

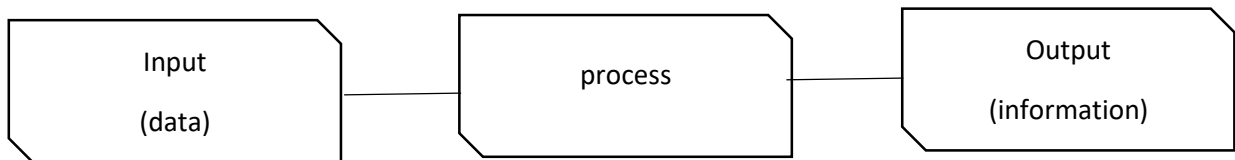
FORM 1

Topic 1: introduction to computer

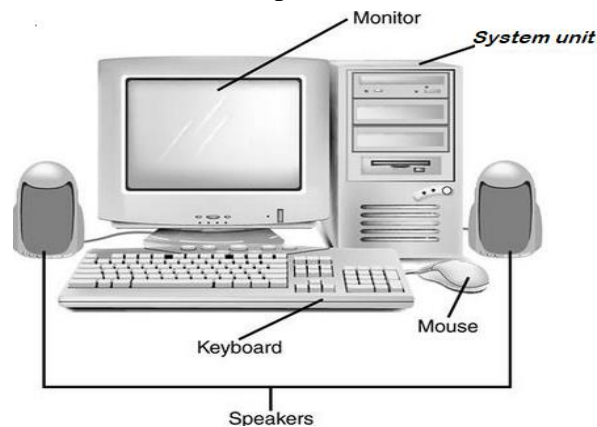
DEFINITION OF TERMS

- **COMPUTER**

- A Computer is an electronic device that processes data (user's input) to information (desired output)
- It is said to be electronic because it utilizes electric signals to *process* data
- The processing is made possible by a set of instructions called *programs*
- Therefore, three key terms in the definition of computer are:
 - Input
 - Process
 - Output



- Below is a diagram showing a Personal Computer (PC) called desktop computers which are mostly used in offices, business premises and at home.



- A typical desktop computer is made up of a *system unit* and *peripheral devices* such as monitor (also known as screen), keyboard and mouse.
- A system unit houses the brain of the computer called Central Processing Unit (CPU) and also drivers
- Drivers are used to store, record and read data
 - **Data and Information**
 - *Data* is defined as raw facts that do not have much meaning to the user.
 - It may include numbers, letters and symbols.
 - *Information* is the processed data that is meaningful to the user.
 - In other ways, information is the product of data and process.
 - **Information Technology (IT)**
 - Information Technology (IT) refers to the use of hardware, software and their technology to collect, process, secure, store, exchange or disseminate information.
 - Examples of hardware include: computers, PDAs, Smartphones and printers.
 - Information may be in a form of text, graphics, sound or video.
 - **Communication Technology (CT)**
 - Communication Technology (CT) refers to the use of devices and communication channels to transmit information correctly, efficiently and cost-effectively.

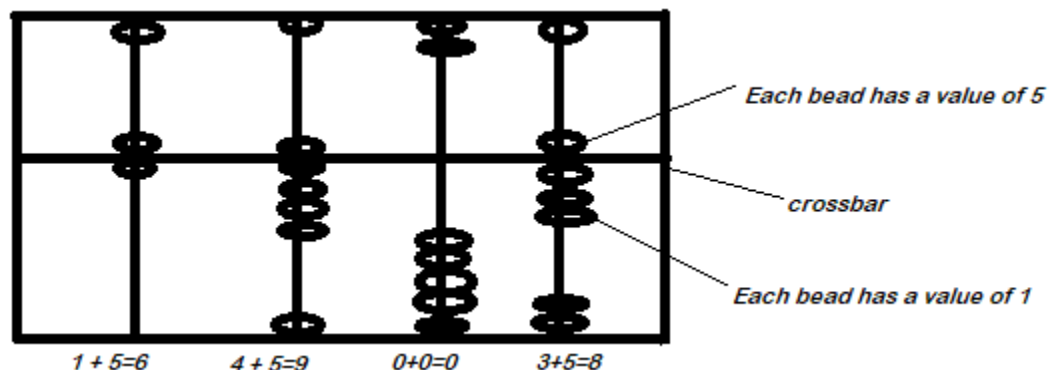
- Such devices include radio transmitter and receiver, telephones, satellites, fax machines etc.
- Communication channels include telephone lines and radio waves
- **Information and Communication Technology (ICT)**
- ICT refers to the integration of communication technologies and information technologies for the purpose of acquiring, processing, storing, standardizing and disseminating information for public consumption.
- **Information Systems (IS)**
- Information Systems refers to the set of components namely persons, procedures or hardware and software resources that collect, process and deliver information in a given organization.
- Information technology and Information system are somehow similar, but the major difference between them is that Information system may not necessarily rely on technological devices, pen, paper and manual files may be used while IT is purely electronic and it tries to automate IS processes.
- **Garbage in garbage Out (GIGO)**
- This is a phrase which implies that if incorrect data is entered in a computer and the command to process it is given, the computer will output incorrect result.
- This means that a computer is just a machine, it cannot do things on its own.

HISTORY OF COMPUTER

- Before computers were introduced, people were using non-computing devices.
- Non-computing devices are tools that were used to perform arithmetic computations manually or mathematically.
- These computing devices are:
 - Sticks
 - Stones
 - Abacus
 - Napier bones
 - La Pascaline machine

Abacus

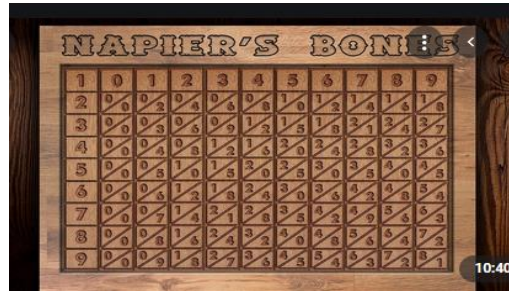
- An abacus was a Chinese counting instrument which dates back to 300 BC.
- Abacus has bead-like parts that move along rods.
- Each bead above the middle bar stands for five units while each bead below stands for one unit.



Napier bones

- Napier bones was developed by John Napier, a Scottish mathematician in the 17th Century.

- It was used for performing multiplication and division.



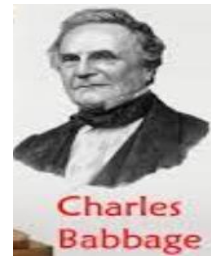
La Pascaline machine

- La Pascaline is accounting machine that was made by Blaise Pascal in the 17th Century.
- It was used for addition and subtraction



The Analytical Engine

- The analytical engine was designed by an English mathematician, Charles Babbage in 1832
- The engine is recognized as the first real computer and Babbage as the father of computing.
- However, due to technological limitations, Babbage never implemented it.
- Below is the prototype of analytical engine



Analytical engine prototype

ELECTRONIC COMPUTERS AND THEIR GENERATIONS

- It took several years after Charles Babbage designed analytical engine to come up with an electronic computer.
- Computers are generally classified into five generations depending on the technology used to develop them.
 - **First generation computers (1940's to 1958)**
- First generation computers were very large physically and used thousands of gadgets called *vacuum tube* or *thermionic valve*.



The disadvantages of these computers were

- They consumed a lot of power
- They emitted a lot of heat
- They constantly broke down

Examples of 1st Generation computers are

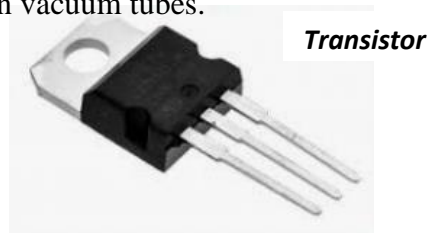
- Electronic Numeric Integrator and Calculator (ENIAC)
- Electronic Discrete Variable Automatic Computer (EDVAC)

Uses of 1st Generation computers

- ENIAC was developed during first world war to make certain calculations for construction of hydrogen bomb

- **Second Generation Computers (1958-1964)**

- Computers in this generation used a tiny solid-state electronic device called *transistors* that were smaller than vacuum tubes.



