **git push:** Uploads your local commits to the remote repository.

7. Inspecting history:

- **git log:** Shows the commit history of the repository.
- **git diff [commit1] [commit2]:** Shows the differences between two commits.

8. Stashing changes:

- **git stash:** Temporarily stores changes without committing them.
- **git stash pop:** Applies the most recent stashed changes.

9. Removing files:

- **git rm [file-name]:** Removes a file from the staging area and the working directory.
- **git rm --cached [file-name]:** Removes a file from the staging area but keeps it in the working directory.

10. Reverting changes:

- **git revert [commit]:** Reverts a specific commit.
- **git checkout HEAD~[n]:** Undoes the last n commits.

ii) Version Control Operations Using Git commands:

1. Create a directory named myrepo.

```
Admin@DESKTOP-B4M80C7 MINGW64 ~
$ mkdir myrepo
```

2. Now we need to navigate to the myrepo directory

```
Admin@DESKTOP-B4M80C7 MINGW64 ~
$ cd myrepo
```

3. We need to initialize the Git in the directory by using git init command

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo
$ git init
Initialized empty Git repository in C:/Users/Admin/myrepo/.git/
```

4. Now, we need to configure our global user email and name by the following commands:

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git config --global user.email "ssnandinigorthi@gmail.com"

Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git config --global user.name "NANDINIGORTHI"
```

5. We need to create a file named “file1.txt”

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ touch file1.txt
```

6. Now check the git status

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git status
On branch master

No commits yet

Untracked files:
  (use "git add <file>..." to include in what will be committed)
```

7. Add “file1.txt” to git through the following command:

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git add file1.txt
```

8. Again check the git status

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git status
On branch master

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
    new file:   file1.txt
```

9. Commit "file1.txt" to Git with the message "new file"

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git commit -m "new file"
[master (root-commit) ac6b7de] new file
 1 file changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 file1.txt
```

10. Again check the git status 22

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git status
On branch master
nothing to commit, working tree clean
```

11. To display the list of files in the current directory we need to use the command ls

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ ls
file1.txt
```

12. To list the files tracked by the git we need to use the following command

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git ls-files
file1.txt
```

13. Create a file named “file2.txt” and write "hello world" to it:

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ echo "hello world">> file2.txt
```

14. Now need to know how many files are present use the following command

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ ls -l
total 1
-rw-r--r-- 1 Admin 197121 0 Aug 17 09:57 file1.txt
-rw-r--r-- 1 Admin 197121 12 Aug 17 10:01 file2.txt
```

15. Now we need to know the list of files in git

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git ls-files
file1.txt
```

16. Now that we have created the file2.txt we need to verify the status of git

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git status
On branch master
Untracked files:
  (use "git add <file>..." to include in what will be committed)
    file2.txt

nothing added to commit but untracked files present (use "git add" to track)
```

17. Add "file2.txt" to Git

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git add file2.txt
warning: in the working copy of 'file2.txt', LF will be replaced by CRLF the
next time Git touches it
```

18. Again check the git status

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git status
On branch master
Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
    new file:   file2.txt
```

19. Commit "file2.txt" to Git with the message "second file"

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git commit -m "second file"
[master 30b0de9] second file
 1 file changed, 1 insertion(+)
  create mode 100644 file2.txt
```

20. List the files in the current directory

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ ls
file1.txt  file2.txt
```

21. List the files tracked by Git

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git ls-files
file1.txt
file2.txt
```

22. To view the git commit history we use the following command

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git log
commit 30b0de9ba0b06070188c99522de2ed6b5474c5a0 (HEAD -> master)
Author: NANDINIGORTHI <ssnandinigorthi@gmail.com>
Date:   Thu Aug 17 10:06:13 2023 +0530

    second file

commit ac6b7de7897570ea041137c5ee6cc6f4379f3
Author: NANDINIGORTHI <ssnandinigorthi@gmail.com>
Date:   Thu Aug 17 09:58:30 2023 +0530

    new file
```

23. To view the git commit history in a concise format we use the following command

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git log --oneline
30b0de9 (HEAD -> master) second file
ac6b7de new file
```

24. Append the text "new line 1st time" to "file1.txt"

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ echo "new line 1st time">>> file1.txt
```

25. To view the command history we use the following command 24

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ history
 1  mkdir myrepo
 2  cd myrepo
 3  git init
 4  git config --global user.email "ssnandinigorthi@gmail.com"
 5  git config --global user.name "NANDINIGORTHI"
 6  touch file1.txt
 7  git status
 8  git add file1.txt
 9  git status
10  git commit -m "new file"
11  git status
12  ls
13  git ls-files
14  echo "hello world">> file2.txt
15  ls -l
16  git ls-files
17  git status
18  git add file2.txt
19  git status
20  git commit -m "second file"
21  ls
22  git ls-files
23  git log
24  git log --oneline
25  history
```

26. Check the git status

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git status
On branch master
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   file1.txt

no changes added to commit (use "git add" and/or "git commit -a")
```

27. Now we need to commit all changes including modifications in the "file1.txt" to Git

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git commit -a -m "updated with 2nd line"
warning: in the working copy of 'file1.txt', LF will be replaced by CRLF the
next time Git touches it
[master ae65fd9] updated with 2nd line
 1 file changed, 1 insertion(+)
```

28. Again check the git status

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ git status
On branch master
nothing to commit, working tree clean
```

29. List the files in the current directory using the ls command

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ ls
file1.txt  file2.txt
```

30. To view the content of file1.txt we need to use the cat command.

```
Admin@DESKTOP-B4M80C7 MINGW64 ~/myrepo (master)
$ cat file1.txt
new line 1st time
```

This will display the contents of "file1.txt", including the newly added line. You have viewed the Git commit history, command history, appended a new line to "file1.txt", added and committed it to Git using the '-a' flag, checked the Git status, listed the files in the directory, and viewed the content of "file1.txt".

Below is a **clear, step-by-step, lab-friendly write-up** on installing LaTeX and preparing research articles using Overleaf. You can directly include this in a lab manual.

Experiment 2: Installation of LaTeX and Preparing Research Articles Using Overleaf

1. Aim

To learn how to (i) install LaTeX on a local system and (ii) prepare a research article using an Overleaf account and its online LaTeX editor.

2. Objectives

- Understand the role of LaTeX in academic writing.
- Install a LaTeX distribution (TeX Live / MiKTeX) and an editor.

- Create and manage an Overleaf account.
 - Prepare, compile, and export a research article using Overleaf templates.
-

3. Theory

3.1 What is LaTeX?

LaTeX is a document preparation system widely used for research papers, thesis writing, books, and technical documentation. It is especially useful for mathematical typesetting, bibliographies, cross-referencing, and creating professional layouts.

3.2 Why Use LaTeX?

- Produces publication-quality documents
 - Ideal for math and scientific writing
 - Automatic numbering, references, and bibliography
 - Templates available for journals, conferences, and theses
 - Stable and version-controlled academic writing environment
-

4. Installation of LaTeX

4.1 Installing LaTeX on Windows

Step 1: Download MiKTeX

- Visit: <https://miktex.org/download>
- Download the Windows installer (.exe file).

Step 2: Run the Installer

- Accept all default settings.
- Select “Install missing packages automatically” → Yes.

Step 3: Install an Editor (TeXstudio)

- Download from: <https://www.texstudio.org/>
 - Install with default settings.
 - Inside TeXstudio, set MiKTeX as the compiler (auto-detected).
-

4.2 Installing LaTeX on Linux (Ubuntu / Debian)

Open the terminal and type:

```
sudo apt update
```

```
sudo apt install texlive-full
```

```
sudo apt install texstudio # Optional editor
```

This installs the complete LaTeX environment.

4.3 Installing LaTeX on macOS

Step 1: Install MacTeX

- Visit: <https://tug.org/mactex/>
- Download MacTeX (approx 4GB).
- Run the .pkg installer and complete setup.

Step 2: Editor (Optional)

- Install **TeXShop** (comes with MacTeX)
 - Or install **TeXstudio** from its official website.
-

5. Creating and Using Overleaf for Research Articles

Overleaf is an **online LaTeX editor** that requires no local installation.

5.1 Creating an Overleaf Account

Step-by-step

1. Visit: <https://www.overleaf.com/>
2. Click **Sign Up**.
3. Choose a method:
 - Google Account
 - Email Registration
 - Institutional Login (if available)
4. Verify your email (if required).
5. Dashboard will open with project options.

5.2 Creating a New Research Article Project

Step 1: Click “New Project”

You will see multiple options:

- Blank Project
- Academic Journal Template
- IEEE Template
- Springer Template
- Thesis / Dissertation
- Report, Article, Book, etc.

Step 2: Select “Academic Journal Article”

Overleaf will create:

- main.tex – The main LaTeX document
 - Auxiliary files (references, images folder)
-

5.3 Understanding the Overleaf Workspace

Three main panels:

1. **Editor Panel** – where you write LaTeX code
 2. **PDF Output Panel** – automatically compiles and shows the final document
 3. **Files Panel** – manage project files, images, bibliography, etc.
-

5.4 Writing Content in LaTeX

A minimal article template:

```
\documentclass[12pt]{article}\n\n\\usepackage{graphicx}\n\\usepackage{amsmath}\n\\usepackage{cite}
```

```
\title{Sample Research Article Using LaTeX}
```

```
\author{Your Name}
```

```
\date{\today}
```

```
\begin{document}
```

```
\maketitle
```

```
\begin{abstract}
```

This is a sample abstract explaining the objective of the paper.

```
\end{abstract}
```

```
\section{Introduction}
```

This section introduces the research problem and motivation.

```
\section{Methodology}
```

Explain the work, equations, and diagrams.

```
\section{Results}
```

Include graphs, figures, and tables.

```
\section{Conclusion}
```

Summarize the findings and future scope.

```
\bibliographystyle{IEEEtran}
```

```
\bibliography{references}
```

```
\end{document}
```

5.5 Adding References (BibTeX)

1. Create a file named **references.bib**.
2. Add entries such as:

```
@article{example2020,  
    title={Sample Title},  
    author={Author, A.},  
    journal={Journal Name},  
    year={2020}  
}
```

3. Cite in the text using:

```
\cite{example2020}
```

4. Overleaf auto-generates bibliography on compile.
-

5.6 Uploading Figures

1. Go to **Files → Upload**
2. Upload .png, .jpg, .pdf, or .eps

Insert image:

```
\begin{figure}[h]  
    \centering  
    \includegraphics[width=0.6\textwidth]{figure.png}  
    \caption{Sample Figure}  
    \label{fig:sample}  
\end{figure}
```

5.7 Compiling and Exporting PDF

- Overleaf auto-compiles when you stop typing (or press *Recompile*).
 - Click **Menu** → **Download PDF** to save your final article.
-

6. Lab Tasks

Task 1: Install LaTeX on your system and compile a sample .tex file.

Task 2: Create an Overleaf account and start a new project.

Task 3: Prepare a 2–3 page article including:

- Title, author, abstract
- Introduction, methodology, results, conclusion
- At least one figure
- At least one table
- Bibliography using BibTeX

Task 4: Download and submit the PDF generated by Overleaf.

EXPERIMENT-3 : Introduction to Scratch Programming

1. AIM

To understand the basic components of the **Scratch Online Programming Environment**, including the **Stage**, **Sprite**, **Script Area**, and **Block Palette**, and to create a simple interactive animation.

2. OBJECTIVES

Students will be able to:

- Identify the Scratch interface components
- Understand and use the **Stage**
- Work with **Sprites** and their properties
- Write simple programs in the **Script Area**
- Use the **Block Palette** to drag/drop blocks

- Create a basic animation

3. THEORY

3.1 What is Scratch?

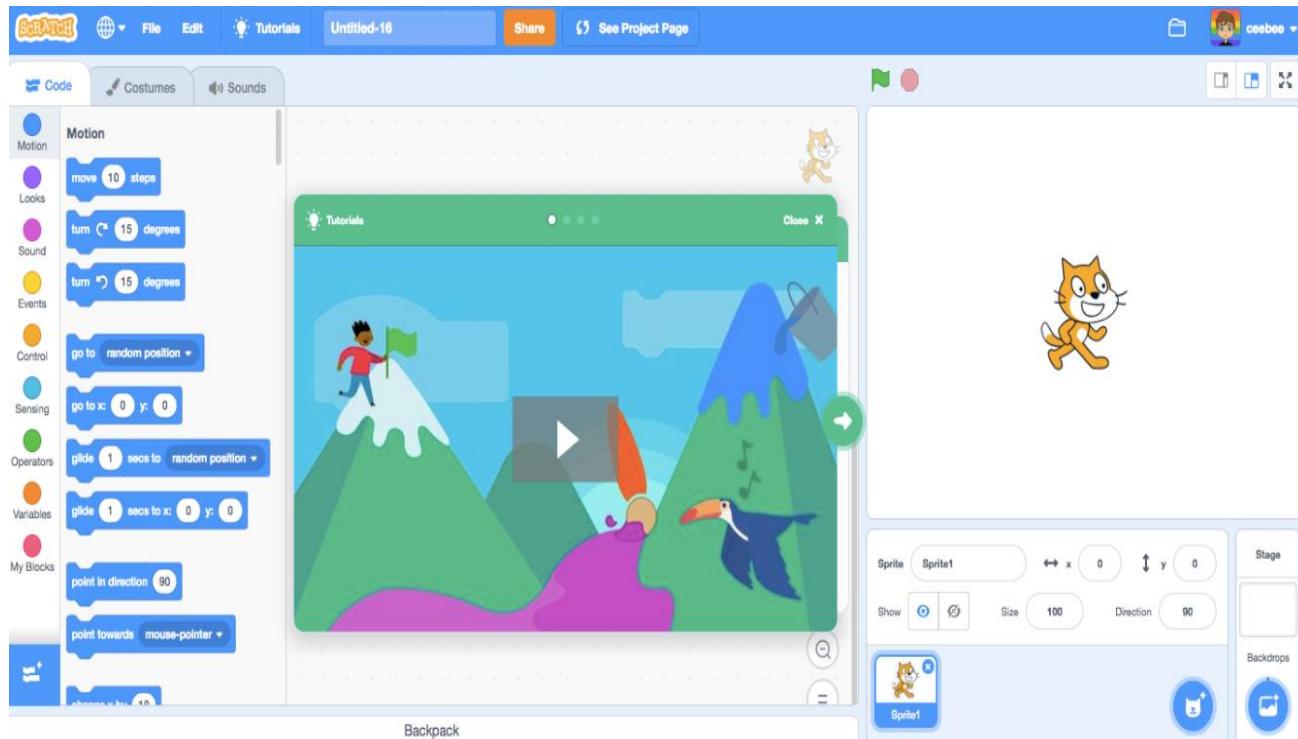
Scratch is an online block-based programming language developed by MIT that allows students to create animations, stories, and games using drag-and-drop programming blocks.

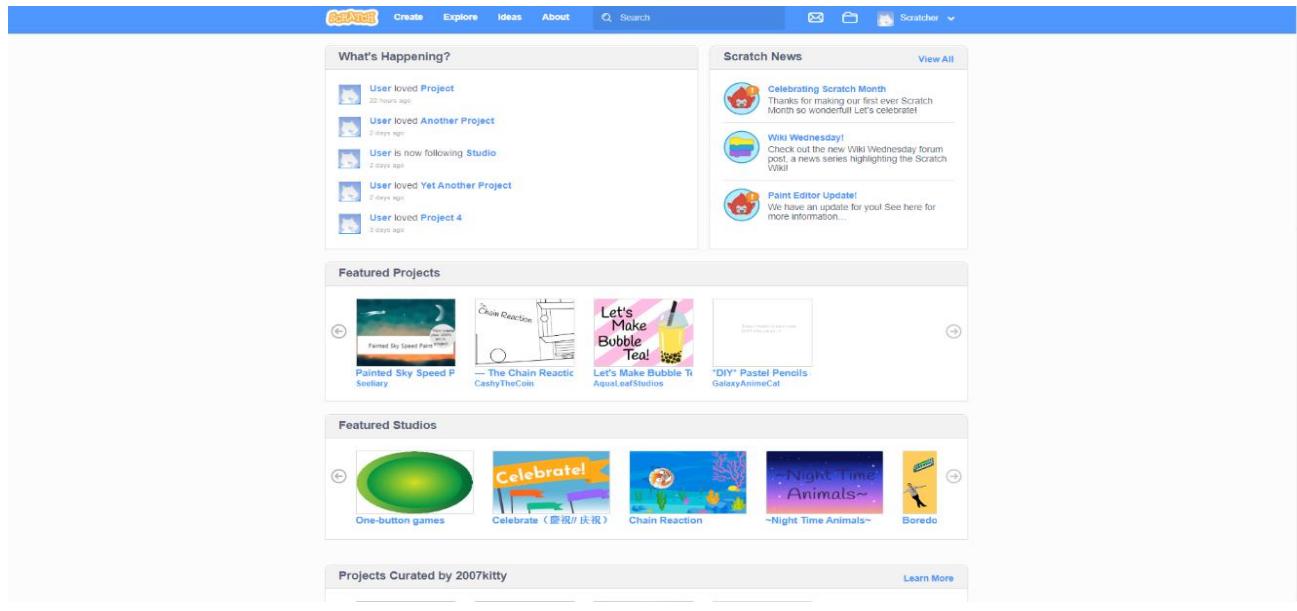