The characteristics of these computers are that

- They produced less heat than 1st Generation
- Were much faster than 1st Generation
- Were smaller in size than 1st Generation
- More reliable than 1st Generations

Examples of second generation computers are:

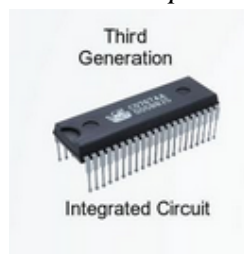
- IBM 1401 AND IBM 7070
- UNIVAC 1107
- ATLAS LEO Mark III
- Honeywell 200

Uses of second generation computers

- They were used mainly for scientific, business applications and computer games

- **Third Generation computers (1964-1970)**

- The third generation computers used electronic device called *Integrated Circuit (IC)*
- An Integrated Circuit consists of thousands of small transistor circuits packed on a semiconductor called *silicon chip*



Characteristics of third generation computers

- Third generation computers emitted less heat, were smaller in size, were easier to program, use and maintain than 1st and 2nd Generation computers

Examples of third generation computers are

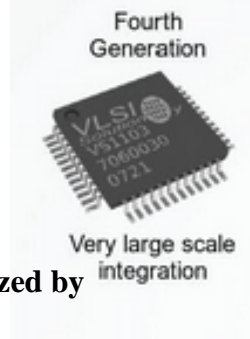
- IBM 360
- ICL 19000 series

Uses of third generation computers

- They allow processing more than one task (multitasking)
- Had most applications such as word processor for typing, calculators and business applications

- **Fourth Generation computers (1970 to present)**

- The gadget used in this generation was *Large Scale Integrated Circuit (LSI)* and *Very Large Scale Integrated Circuit (VLSI)*



Fourth generation computers were characterized by

- Very low emission of heat
- Are small in size
- Easier to use and maintain

Examples of fourth generation computers are

- IBM 370
- IBM 4300
- Honeywell DPS-88
- Burroughs 7700

Uses of fourth generation computers

- Use of most applications
- Used to design financial applications
- Use of internet became common

- **Fifth generation computers**

- These are today's computers that have high processing power and speed
- These computers have special programs that mimic human intelligence referred to as *Artificial Intelligence*



These computers are characterized by:

- Use of artificial intelligence
- Connectivity to internet
- Have superior hardware and software
- Very small in size
- Uses of fifth generation computers
- Used in expert system that is used in decision making

TOPIC 2: COMPUTERS AND THEIR USES

- In our day to day activities, computers are used in almost every field because they are more efficient and accurate.
- Some of the areas where computers are used are:
 - **Supermarket**
 - In supermarket, computers are used management of daily activities like stock control.
 - They keep records of what is in stock, what is out of stock and provide alert when a particular item is running out of stock
 - **Offices**
 - Computers are used in offices for sending and receiving information
 - Document processing e.g. writing memos.
 - **Banks**
 - In banks, computers are used in the following ways:
 - In Automated Teller Machine (ATM) for cash withdraw and deposits.
 - Keeping customer records
 - Chaque processing
 - Document processing
 - **Industries**
 - Computers are used to monitor and control industrial processes
 - Computers are also used in industries as robots
 - A robot is a machine that works like a human being but performs tasks that are too unpleasant, dangerous or complex and tedious to human being
 - **Hospitals**
 - Computers are used to keep patient's records
 - Computers are also used to diagnose patient's body in X-ray
 - Computers are also used in hospital as life support machine in Intensive Care Unit (ICT)
 - **Transport**
 - In transport, computers are used in the following ways
 - To monitor vehicle traffic in busy town
 - In aircraft navigation
 - In making reservation
 - **Communication**
 - Used in sending and receiving messages using internet, social media etc
 - **Law enforcement agencies**

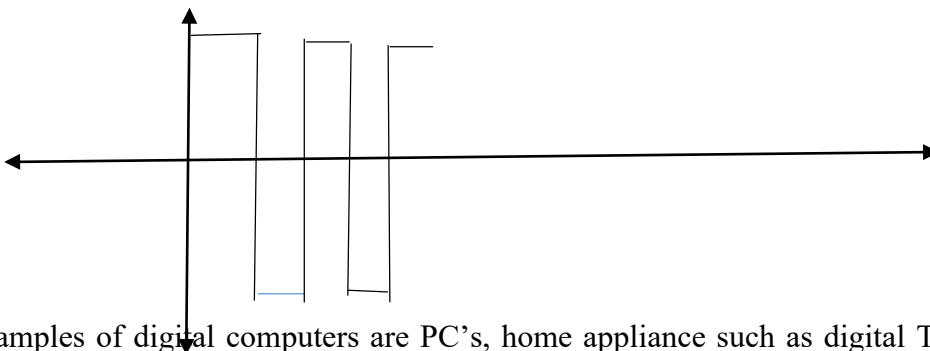
- Computers help law enforcers to carry out criminal investigation using information stored in computers such as fingerprint, images etc
- **Education**
- Computers are used in teaching and learning processes referred to as Computer Aided Learning (CAL) and Computer Aided Instruction (CAI)
- Computers are also used in online learning (e-learning)
- They are also used to demonstrate experiments in science subject, a process called simulation
- They are use in processing examination
- **Domestic and entertainment**
- Computers are used at home for recreation activities such as watching movies, playing music and computer games.
- They are also used in storing personal information
- Calculation and keeping home budget and research
- **Library**
- In library, computers are used in stock control i.e. keep details of books and other materials that are available in the library
- They are also used by library users to search for a reading material
- They are also used to manage lending and returning of books

CLASSIFICATION OF COMPUTERS

- Computers are classified into three classification
 1. According to data it processes
 2. According to size
 3. According purpose

Classification according to data it processes

- There are three types of computer according to data it processes and these are
- 1. **Digital computers**
- Digital computers processes data that is discrete in nature.
- Discrete data or digital data is represented by using two-state square waveform as shown below:



Examples of digital computers are PC's, home appliance such as digital TV, microwaves, wall clocks etc.

2. Analog computers

- These are computers that process data that is continuous in nature.
- Continuous data or analog data is represented using continuous waveform ads shown below:



Uses of analog computers

- Used in manufacturing process control like monitoring and regulating furnace temperature and pressure
- Used in other applications like weather stations to record and process physical quantities e.g. wind, cloud speed and temperature

3. Hybrid computers

- Hybrid computers are designed to process both analog and digital data.
- Example of hybrid computers are thermometer used to measure body temperature in hospitals, a pump used in filling stations to record price and litres of fuel

Comparison of digital and analog computers

- i Digital computers are simpler to develop than analog computers
- ii Digital computers are more reliable than analog computers
- iii Digital computers are smaller in size than analog computers of the same functionality
- iv Digital computers consume less power compared to analog computers

Classification according to size

- Based on physical size, computers can be classified into four main categories namely: Super computers, Mainframe computers, Minicomputers and Microcomputers.

1. Super computers

- These computers are characterized by
 - Fastest
 - Largest
 - Most expensive
 - Most powerful
- They are able to perform many operations in a second
- Because of weight, they are just kept in a special room
- Because of their huge processing power, they generate a lot of heat, therefore special cooling system is required. It is sometimes immersed in aquarium –like tank containing liquid fluocarbon to provide cooling.
- Super computers are mainly used for scientific research which requires enormous calculations
- Applications that requires use of super computers are aerodynamic design and simulation, petroleum research, defense and weapon analysis etc.
- Super computers are found in developed countries such as USA and Japan

2. Mainframe computers

- Mainframe are less powerful and less expensive than supercomputers
- While supercomputers are described as giant computers, mainframe computers are described as big in size
- Mainframe computers are used for processing data and performing complex mathematical calculations.
- They have large storage capacity and support many variety of peripherals.
- They handle all kind of problems: scientific or commercial
- They are mostly found in government agencies, big organizations and companies such as banks, hospitals and airports which have large information processing need

3. *Minicomputers*

- They resemble mainframe but they are slightly smaller. They are referred to as small-scale mainframe computers
- They support fewer peripheral devices and are not powerful ad fast as mainframe
- They are used mainly in scientific laboratories, research institution, engineering plants and places where processing automation is required.
- They have functions like accounting, word processing, database management and specific industry applications.

4. *Microcomputers*

- microcomputer is the smallest, cheapest and less powerful
- it is called microcomputer because its CPU is called microprocessor which is very small compared to minicomputer, mainframe computer and supercomputer.
- They are commonly used in training and learning institutions, small business enterprise, communication centres etc.
- The following are the examples of microcomputers used today
 - a. *Desktop computers*: Designed to be placed on top of an office desk
 - b. *Notebook or laptop computers*: Is portable PC hence convenient for mobile user
 - c. *Palmnote or Personal Digital Assistant (PDA)*: Is small enough to fit the pocket

Classification according to purpose

- Computers can be classified according to tasks they perform. There are two types:

1. *General purpose computers*

- General purpose computers are designed to variety of tasks when loaded with application programs.
- They are most type of computer in use today
- They perform tasks like word processing, calculations, accounting, information management etc.

2. *Special computers*

- Special computers are designed to serve a specific purpose or accomplish one task.
- Example of such computers are robot used in manufacturing industries, basic phone for voice communication only, electronic calculators
- Since special computers are dedicated to a single task, they perform task very quickly and very efficient.

Units of data representation

- Human beings communicate with one another using a special language made up of speech, vision, touch and written symbol
- However, this language is too complex for computers to understand

- In order for human being to communicate with computers, human language need to be changed into simpler language known as *machine language* which computer can understand
- Computers understand machine language which is represented by 0 and 1
- All data that is processed by the computer is represented in a form of binary numbers (0s and 1s).
- This number system is referred to as **binary number system**
- However, due to need to increase processing speed and reduce amount of space taken by data storage devices, other systems are used such as:
 1. Octal (made up numbers of 0-7)
 2. Hexadecimal (made up of number 0-15)

Data storage units

- Computer data can be measured and stored in various units. The basic unit is binary digit (bit)
- The following are definition for the various size
 - ❖ **Bits:** a bit is a binary digit which can either be 0 or 1. It is the smallest element of data in a computer
 - ❖ **Byte:** a byte is a group of 8 bits used to represent a single character in a computer
 - ❖ **Nibble:** a nibble is half a byte which is group of 4 bits
 - ❖ **Word:** is two or more bytes. It has 16bits, 32bits, 64bits etc
 - ❖ **Kilobyte:** a kilobyte is exactly 2^{10} bytes =1024. A kilobyte is approximately 1000 bytes
 - ❖ **Megabyte:** a megabyte is exactly 2^{20} bytes=1,048,576 bytes. A megabyte is approximately 1,000,000 byte or 1000 kilobyte
 - ❖ **Gigabyte:** a gigabyte is exactly 2^{30} = 1,073,741,824 byte. A gigabyte is approximately 1000 megabyte or 1 billion bytes.
 - ❖ **Terabyte:** a terabyte is exactly 2^{40} bytes = 1,099,511,627,776 bytes. A terabyte is approximately 1 trillion bytes or 1 thousand gigabyte

Converting between data units

- 1 byte = 8bits = 1 byte
- 1 kilobyte = 1000 byte = 1 thousand bytes
- 1 megabyte = 1000 kilobyte = 1 million bytes
- 1 gigabyte = 1000 megabyte = 1 billion bytes
- 1 terabyte = 1000 gigabyte = 1 trillion bytes

Character sets

- Data is entered in a computer in a form of character which can be numbers, alphabet or symbol.
- When you press a character e.g. A on the keyboard, the keyboard sends a signal made up of binary number to the computer e.g. 01110011
- To avoid confusion about what every unique sequence means in a world of computing, character set are developed to give universal meaning to the binary sequence.
- A character set converts a binary number/code to human readable form and vice versa
- It is character set that maps binary code to letter e.g. A on the keyboard
- The two character sets developed are:

1. *American Standard Code for Information Interchange (ASCII)*: It uses 7 bits to encode character in computer, communication equipment and other devices. It is mainly used to encode text character
2. *Extended Binary Coded Decimal Interchange Code (EBCDIC)*: It uses 8 bit to encode characters mainly in IB computers.

TOPIC 3: COMPUTER HARDWARE

TYPES OF COMPUTER COMPONENTS

- A computer is made up of two main components:
 1. Hardware
 2. Software
- Hardware is the physical or tangible component that make up a computer system.
- Software refers to set of instructions that direct a computer on what to do. Two types of software are system software and application software

Computer hardware

- A computer hardware is made up of the following components:
 1. Input devices
 2. Output devices
 3. Storage devices
 4. Communication devices
 5. The Central Processing Unit (CPU)
 6. System unit

● INPUT DEVICES

- Input devices convert user input which is in human readable form to machine language that a computer can process.
- Input devices are classified into four categories according to the method used to enter data as follows:
 1. Keying devices
 2. Pointing devices
 3. Scanning devices
 4. Other technologies used to capture data
- **Keying devices**
 - Keying devices are used to enter data into a computer. They convert typed numbers, letters and special characters into machine readable form before processing takes place.
 - The following are types of keying devices
 - a. **Traditional keyboard**: It is a full sized rigid keyboard



- b. **Flexible keyboard**: It is more portable keyboard that can be folded and packed into a bag



- c. **Ergonomic keyboard:** It is designed to provide comfort and alleviate wrist strain



- d. **Keypad:** It is miniature keyboard used on portable devices such as PDA, laptops and mobile phones.



- e. **Braille keyboard:** It is a keyboard designed for use by the blind. It consists of keys identified by raised dots



▪ **Pointing devices**

- Pointing devices are used for controlling a pointer cursor on the screen.
- Examples of pointing devices are
 1. Mouse
 2. Trackball
 3. Joystick
 4. Light pen and stylus

a. **Mouse**

- A mouse is a pointing device that enable the user to execute commands.
- It is used to control an arrow displayed on the screen
- It has two buttons: left and right button and optional scroll button
- The following are three types of mice
 - i *Standard mouse/traditional mouse*
- It has a ball underneath, two buttons and optional scroll buttons.
- The ball controls the movement of the cursor when the mouse is rolled



ii *optical mouse*

- It used light technology to control movement of the cursor on the screen.
- It uses a tiny digital camera to take 1,500 pictures every second.



iii Cordless mouse/wireless mouse

- Is a battery powered mouse that used radio or infrared waves instead of being physically connected to the system unit.
- It does not have a cord



b. Trackball

- A trackball works just like a mouse only that its ball is located at the top.
- The user rotates the ball using finger to move the cursor



Difference between mouse and trackball

1. The mouse has a ball underneath while a trackball has a mouse on top
2. To move the cursor using a mouse, you move the whole mouse on a flat surface while to move the cursor using the trackball, you rotate the ball using finger

c. Joystick

- A joystick is an input device that looks like lever and is used to control a pointer on the screen
- It is purposely used for playing computer games.
- The user controls the game action by varying pressure, speed and direction of the joystick



d. Light pen and stylus

- Light pen operates by detecting the command or item being illuminated by it
- A stylus is used on devices such as PDAs that recognize commands or handwritten data



■ Scanning devices

- Scanning means capturing data from an object and converting it into digital format.
- Scanning devices are classified into two according to technology used to capture data as
 1. Optical scanner
 2. Magnetic scanner

1. Optical scanner

- Optical scanners capture data using optical or light technology
- A light beam passes over an object and the image is analyzed by specialist software
- Three examples of optical scanners are
 1. *Optical mark recognition scanner (OMR)*
- Is used to detect marks made on a piece of paper using ink or soft pencil by passing infrared beam over them.
- OMR are used to mark multiple choice question, analyse responses to structured questionnaire and select correct number combination from lottery tickets.



2. *Optical Barcode Recognition (OBR)*

- These scanners are used to capture data coded as lines known as barcode or Universal Product Code (UPC)
- Barcode holds manufacturer's details and product code



OBR reader



Barcode

3. *Optical Character Recognition (OCR)*

- Is used to read typewritten, computer printed or handwritten characters and transforms the image into softcopy that can be manipulated using word processor
- Some advanced OCR called flat-bed scanners capture pictures and real objects



Flat-bed scanner with integrated OCR

2. Magnetic scanners

- Magnetic scanners are used to capture data written using magnetic ink or coded onto magnetic strip.
- Examples of magnetic scanners are:
 1. *Magnetic Ink Character Recognition (MICR)*
- Are used to read characters written using magnetic ink. An example is cheque reader used in banks



2. Digitizers

- Also known as graphic tablet allow a user to draw image using stylus



Other technology

1. Digital cameras

- Digital cameras capture data the same way other cameras do only that image is stored in digital form.
- Pictures are stored in memory card instead of a film.
- The stored image can then be edited, printed or uploaded on the internet



2. Touch screen

- Touch screen technology lets the user to touch the screen using finger or a stylus in order to write or select an item
- The screen consists of infrared light crisscrossing behind it. When the user touches the location on the screen, the finger interrupts the infrared light and the output is displayed on the screen
- Touch screen is mostly used in retail stores, airports, on smartphones and PDAs



3. Microphones

- A microphone is used to enter data in form of voice into the computer.
- This method is suitable for physically challenged users.
- However, it has disadvantage that it does not fully support speech related aspects such as tones unless it is trained to support this.

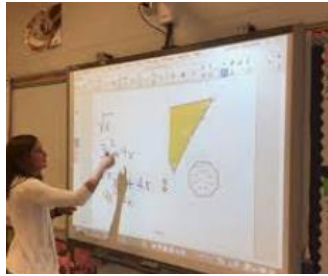


headset

4. Interactive whiteboard

- It is also called smartboard is a large interactive display that connect to a computer.

- The computer display is projected onto the board's surface where users control the computer and write using a pen or a finger.
- The board is mounted on wall or on floor stand
- Smartboards are used in places such as classrooms, corporate board rooms, seminars and broadcasting studios



- **OUTPUT DEVICES**

- Output devices are peripheral devices that a computer uses to display information after the processing operations.
- Output devices are classified into two
 1. Softcopy
 2. Hardcopy

Softcopy output devices

- Soft copy refers to intangible output that can be seen or heard
- Examples of soft copy output devices are
 - i Visual display unit(VDU)
 - ii Sound output devices
 - iii Data projectors
 - iv Light Emitting Diodes (LED)

- **Visual display unit/Monitor**

- Visual display unit also known as monitor or screen is used to display information in form of text, pictures and video.
- It is called a monitor because it enables the user to monitor or see what is going on in the computer
- There are three types of monitors:
 - a. *Cathode Ray Tube monitors (CRT)*
 - Consist of a long glass tube with an electron gun on one end and a screen on the other.
 - The electron gun shoots electrons to illuminate the screen and is coated tiny phosphorus dots
 - The dots consist of three primary colours: red, green and blue to make a pixel



- b. *Liquid Crystal Display (LCD) monitor*

- LCD is made of special liquid crystals

Advantage of LCD over CRT monitors

- LCD are less bulky than CRT
- They consume less power than CRT
- They have little strain effect of eyes than CRT