4. SCRATCH INTERFACE: REAL SCREENSHOTS

4.1 Scratch Home Page

Students open Scratch Online at:

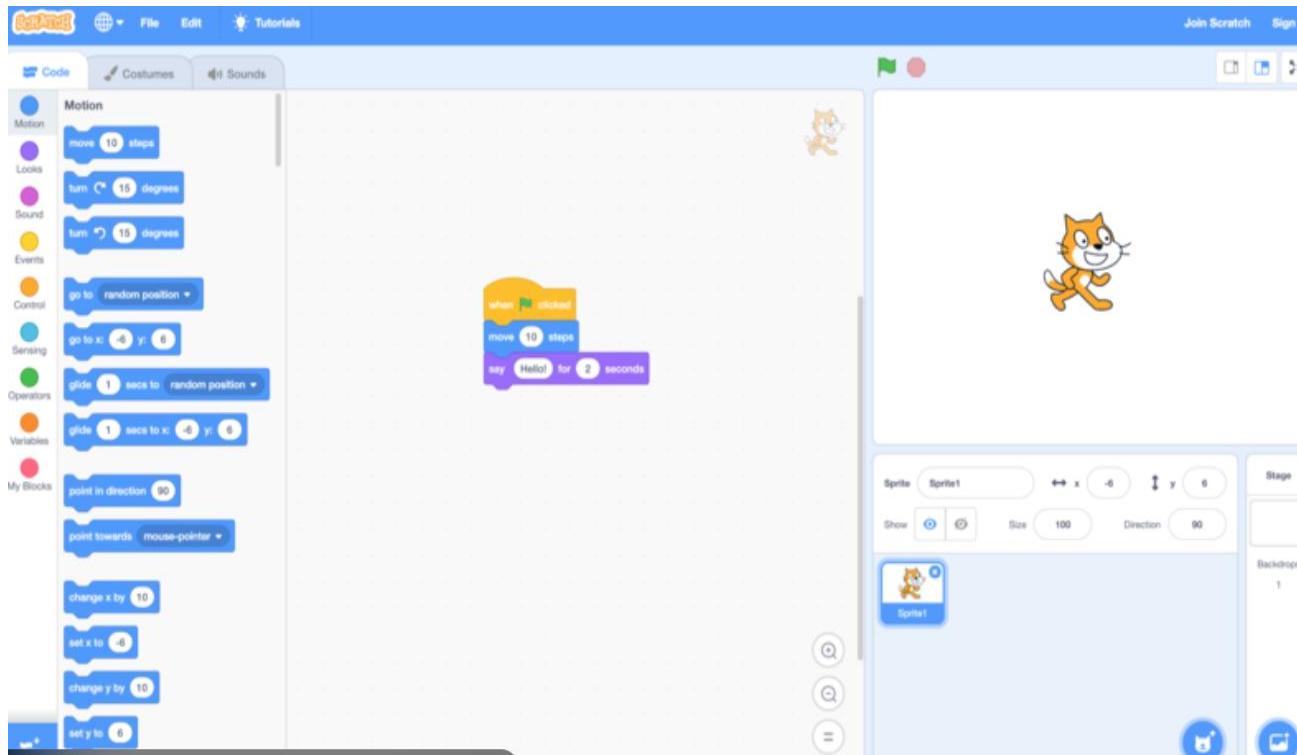
 <https://scratch.mit.edu>



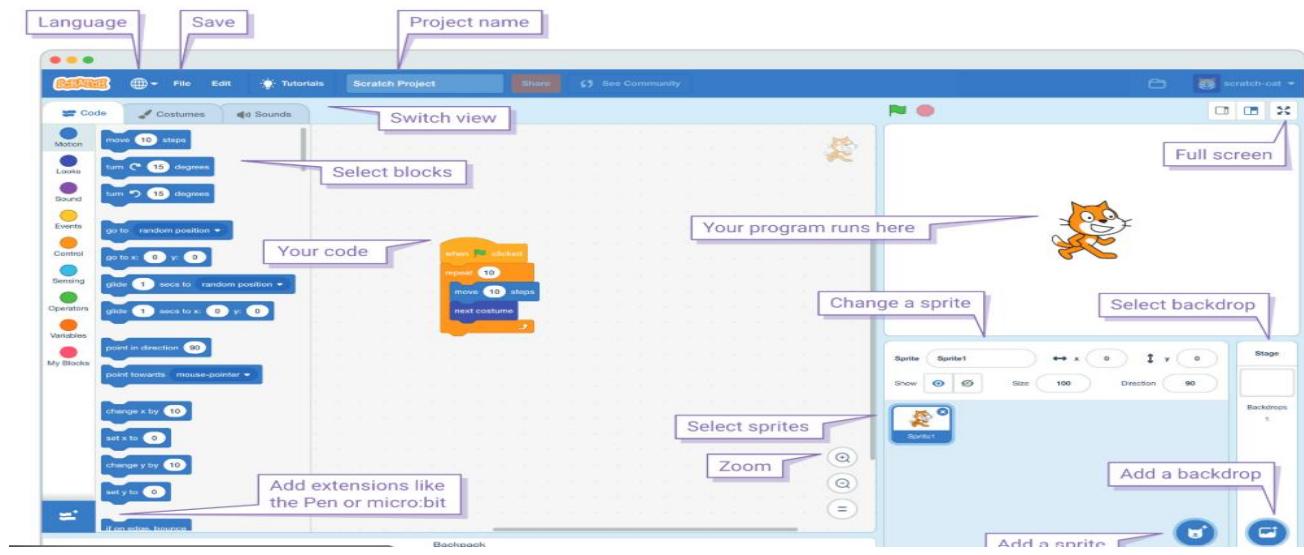


4.2 New Project Window

Click **Create** → Scratch opens with the default project.



Scratch 3 Interface



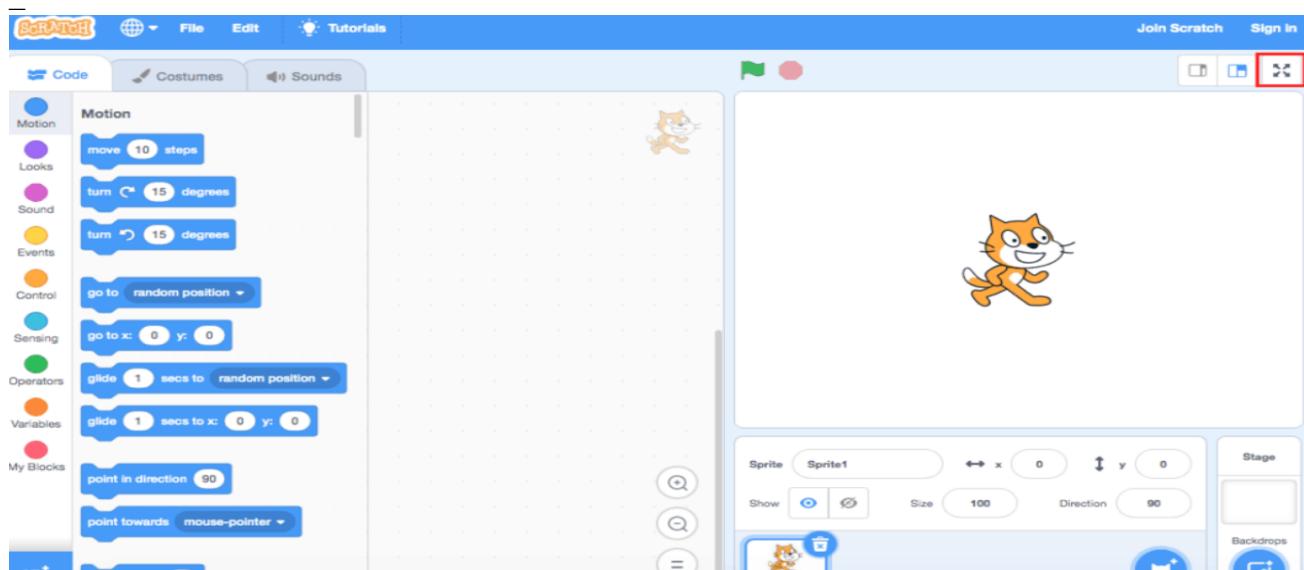
5. COMPONENTS OF SCRATCH

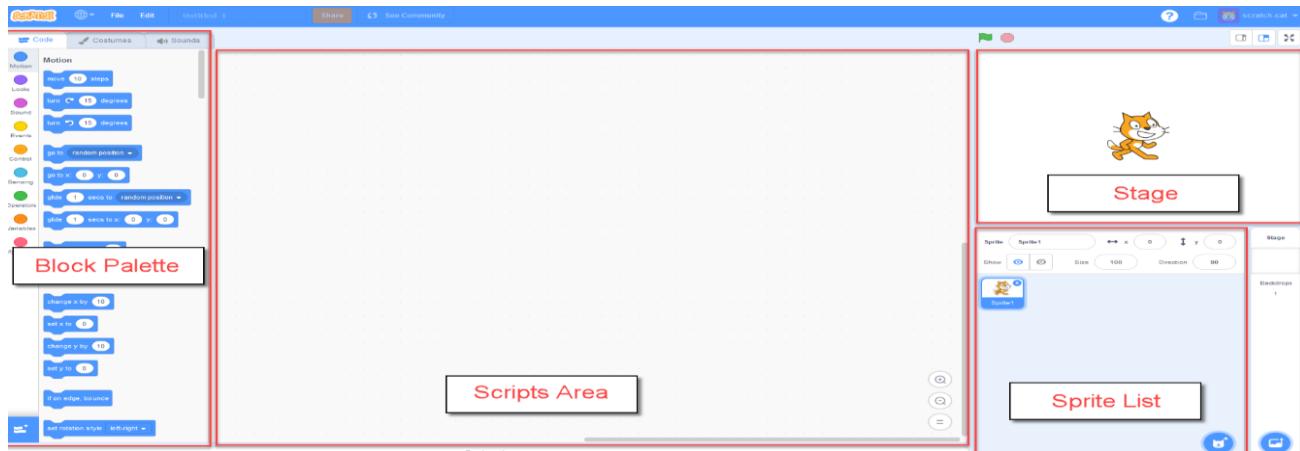
5.1 The Stage

The **Stage** is where all animations and actions take place.

Features:

- Shows sprites, backgrounds and movements
- Coordinates: X = -240 to +240, Y = -180 to +180
- Can change backdrops



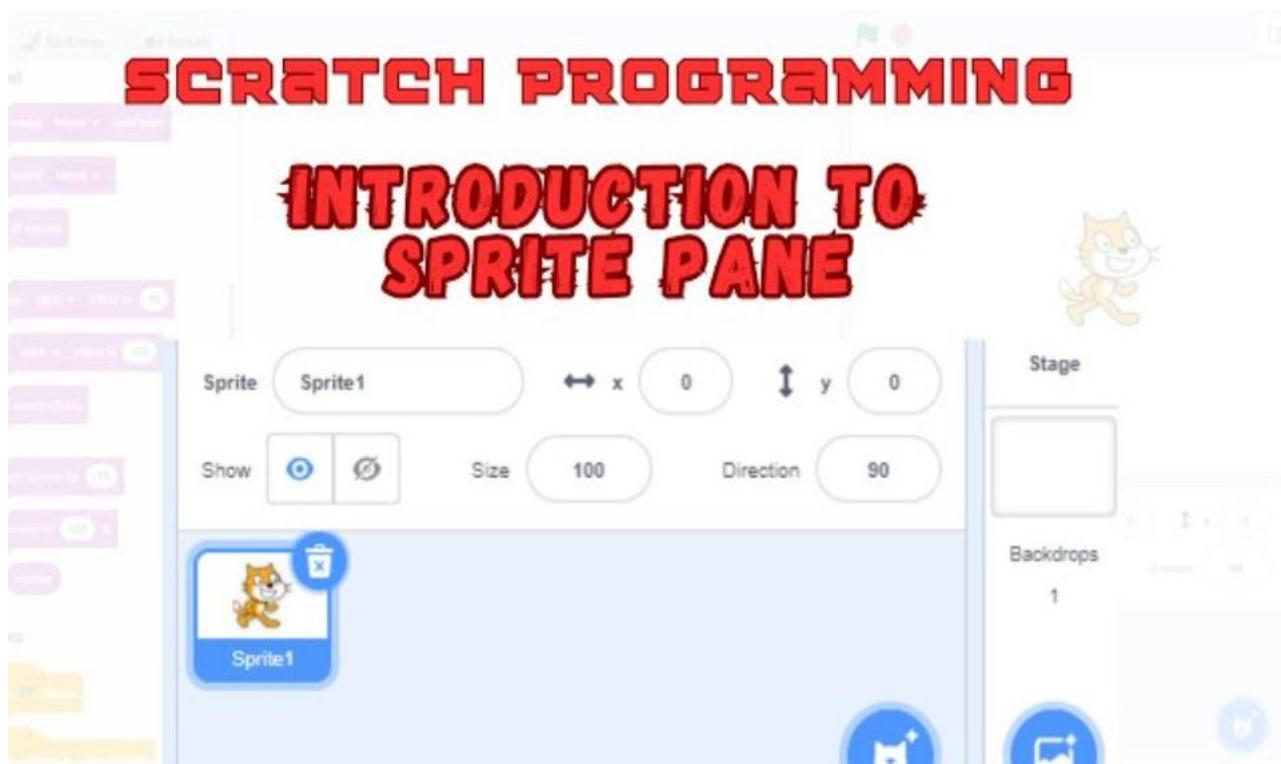


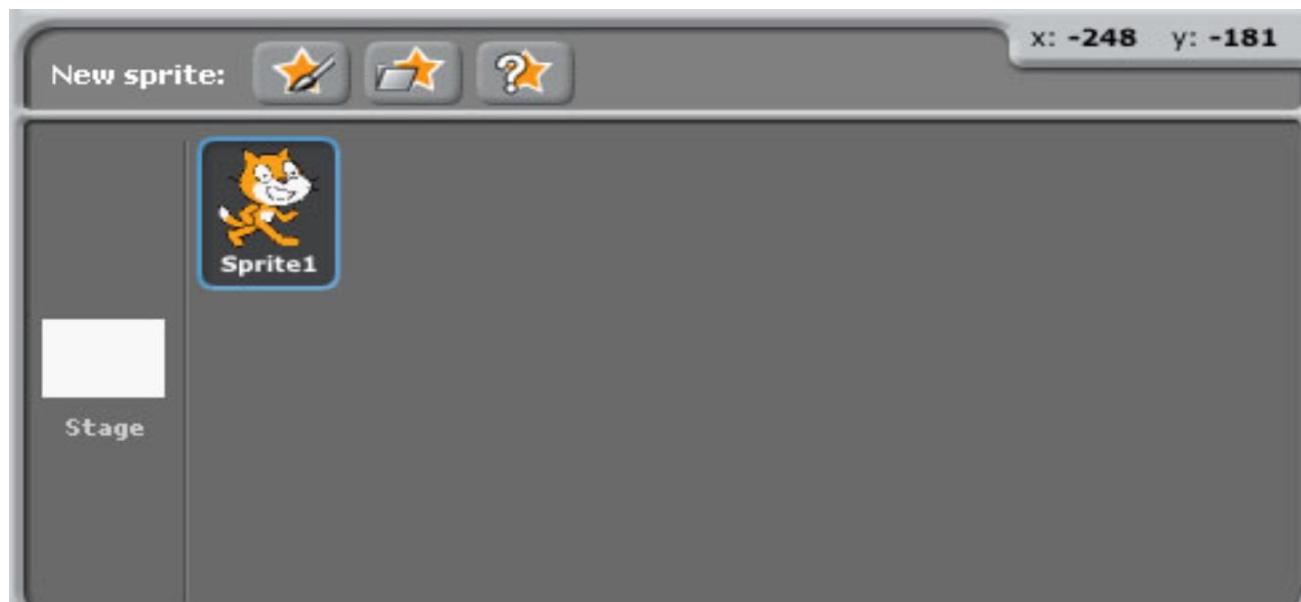
5.2 Sprite (Character)

A **Sprite** is any object that performs actions.