- Two technologies used to make LCD are
 1. Passive matrix
 2. Active matrix
- In passive matrix, LCD creates images by scanning the entire screen. This type of LCD requires little power but have poor clarity
- Active matrix display is made using thin film transistor technology, hence the name TFTs. These displays consume more energy than passive matrix but offer better clarity.
- Therefore, passive matrix consumes less power but have poor clarity while active matrix consumes more power but offers better clarity.

c. Gas plasma display

- Gas plasma display resembles LCD only that they make use of gas instead of liquid crystals
- They contain millions of pixels that are illuminated by charged neon gas
- Advantage of Gas plasma display over LCD is that images displayed on it do not suffer from angle distortion
- It is mainly used to produce high definition TV (HDTVs) and wall display screen



NOTE: Gas plasma display and LCD are generally referred to as flat-panel display

Monitor display terminologies

- **Pixel:** stand for picture element. Pixels are tiny dots which are used to form the image displayed on the screen. In colour monitor, pixels have red, green and blue colours
- **Colour depth:** refers to number of colours which can be displayed by a pixel. It is measured in bits
- **Resolution:** This is number of pixel per inch on the screen. It is given in dots per inch(dpi) or bits. The higher the resolution, the more the number of pixels per square inch hence the clear the picture.
- **Refresh rates:** Since CRTs cannot hold image for a long time, image in the video RAM is used to refresh the one on the screen. If the screen has low refresh rate, the image tends to flicker hence causing eyestrain.

- **Display size:** Is measured in inches as the diagonal length of the screen measured from top to bottom.

Video graphic adapters

- For monitor to display information, it must be connected through video port to a video adapter plugged on a motherboard.
- A video adapter determines the resolution and clarity of the monitors
- Examples of video adapters include:
 - a. *Colour graphic adapter (CGA)*: Is oldest type of adapter that displays text and images up to 16 colours
 - b. *Enhanced Graphic Adapter (EGA)*: Was an improvement of CGA but also displays in 16 colours
 - c. *Video Graphic Array (VGA)*: Displays text, graphics and video using 256 colours
 - d. *Super Video Graphic Array (SVGA)*: Display text and graphics using more than 16 million colours and has minimum resolution of 800×600 pixels
 - e. *Extended Graphic Array (XGA)*: Has resolution of up to 1024×768 pixels and is popular with 17 and 19 inch monitors
 - f. *Super Extended Graphic Array (SXGA)*: Has resolution of 1280×1024 pixels and is popular with 19 and 21 inch monitors
 - g. *Ultra Extended Graphic Array (UXGA)*: Is the latest and highest standard

- **Sound output devices**

- Sound output devices produces sounds such as beeps, audio or digital
- Some computers come with inbuilt speakers while some computers need external speakers which are connected to a sound card through the jacks on the system unit.



- **Data projector**

- Data projector are used to display output from a computer onto a plain white screen like a wall or whiteboard.



- **Light emitting diodes**

- Light Emitting Diode (LED) are indicators that display light when an electric current is passed through them.
- An example is light displayed on CPU when computer is powered on.
- LEDs are used to give warnings the same way motorists use signals to indicate whether he/she is overtaking or taking a turn.

HARDCOPY OUTPUT

- Hard copy refers to tangible output that can be felt such as paper.
- Two examples of hard copy output devices are:
 1. Printers
 2. Plotter

● Printers

- Printers are used to produce information on a piece of paper.
- Printers are classified according to different printing mechanisms
- The two categories of printers are:
 1. Impact printer
 2. Non-impact printer

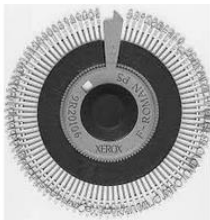
Impact printer

- Impact printers print using striking mechanism.
- This means that they strike on a paper in order to form an imprint on it.
- Two example of impact printers are:
 - a. Dot matrix printers**
- Has a set of pins on printer's head which strike on an ink ribbon placed over the paper.



b. Daisy wheel printers

- Has removable flower-like wheel consisting of spokes with embossed characters. When printing, the wheel rotates to align the required character and then character is hit with a hammer.



Advantage

- Cheaper to run
- Print for a long time without breaking

Disadvantage

- They produce low quality printout

Non-impact printer

- Non-impact printers are faster and more quite that impact printers
- They print using ink, thermal or laser mechanisms.
- The four types of non-impact printers are:

a. Inkjet printers

- It prints by spraying tiny ink droplets onto a paper to create an image.
- A colour inkjet printer has black and tricolor cartilage that contains cyan, magenta and yellow (CMY) compartments.
- The cartilage has nozzle that spray ink on the paper



Advantages

- Cheaper to purchase
- Produce better quality printout

Disadvantages

- Expensive to run due to high cost of replacing the cartilage

b. Thermal printers

- It uses thermal technology to heat ink which is normally in wax or resin form to melting point before fusing it onto the paper
- It is used in point of sale terminals (shops) to prints receipts and barcodes



Advantages:

- Produce high quality printout

Disadvantages

- Expensive to purchase and run

c. Laser printers

- Laser printer operate by shining a laser beam to create an image on a rotating drum
- As the beam hit the drum, it ionizes some regions which attract ink toner particles
- The toner is then fused onto a piece of paper through heating.



Advantages

- Very fast compared to the others

- Cheaper to run
- Produce high quality printouts

Disadvantages

- Expensive to purchase

d. Photo printer

- Photo printers are used to print photos



Factors to consider when purchasing a printer

1. *Print quality*: dot matrix printer is good for bulk printing of draft documents; laser is good for official documents while thermal printer is good for checkout counter receipts
2. *Initial cost*: Laser and thermal printers are expensive than inkjet
3. *Running cost*: The cost of maintaining inkjet printer is higher than that of maintaining laser printers
4. *Speed*: The speed of a printer is measured in terms of the number of pages it can print per minute
5. *Colour printing*: Most printers support black and colour printing. However, colour printers are expensive.

- **Plotters**

- A plotter is a large type of hard copy output device.
- They are mostly used for printing geographical, architectural and engineering drawings such as maps, advertisements posters to be placed on billboards, machine parts etc



SECONDARY STORAGE DEVICES

- Secondary devices also called auxiliary storage are devices that provide long-term storage for programs, data and information.
- They are called secondary devices because they are not directly accessible by the CPU.
- Secondary devices can be classified according to:
 1. Portable/removable and fixed

2. Technology used to store and retrieve data such as magnetic, optical, magneto-optical and solid state

Removable storage devices

- Removable storage devices are those that are not housed inside the computer.
- Data is read and written using drive
- Examples of removable storage include
 1. Magnetic tapes
 2. Floppy disks
 3. Optical disks
 4. Solid state

Magnetic tapes

- Magnetic storage is made using a thin ribbon of Mylar, coated with a thin layer of magnetic materials composed of iron oxide.
- The tape is housed inside plastic cartilage
- Data is read and written using tape drive
- Examples of magnetic tape are: reel to reel tapes, cassette tapes and cartilage tape



Disadvantages of using magnetic tapes

- They are slow because of the linear storage data records on the tape
- There is a space between a successive data records called Inter-record Gap (IRG) which result in wastage of storage space

Floppy disks

- A floppy disk of diskette is made of a small flexible round disk coated with magnetic iron oxide
- The disk is covered with a plastic protective case.
- It is now becoming unpopular sue to presence of flash disks



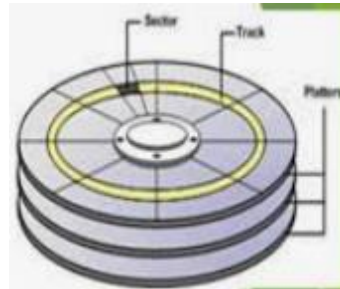
Reading/writing to a floppy diskette

- Reading from a disk means converting magnetic sports of data from the diskette into signals for retrieval

- Writing to a floppy means converting signals into magnetic spots and storing them onto the available space on the diskette
- Floppy drives are used to read data from the floppy

Structure of a disk platter

- The surface of the disk is divided into tiny invisible concentric circles called tracks that store data
- The tracks are further divided into units called sectors as shown below:



Zip disks

- A zip disk is high capacity magnetic disk that resembles a floppy disk.
- A zip disk has higher storage capacity and is physically thicker compared to floppy disk
- Zip disk can hold data up to 250MB of data



Jaz disks

- Jaz disks resembles zip disks only that they can hold as much data as 2GB.
- Data is read and written using external or internal jaz drive

High capacity floppy

- Simply known as HiFD are high capacity diskette that can store data up to 200MB of data

Laser Servo 120 superDisks

- Laser Servo 120 SuperDisk technology (LS-120) is diskette that resembles the 3.5 inch diskette but uses optical technology.
- It has greater storage capacity and speed of data retrieval
- The LS-120 drive read and write both 3.5 inch floppy and 120 MB superdisk

Care of magnetic storage media

- To avoid accidental loss of data or information held on magnetic media, the following rules must be observed:
 1. Do not expose magnetic media to strong magnetic field
 2. Do not expose magnetic media to excessive heat. Heat energy lead to loss of magnetic strength hence data loss
 3. Do not drop magnetic media on the ground because it weakens magnetism

4. Do not bend or fold magnetic media or put heavy weight on it to avoid breaking or damaging it
5. Do not touch the magnetic surface
6. Do not remove a media from the drive when it is being accessed by the computer because it may result in data loss

Optical storage media

- They are called optical storage media because data is read and written from them using a laser beam.
- There are two reasons why optical storage are used:
 1. They store every large volume of data
 2. Data stored in them is more stable and more permanent than magnetic media

Compact disks (CD)

- Compact disks hold large quantity of data and information of 700 MB
- Compact disks are available in three forms:
 1. **Compact disk-read only memory (CD-ROM)**
 - Contains data that can only be read but not written
 - To record data, the recording surface is made into pits and lands (bumps)
 - When laser beam falls on the land, this is interpreted as 1, otherwise a zero is recorded.
 2. **Compact disk-recordable (CD-R)**
 - CD-R is coated with a special dye which changes colour to represent data when burned using laser beam.
 - Once data is burned in CD-R, it becomes read only

NOTE: CD-ROM and CD-R are referred to as Write Once Read Many (WORM) because data is recorded once and read many times

3. **Compact disk-rewritable (CD-RW)**
 - CD-RW allows the user to record and rewrite new information

Digital Versatile Disks (DVD)

- It is also called Digital Video Disk
- It resembles the CD only that DVD has higher storage capacity of up to 17GB
- They are suitable for recording motion pictures and video because they offer better sound and picture quality than CD

Optical cards

- An optical card resembles a MICR card but data is read and written optically on a stripe
- These types of cards are used in banking and other business organizations to record customer details

Solid state storage media

- Is a non-volatile storage that employs integrated circuit rather than mechanical, magnetic or optical technology.
- They are referred to as solid state because they do not have movable parts
- Examples of solid state devices are memory sticks and flash disks



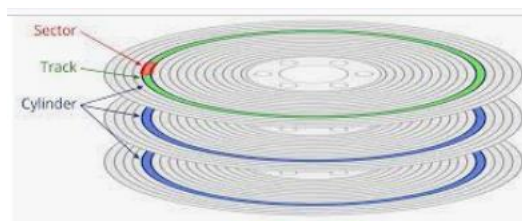
Hard disk

- A hard disk is mounted inside the computer. As a result, it is referred as fixed disk
- However, some hard disks are removable and are called external hard drive
- A hard disk is also called hard drive
- Most hard disks are connected to a motherboard via a channel called *controller*.
- Some of these controllers are Integrated Drive Electronic (IDE), Enhanced IDE (EIDE) or AT attachment (ATA)



Structure of hard disk platters

- A hard disk contains one or more metallic platters, stack on top of each other but not touching one another
- The stack of platters is attached to a rotating pole called *spindle*
- It has more than one platter, they are stacked on top of one another to form a cylinder



- As the disk rotate, the read/write head move in and out over the surface to record or read data.
- Hard disk provides efficient data transfer and large storage capacity

THE CENTRAL PROCESSING UNIT

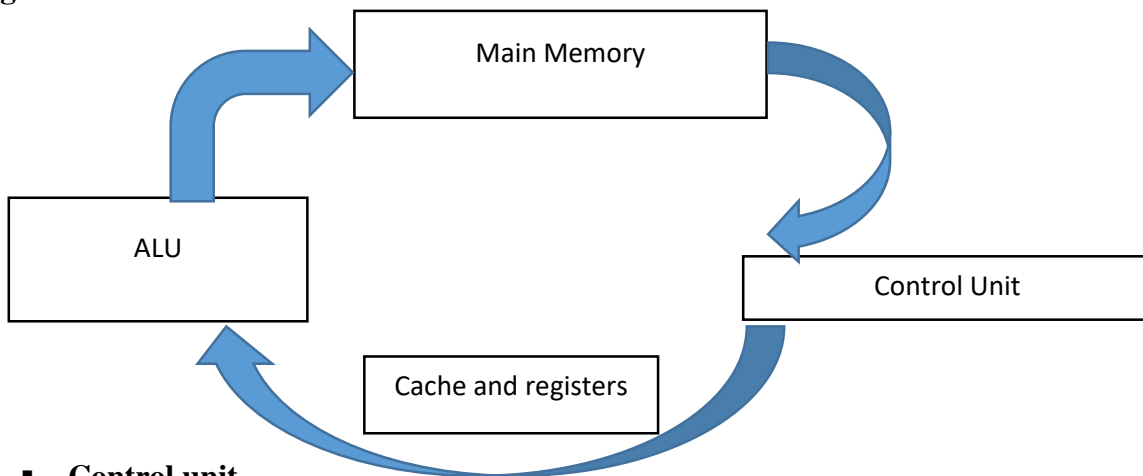
- The Central Processing Unit (CPU) also known as processor is the most important component of the computer
- It is regarded as the brain of the computer because all processing activities are carried out inside the processor.
- In microcomputer, the CPU is housed inside the system unit. It is mounted on the motherboard

Components of CPU

- The CPU consists of three functional elements namely
 1. The control unit

2. Arithmetic and Logic Unit (ALU)
3. Main memory

Figure below illustrate the functional elements of a CPU



▪ **Control unit**

- Control unit coordinates all processing activities in the CPU as well as input and output operations
- It determines which operation or instruction is to be executed next
- To coordinates these activities, the control unit uses *system clock*
- The system clock sends electric signal as means of communication
- The number of pulses per second determine the speed of the microprocessor
- The faster the clock pulses, the faster the CPU, hence the faster the computer can process data.

▪ **Arithmetic and Logic Unit (ALU)**

- ALU is unit of CPU where all arithmetic and logical operations are carried out
- The basic arithmetic operations are addition, subtraction, division, multiplication
- Logical operations are computer’s capacity to compare two or more values e.g. greater than, less than etc
- In order for the ALU to be able to process data, it has special temporary storage called registers which holds data before and after processing

▪ **Main memory**

- Main memory also known as primary storage is a type of storage that is directly accessible by the CPU
- Two types of main memory are
 - A. Random Access Memory (RAM)
 - B. Read Only Memory (ROM)

1. Read Only Memory (ROM)

- ROM is used to store programmed instructions and data permanently or semi-permanently.
- Data and instructions stored in ROM are those which remain unchanged for a long period of time like POST instructions, special purpose computers and computerize fuel pumps



- Depending on permanence of the instructions or data written on it, there are four types of ROM namely
 - a. *Mask Read Only Memory (MROM)*: Once the content is written on it by the manufacturer, it cannot be changed.
 - b. *Programmable Read Only Memory (PROM)*: This allows the user to change the data only once after content is written on it
 - c. *Erasable Programmable Read Only Memory (EPROM)*: Its content can be erased by exposing it to ultra violet (UV) light and then reprogrammed for another use
 - d. *Electrically Erasable Programmable Read Only Memory (EEPROM)*: This type of ROM can be erased and reprogrammed using electricity. An example is memory that stores BIOS

Characteristics of Read Only Memory

- One can only read its content but cannot write on it unless is special type of ROM
- It is non-volatile, i.e. its content is not lost when computer is switched off
- It stores permanent or semi-permanent instruction from the manufacturer called *firmware*
- Its content is manufacturer defined f

2. Random Access Memory (RAM)

- Random Access memory also known as working storage is used to hold instruction and data needed by the currently running application.
- The information in RAM is continuously read changed and removed
- It is referred to as random because its content can be read directly regardless of sequence in which it was stored
- Content in Ram is temporary and is lost once the computer is turned off



Characteristics of RAM

- Data in RAM can be both read and written
- RAM is temporary/volatile storage because its content is lost once the computer is turned off
- Its content is user defined i.e. the user dictates what is to be contained in RAM'

Types of RAM

- There are three types of RAM and these are

1. Static RAM (SRAM)

- Is faster type of memory located inside microprocessor
- For this reason, it is used on special purpose memory called cache memory
- Cache memory is used to enhance processing speed by holding data and instructions that are instantly required by the processor

2. Dynamic RAM (DRAM)

- DRAM is relatively slower compared to SRAM
- The term dynamic refers to the tendency for the stored charge to leak away, even with constant power supply
- For this reason, DRAM requires periodic refreshing to maintain its data storage

3. Rambus RAM

- This is latest and fastest RAM in terms of response time

Special purpose memories

- The special memories are as follows;

1. Cache memory

- This is the fast type of memory
- Cache memory is used to enhance processing speed by holding data and instructions that are instantly required by the processor
- The three types of cache memory are:
 - a. *Level 1*: also known as primary cache is located inside microprocessor
 - b. *Level 2*: also known as external cache may be inside microprocessor or mounted on the motherboard
 - c. *Level 3*: Is the latest type of cache that works with level 2 cache to optimize system performance

2. Buffers

- Buffers are special memories that are found in input/output devices
- Input data is held in the input buffers while processed output is held in output buffers e.g. buffers that stores documents being printed