Sprite Properties include:

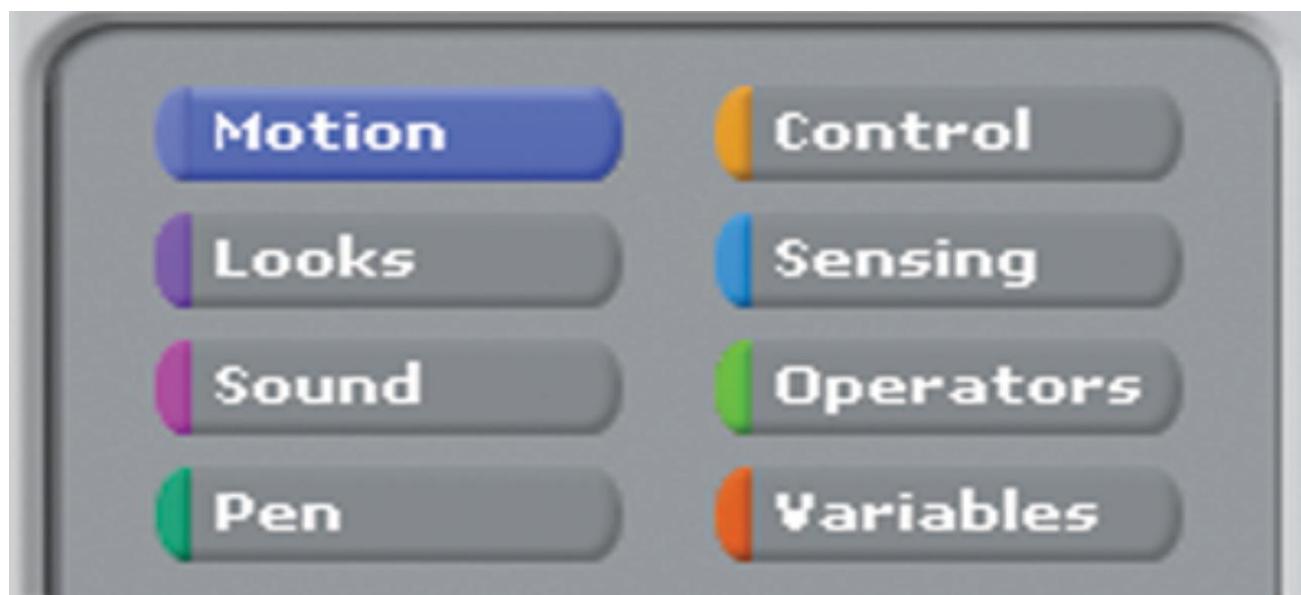
- Costumes
- Sounds
- Position
- Direction

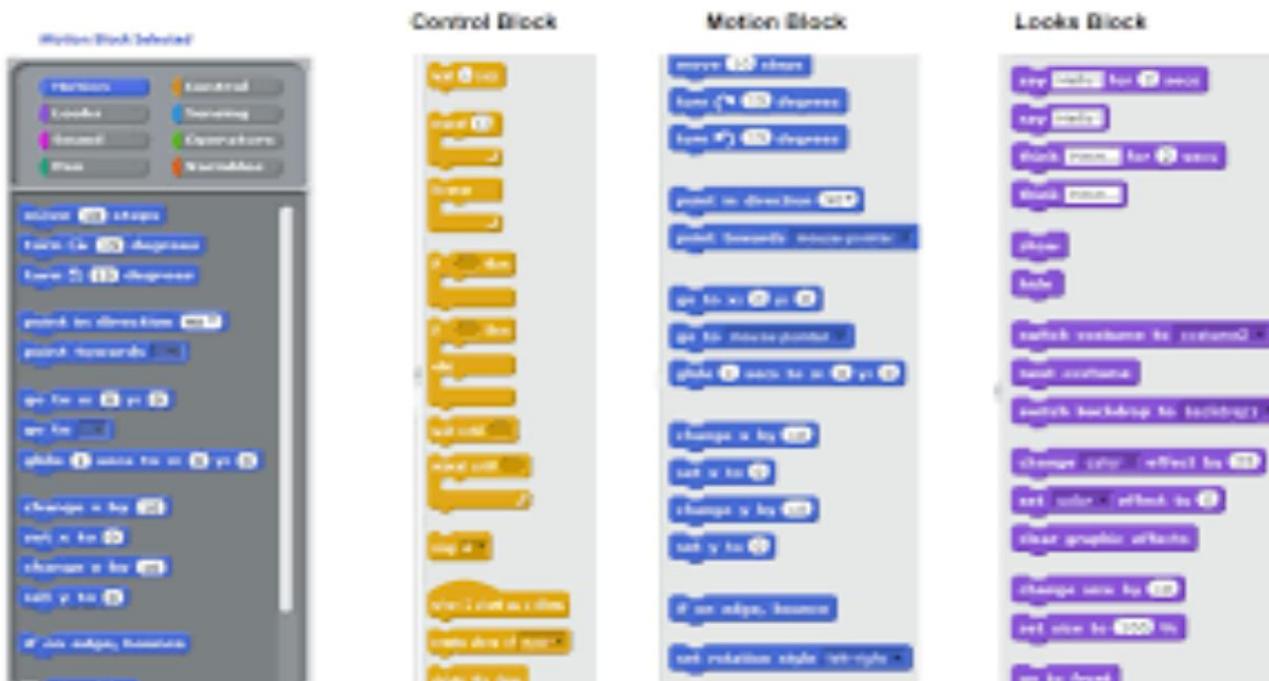




5.3 Block Palette

Located on the left — contains all programming blocks.



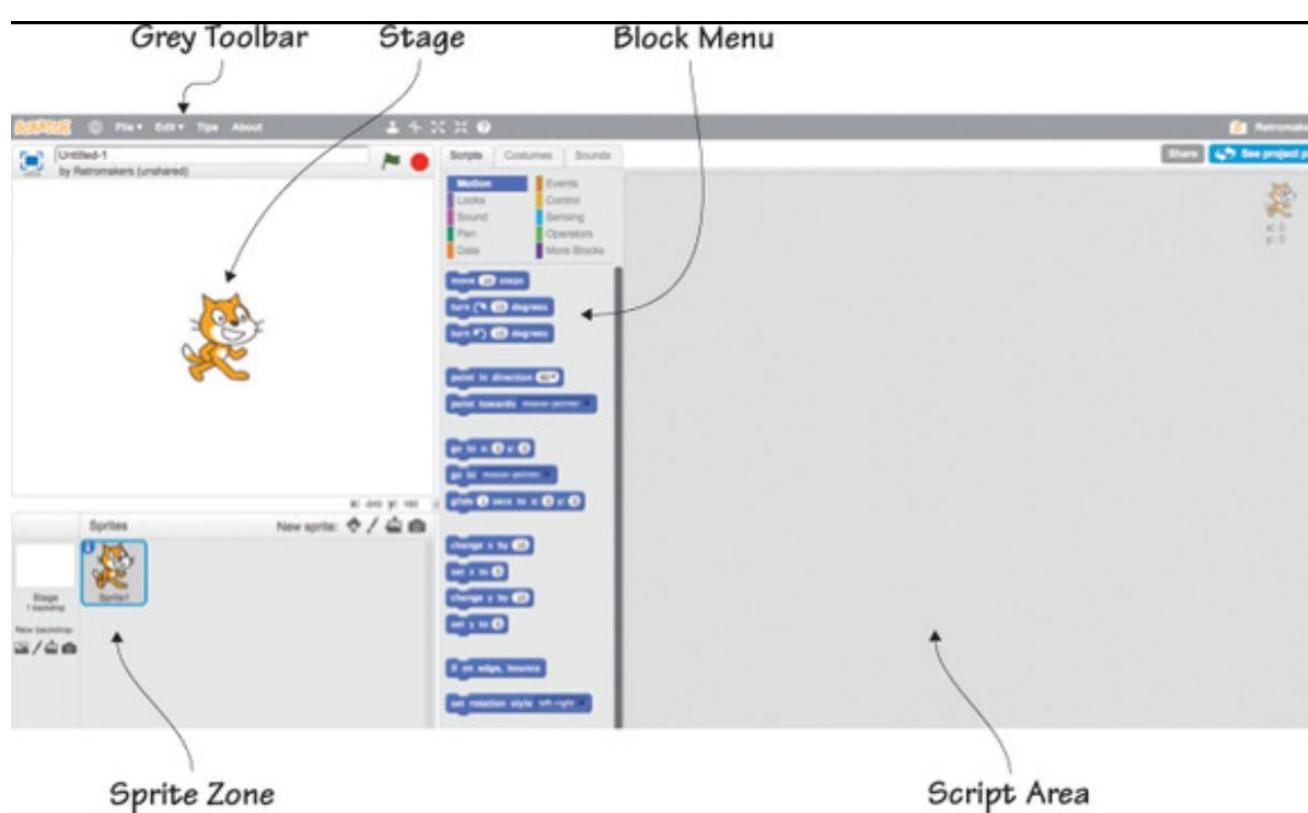
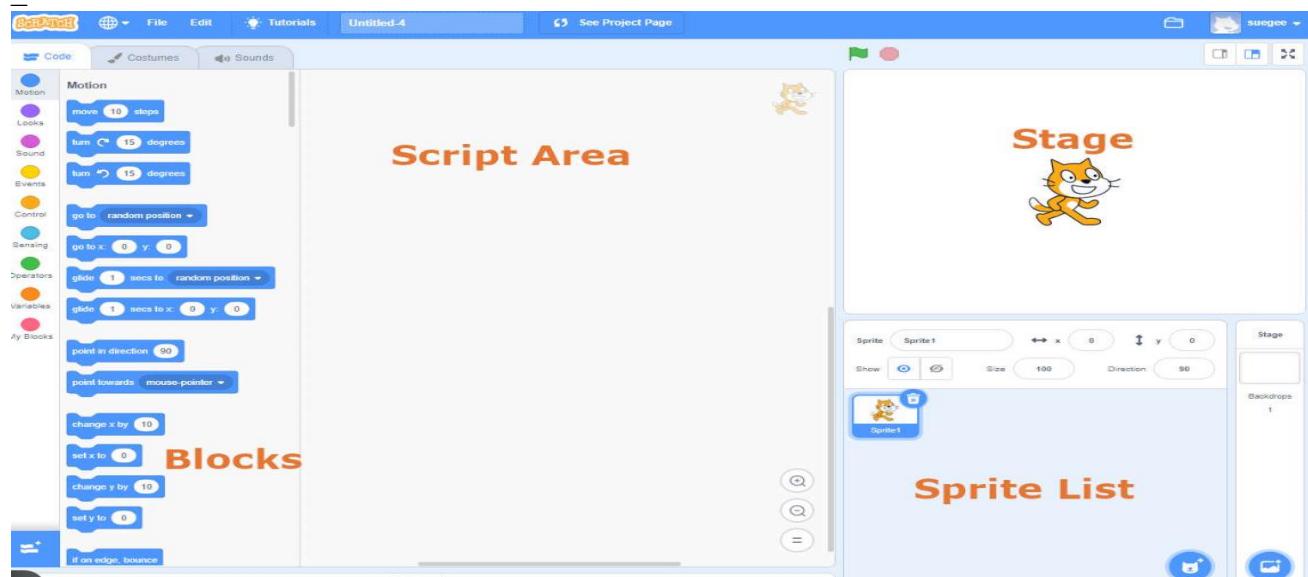


Categories:

- Motion
- Looks
- Sound
- Events
- Control
- Sensing
- Operators
- Variables

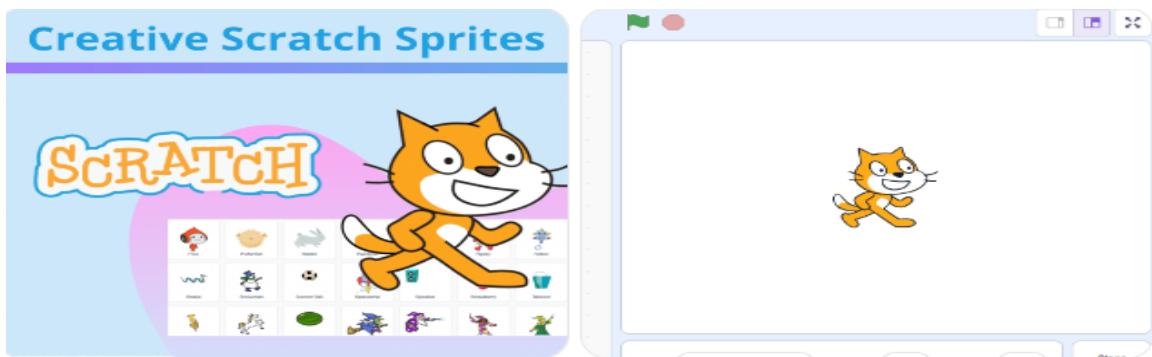
5.4 Script Area

The **Script Area** is where you drag blocks to create programs.



6. PROCEDURE (STEP-BY-STEP WITH SCREENSHOTS)

STEP 1: Starting a New Scratch Project



Click **Create** on scratch.mit.edu.

STEP 2: Add an Event Block

Go to Events → “when green flag clicked”

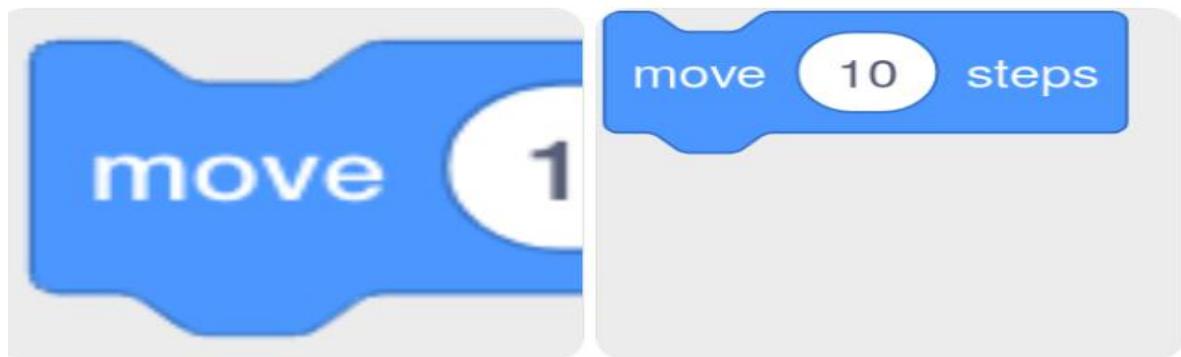