3. Registers

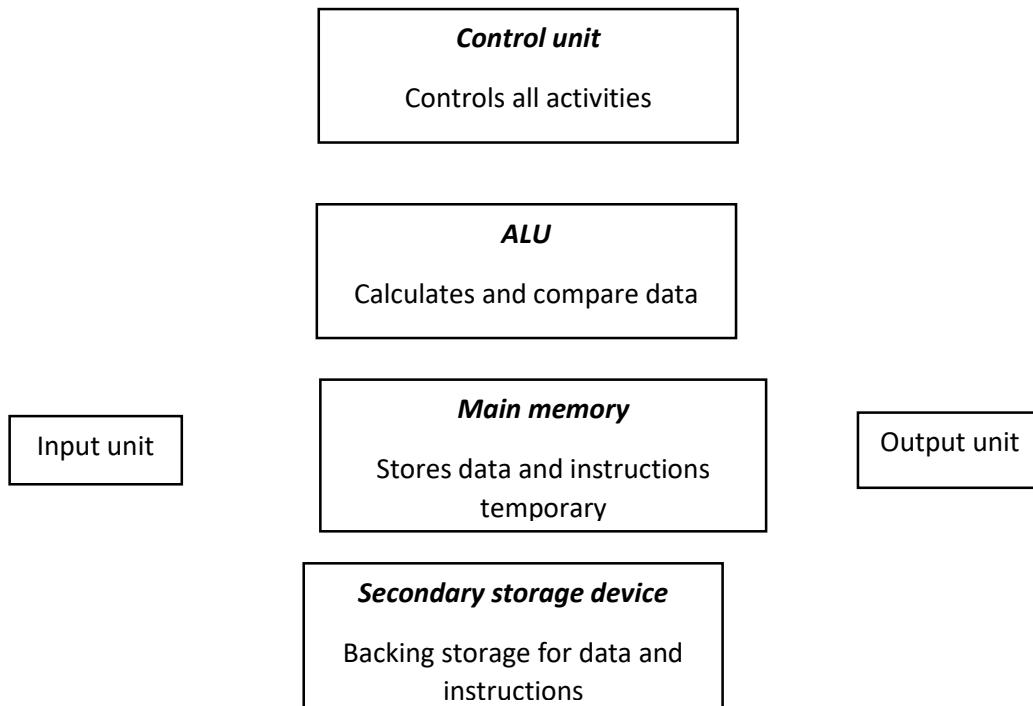
- As opposed to buffers, registers hold one piece of data at a time and are inside the CPU.
- Examples of registers are:
 - a. *Accumulator*: This temporary holds the results of the last processing step of the ALU
 - b. *Instruction register*: This temporarily hold an instruction just before it is interpreted into a form that a CPU can understand
 - c. *Address register*: This temporarily holds the next piece of data waiting to be processed
 - d. *Storage register*: This temporarily holds a piece of data that is on its way to and from the CPU and main memory

Memory capacity

- Memory and storage capacity is measured in special units called *bytes*.
- A byte is equivalent to single character. For example, 2345 has **4** bytes while the word *my home* has **7** bytes and the sentence *this is my name.* has **16** bytes
- Memory quantities can be expressed in
 - Kilobyte (KB) is approximately 1000 bytes
 - Megabyte (MB) is approximately one million bytes
 - Gigabyte (GB): Is approximately one billion bytes
 - Terabytes (TB): Is approximately one trillion bytes

Overall functional organization of a CPU

Figure below summarises the overall functional organization of a CPU and how it controls other computer components



- The ALU, control unit and main memory use electrical pathways or links called *buses*.
- There are **three** types of buses
 1. *Control bus*: This is a pathway for all timing and controlling functions sent by the control unit to other parts of the system
 2. *Address bus*: This is the pathway used to locate the storage position in the memory where the next instruction data to be processed is held
 3. *Data bus*: This is the pathway where the actual data transfer takes place

NOTE: The difference between primary storage (main memory) and secondary storage (auxiliary storage) is that

1. Primary storage stores data temporarily while secondary storage stores data permanent
2. Primary storage is directly accessible by the CPU while the secondary storage is not directly accessible by the CPU

COMMUNICATION DEVICES

- These are devices that enables communication between two or more computers
- The three examples of communication devices are:
 - 1. Network Interface Card (NIC)**
 - NIC provides physical connection between the computer and the transmission media.
 - It has port through which you connect cables from other computers
 - Data moves through the NIC and the cable to other devices



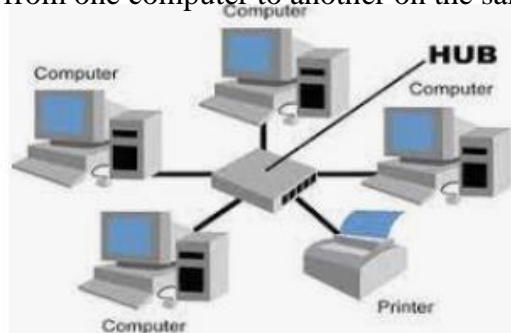
- 2. MODEM (Modulator Demodulator)**

- A modem is a device that convert computer signals from and to form that is suitable for the transmission e.g. from digital to analog and vice versa.



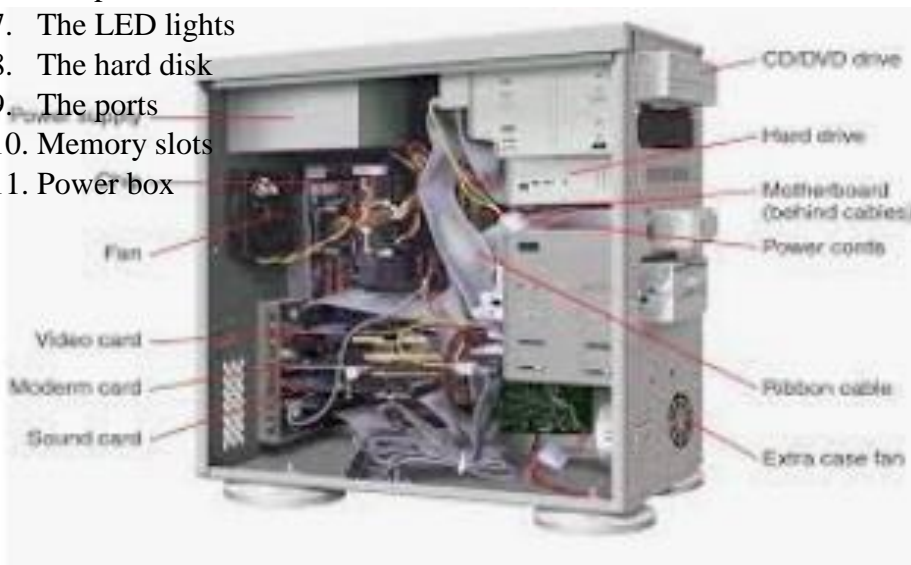
3. Hubs

- A hub is a device that connects computers on a network
- It relays information from one computer to another on the same network\



COMPONENTS OF A SYSTEM UNIT

- A system unit has many components; some are hidden inside the system unit.
 - Below are the components
1. The power button
 2. The motherboard
 3. The data cables
 4. Integrated circuit (IC) chips
 5. The processor
 6. The power cables
 7. The LED lights
 8. The hard disk
 9. The ports
 10. Memory slots
 11. Power box



Ports and interface cables

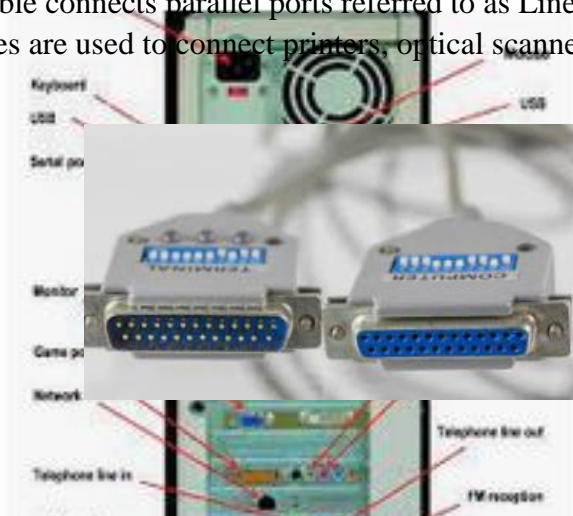
- Peripheral devices are connected to the system unit through *port* using either cables or wireless connectivity
- Figure below shows the back of the CPU where peripheral devices are connected



Types of interfaces/ports

1. Parallel interface

- Parallel cables transmit information simultaneously using a set of many conductors (wires).
- The advantage of parallel cables is that they transmit data faster over a short distance.
- A parallel cable connects parallel ports referred to as Line Printer (LPT).
- Parallel cables are used to connect printers, optical scanners, and other removable storage devices such as zip drives.