Drag it into the Script Area.



STEP 3: Add Motion Block

Go to **Motion** → **move 10 steps**

Attach it to the event block.



STEP 4: Test the Script

Click the **Green Flag**.

The sprite will move 10 steps.



STEP 5: Add Rotation

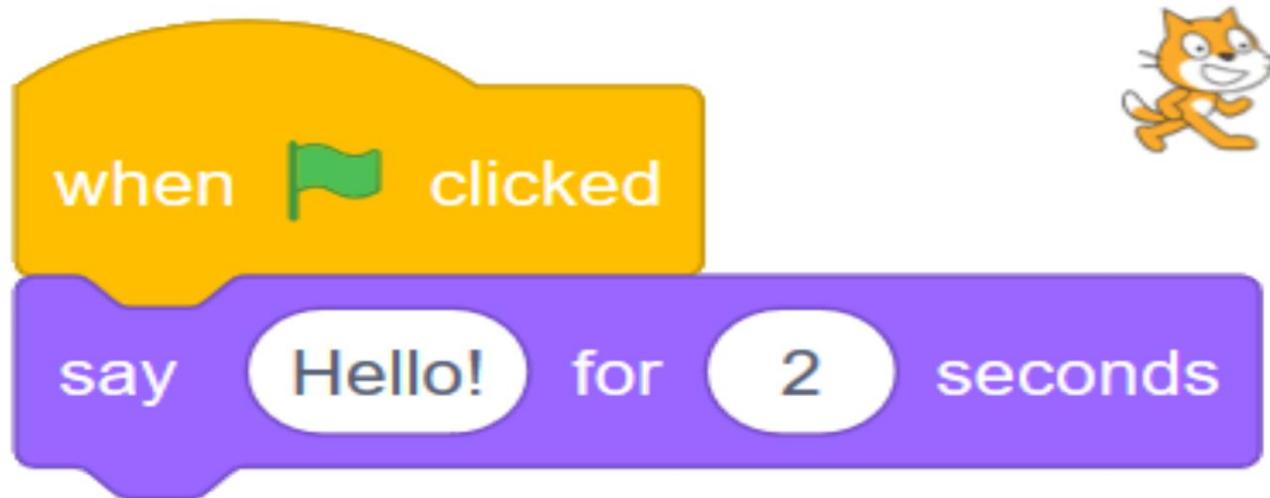
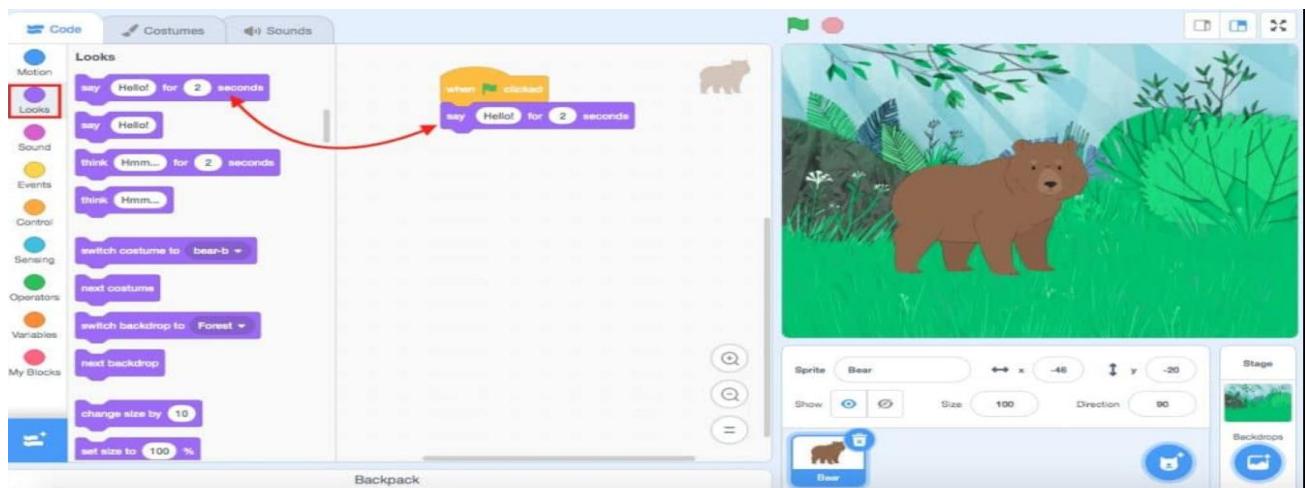
Add **turn 15 degrees** block under the movement block.



STEP 6: Add Sprite Interaction

1. From Events, drag:
“when this sprite clicked”
2. Attach:
Looks → say “Hello!” for 2 seconds

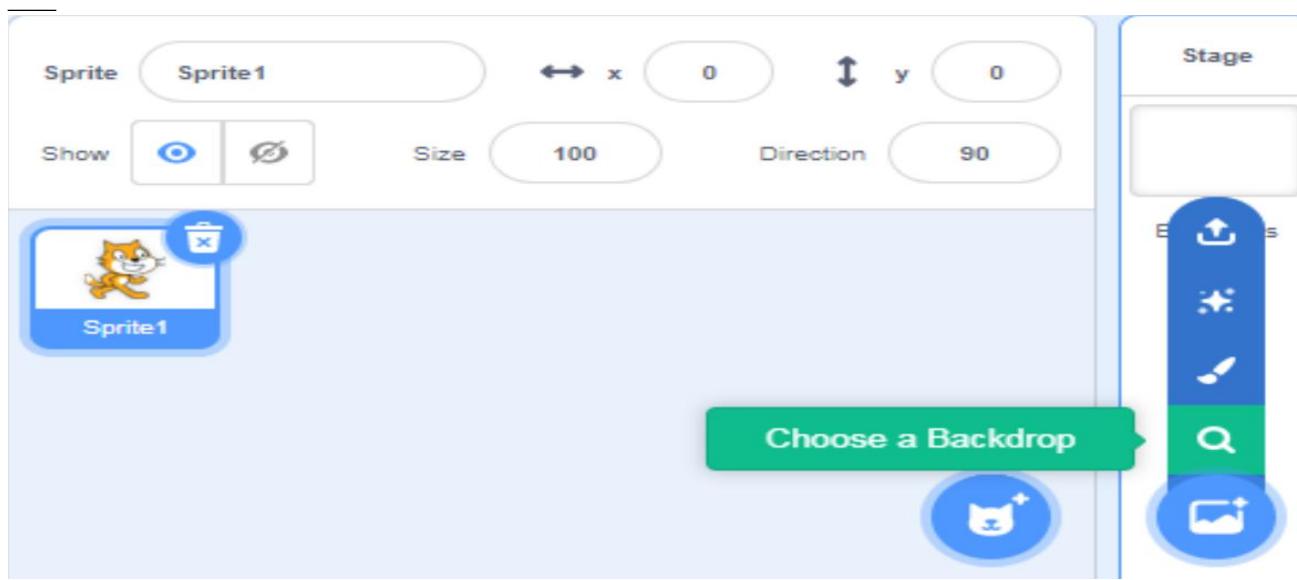
Now clicking the sprite will make it speak.



STEP 7: Add Background

Click **Choose Backdrop** → select any backdrop.





STEP 8: Add Loop for Continuous Movement

Use:

- Control → repeat 10
- Put move and turn blocks inside loop



7. LAB TASKS FOR STUDENTS

Students must complete the following:

- ✓ Task 1: Move the sprite across the stage
- ✓ Task 2: Make sprite speak when clicked
- ✓ Task 3: Change sprite costume
- ✓ Task 4: Change stage backdrop

✓ **Task 5: Create a loop-based animation**

✓ **Task 6: Add keyboard control for movement**

8. RESULT

Students successfully learned:

- Scratch interface components
 - Stage and sprite operations
 - Creating basic animations
 - Event-driven programming
 - Using block palette and script area
-

9. CONCLUSION

This experiment introduced the foundation of Scratch Online programming. We learned how to create programs using blocks, control sprite actions, and build interactive animations. This forms the base for creating games and complex animations.