2. Serial ports

- Serial port also referred to as COM or RS232 port transmit data one bit at a time
- Serial ports are slower than parallel port
- However, serial cables are more reliable than parallel port because they transmit data over a long distance of 15m away
- Serial cables connect devices such as mouse and some printers



3. Universal Serial Bus (USB) interface

- USB is a new standard serial bus that is set to replace parallel and serial cables
- Although it transmits 1bit at a time, it provides high speed and quality data transmission over a long distance of 5m
- There are two types of USB namely: **Low speed USB** and **High speed USB**

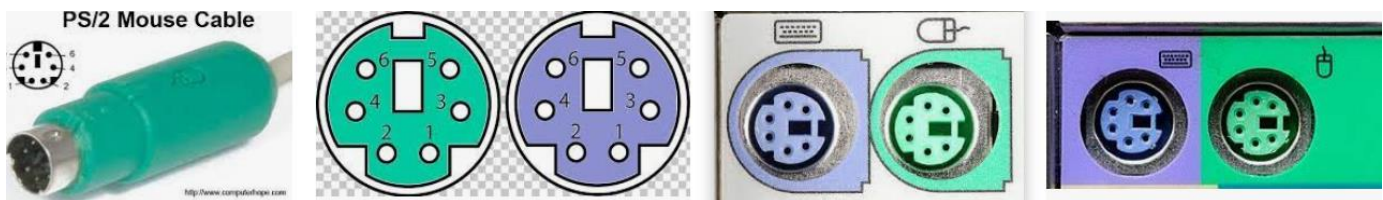


4. Small computer system Interface (SCSI)

- SCSI interface cable transmit data in parallel but are faster than the parallel cables
- Another advantage of SCSI port is that it allows us to connect multiple devices

5. Personal system 2 (PS/2) interface

- It is used to connect mouse and keyboard using 5-pin



6. Video graphic array (VGA) interface

- VGA interface is used to connect monitor or a data projector
- It has 15 pins



7. Audio interface

- These are used to connect speakers and microphones
- The sound output is green while the sound input is pink

8. Firewire interface

- It has same features as USB but transfer data faster than USB
- It is mostly used for streaming video from a digital video camera

Table below shows list of ports and their corresponding symbols

| Symbol | Port |
|--------|-------------------|
| | Parallel |
| | Serial |
| | USB |
| | SCSI |
| | PS/2 for mouse |
| | PS/2 for Keyboard |

Fig 2.28: Port symbols

Switching On and Off the computer

Cold booting a computer

- Once you turn on a computer, it automatically goes through a process of self-test and preparing for use. This process is called *cold booting* or *bootup*
- Once you turn on a computer, you may hear the sound of a cooler fan running. After few seconds, lines of text start scrolling up on the screen. This process is referred to as Power-On-Self-Test (POST)
- POST check the existing drive, basic input and output devices such as keyboard, monitor and mouse. If the problem is encountered, the process is halted and an error message is displaced on the screen
- POST is accomplished by a special firmware program called Basic Input/output System (BIOS) which is held in the ROM chip mounted on the motherboard
- After POST, the computer reads some instructions such as the current date and time from a special memory known as Complementary Metal-Oxide Semiconductor (CMOS)
- CMOS is powered by a dry cell that mostly resembles that of digital watch. If the cell is depleted, the computer requires the user to enter the current date and time
- Lastly, a special type of computer program used to manage computers called Operating System is loaded in the computer memory.

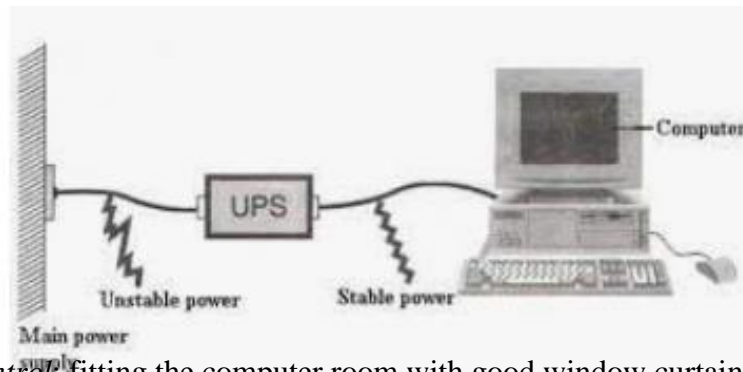
TOPIC 4: SAFE USE OF A COMPUTER

PROTECTION OF COMPUTERS AND USERS

- Computers are delicate devices that need to be handled carefully

Measures that protect hardware and software

1. *Burglar proofing the room:* This include fitting grills on doors, windows and the roof to deter forceful entry into a computer room
2. *Installing intrusion detection alarm system and employing security guards*
3. *Installing fire prevention and control equipment* such as smoke detector, non-liquid based and non-powder based fire extinguisher. The recommended extinguisher is gaseous because liquid can cause rusting and corrosion of computer components
4. *Protect the computers from too high temperature and too low temperature.* High temperature affect proper functioning of the computer chips. Too low temperature affects proper functioning of computer components
5. *The room should be well laid out with enough space for movement.* Computers should be placed on a stable, wide desk to avoid accidentally knocking them down.
6. *Use proper procedure for switching off the computer* to avoid losing data and destroying software.
7. *Protect computers from power surges and low voltage due to power instability by connecting it to Uninterruptible Power Supply (UPS).* The UPS serves two functions: Protecting computers from power surges and low voltage and provide power to the computer when there is blackout to allow a user to save his/her work



8. *Dust and damp control:* fitting the computer room with good window curtains and air conditioning system. Cover the computers with dust cover when not in use. Dampness or humidity is controlled by using humidifiers. Humidity causes rusting of the computers parts
9. *Insulating power cables:* Cables and power sockets should be well insulated and with correct power rating to avoid short circuit that can damage the computers
10. *Avoid taking meals in the laboratory:* Users should not eat or drink in the laboratory. Food particles may fall in moving parts like keyboards and clog them while liquid may pour into electrical circuit and cause short circuit

Measures that protect users from hazards

1. *Protect against electric shock:* All cables should be insulated to avoid electric shock. Cables should be laid away from user path to avoid tripping on them
2. *Use of standard furniture:* Users should use standard furniture to avoid poor posture which may lead to stain injury and limb fatigue. The table should be of right height and the seat should have backrest and high so that the eye =es of the user should be in good level with the screen
3. *Light control:* Wear antiglare screens (light filters) and adjust screen light to avoid eye strain and fatigue caused by overbright CTR monitors. Or use LCD monitors instead of CTR monitors
4. *Ventilation:* The room should be properly ventilated to avoid dizziness caused by lack of enough oxygen and to allow the computers to cool

5. *The walls of the room should not be painted with overbright reflective oil paints and the screen should face away from the window to avoid glare caused by bright background*
6. *Overcrowding: Avoid overcrowding in the computer lab to avoid suffocation or spread of communicable diseases*
7. *Taking a regular break at least after every 40 min*

Environmental hazards

- Always follow the right procedure when disposing the computer wastes to avoid polluting the environment
- Use devices that have energy star policy that encourage minimal use of power by electric device

Causes of software and data loss

- Data loss or software loss is the unexpected or accidental loss of data or software stored in storage media.
- There are many causes of data or software loss and these are:
 - *Accidental deletion:* This is when you accidentally delete a file or program from your hard drive unintentionally
 - *Malicious deletion:* This is when you delete a file intentionally and later on you want the file back. You can recover it by restoring from the recycle bin. Use data recovery software if you emptied the recycle bin
 - *Accidental media format:* Users accidentally format their drive and this result in loss of data or program. Get help from data recovery expert to recover it
 - *Accidental damage:* If the drive or disk is mishandled or accidentally dropped, it may cause data or program loss
 - *Natural disaster:* Drive may be damaged due to fire, floods or some other unforeseen disasters. Have an off-site backup to avoid this loss.
 - *Power failure:* If you experience power failure before you save your work, you may lose your data. Use UPS that gives you chance to save your data before the computer shuts down
 - *Hardware failure:* This may include complete computer failure or failure of component such as hard drive. Use UPS to protect the computer.
 - *Software failure:* When your application suddenly crashes or freezes while you are working on it, may result in severe damage to your hard drive. This causes the program to close suddenly and all unsaved work is lost. Regularly, save your data
 - *Vandalism:* Data may be destroyed or stolen by professional hackers. Put strong passwords enforce strong physical and data security.

Measures against loss of data and software

1. Install up-to-date antivirus in the computers
2. Make sure you scan all external storage media and email for virus before opening
3. Take regular backups of all the important data and software
4. Connect the computers to UPS to prevent data and software loss during power surges
5. All the data must be properly saved and the computer must be safely shutdown
6. Enforce physical security to avoid theft of computers and computer components
7. Use trusted software to avoid corrupting the operating system.
8. Write protect the storage media so that only the trusted users can save content on the storage media
9. Handle the storage devices and media with care to avoid damage due to dropping, dust, heat or magnetic effect

COMPUTER VIRUSES

- A computer virus is a program that loads itself without permission onto the computer and when executed replicates by making copies of itself into other files.
- Virus perform harmful activities on the computer such as
 - Issuing unauthorized commands
 - Deleting data
 - Stealing information
 - Making computer respond slowly to commands
 - Taking up computer space

Types of viruses

- Computer viruses are categorized according to how they function or how they get access to computer such as
- 1. Trojan horse**
 - This virus appears to do useful desired function but does other harmful activities like stealing data files and sending them to unauthorized parties
 - It can be downloaded by the user or installed from removable media
 - 2. Worms**
 - This virus replicates itself and moves from one computer to another through communication links like Bluetooth, email attachment.
 - 3. Boot sector virus**
 - It attaches itself to a boot strap of the hard disk and prevent the computer from booting correctly.
 - It is spread through storage media
 - 4. Memory resident viruses**
 - This virus resides inside RAM (Random Access memory) making the computer not respond correctly
 - 5. Rootkit viruses**
 - These viruses try to open up a computer for access by external entities.
 - They give unlimited access to unauthorized user. They are sometimes installed by Trojan
 - 6. Macro viruses**
 - These viruses attach themselves to another application macro-programming code.
 - They infect other computer applications usually a word or excel program
 - 7. Logic bomb/time bomb**
 - This type of virus is programmed to take a particular action on a particular date or when a certain event takes place.
 - The difference between Logic bomb and time bomb is that a Logic bomb is programmed to take a particular action when a certain event takes place while Time bomb is programmed to take place on a particular data and time
 - 8. Back doors/trap doors**
 - These viruses are Trojan that open up a security vulnerability for unauthorized users to access the computer without knowledge of the authorized user

How are viruses spread?

1. Sharing of removable storage devices like disks, flash and hard drive
2. Opening emails that are infected then the virus infects the host computer
3. Installing strange software on the computer without validating its sources
4. Accepting software updates from unvalidated sources

Measures to control/prevent viruses infection

1. Avoid sharing removable storage media. When sharing, scan the media for virus infection before reading files from it
2. Avoid opening unsolicited for email offers or installing software from questionable sources
3. Install a good antivirus software.
How antivirus works to clean viruses? It reads the digital signature of a virus, recognize it and uses the information it has about the virus to clean it from the computer. Some viruses are polymorphic and metamorphic that they keep on changing their code and digital signature every time they replicate in order to hide itself.

TOPIC 5: COMPUTER SOFTWARE

- Software is the set of instruction that guide a computer on what to do.
- Examples of software are:
 - Microsoft windows
 - Linx
 - Unix
 - Microsoft office
 - Adobe Photoshop
 - Adobe Illustrator
 - QuickBooks

Classification of software

- Generally, software is classified into three classification
 1. According to purpose
 2. According to acquisition
 3. According to End-User-License (EUL)

a. Classification of software according to purpose

- Computer software may be designed to manage hardware or to accomplish specific task.
- Therefore, there are **two** types of software classified according to purpose
 1. System software: Designed to manage hardware resources
 2. Application software: Designed to accomplish specific task
- **System software**
 - System software performs a variety of fundamental operations that avil computer resources to the user.
 - The functions of system software are:
 1. Booting the computer and making sure that all the hardware elements are working properly
 2. Performing operations such as retrieving, loading, executing and storing application programs
 3. Storing and retrieving files
 4. Performing a variety of system utility functions

Types of system software

- System software is divided into the following sub-categories
 1. Operating system
 2. Firmware
 3. Utility programs
 4. Language translator

Operating system

- An operating system controls execution of user programs and act as a go between (interface) between the application, the user and the computer hardware.
- It manages input, output and storage operations in the computers.

- Examples of operating system are: Microsoft windows (XP, 2000, vista, 7,8,10), UNIX, Linux and Macintosh (MacOS)

Firmware

- A firmware also called stored logic is combination of both hardware and software recorded permanently of electronic chips.
- A firmware is a read-only memory chip that is mounted or plugged into a motherboard
- Firmware holds the operating system, utility programs and language translator

Utility programs

- Utility program is a special program that performs commonly used services that make certain aspects of computing go on smoothly.
- Such services include copying, sorting, file handling and disk management
- The two types of utility programs are:
 - a. *System-level utility*: These help the user work with the operating system and its function. For example, it tells a user when he enters wrong command
 - b. *Application –level utility*: These make applications programs run more smoothly and efficiently

Language translator

- This is a processor or a utility that translates a computer program written using a programming language into a form that a computer can understand referred to as machine language
- The three categories of language translators are: *Assemblers, Interpreters and compilers*

- **Application software**

- Application software are programs that are designed to help user accomplish specific task
- **Examples of application software are**

| SOFTWARE | USERS | EXAMPLES |
|-----------------------|--|--|
| Word processors | Typing documents like letters | Word, Lotus, Wordpro, OpenOffice Writer |
| Spreadsheet | Calculating budget | Ms excel, Lots 1-2-3 |
| Desktop publishing | Designing publications like newspapers and books | Adobe PageMaker, MsPublisher, Adobe InDesign |
| Computer aided design | Technical drawing | AutoCAD |
| Database | Keeping records and files | Ms. Access, MySQL. FoxBase, Paradox |
| Graphic design | Designing and manipulating graphics | Corel draw, Photoshop |

b. Classification according to acquisition

- There are two types of software classified according to acquisition and these are:
 - 1. in-house developed software**
 - These are programs that are uniquely designed and tailored to meet a particular user’s needs
 - For example, a bank hires a programmer to develop system that help manage its operations
 - In-house developed programs are not available in shops and once developed for a company or user, they may not address the needs of other users
 - 2. Vendor off-the-shelf software**
 - These software are developed by engineers, packaged and made available in shops through vendors
 - A developer may bundle more than one software into one package to form suite or integrated software e.g. Microsoft office suite, Lotus suite etc. or may sell as single-purpose software e.g. QuickBooks, Opera, VLC media etc.

Advantages of standard software (vender off-the-shelf) over in-housed developed software

1. They can easily be installed and run
2. They are cheap than in-house developed software
3. They are readily available for almost any task
4. They have minor or no errors since they are thoroughly tested
5. They can easily be modified to meet a user' needs

However, some of the drawbacks of vendor off-the-shelf software are

1. They may have some features not needed by the user which may waste computer space
2. They may require the user to change processes and hardware for compatibility which may turn be expensive
3. They may lack some features required by the user

c. Classification according to End-User-License

- There are three types of software classified according to end user license and these are:

1. Open source/non-proprietary software

- This is software whose source code is freely made available to users.
- The users can use, modify and distribute the modified product
- Examples of open source software are Linux operating system, OpenOffice

2. Proprietary software

- These are software whose source code are hidden from users
- Modification is only made by the manufacturer
- Examples of proprietary software is Microsoft Windows, Microsoft Office

3. Freeware software

- These are software that are made available freely to users on the internet
- Examples of these software are free antivirus. Beware when downloading these because some may be malicious software

TOPIC 6: OPERATING SYSTEM

- Operating system is the main program that control execution of user application and enables the user to access hardware and software resources of the computers
- The operating system is very important without which computers can do barely nothing
- It acts as a mediator between the user and the computer hardware
- User applications do not communicate directly with hardware devices instead they send messages via operating system which give instruction to the hardware to perform a particular task
- Figure below shows the view of interaction of the user with the application software and the hardware; with the operating system as a mediator

Types of Operating System

- Operating system is classified into three
 1. According to number of tasks
 2. According to number of users
 3. According to user interface

▪ **Classification according to number of tasks**

1. Single program operating system

- Single program/single task operating system allows processing of one application program in the main memory at a time.
- This means that the user can only one interactive program at a time. The user must exit the program before loading and running another program

- An example of single program operating system is Ms DOS from Microsoft Corporation

2. *Multitasking operating system*

- A multitask operating system allows a single CPU to execute what appears to be more than one application program at the same time.
- Through processor scheduling, the operating system allocates time slice to each ready task

▪ **Classification according to number of users**

1. *Single-user operating system*

- Single user operating system is designed for use by only one person at a time. It cannot support more than one user and run only one application at a time.
- Example of single-user operating system are Palm OS and Ms-DOS.

2. *Multi-user operating system*

- Multi-user or multi-access operating system allows more than one user to interactively use the computer
- An example is server operating system which is accessed by all employees at the company. Other examples are UNIX, Novel, Windows NT/2000 and linux.

▪ **Classification according to interface**

- The term user interface refers to the interaction between the user and the computer
- The interface needs to be user friendly. According to user interface, operating system is classified into three types

1. *Command-line operating system*

- A command-line operating system lets the user type a command at a command prompt
- The computer reads the typed command and execute it
- An example of command ***COPY C:\fruits.Dat A*** means copy a file called fruit.Dat from hard disk C to floppy disk A
- Examples of command-line operating system are: early version of Ms DOS, PC DOS, OS/2 and UNIX

Reasons why command-line operating system have become unpopular today

- It is difficult to remember the command they use
- They cannot process complex graphics
- They hardly make use of emerging hardware and software

2. *Menu driven interface*

- Menu driven interface provide user with a list of options to choose from.
- The interface is suitable for beginners who may have difficult in remembering the commands
- Examples of menu driven are later version of DOS

3. *The graphical user interface (GUI)*

- This is the latest operating system that make the interface more user-friendly
- It provides with user menu to choose from just like menu driven and apart from menu, it has a rectangular work area called windows, graphic objects called icon and most commands are executed using pointing devices.
- The features are given acronym WIMP which sand for Windows, Icon, Menus and Pointers
- Examples of GUI operating system are Microsoft windows version 2000, XP, 7, 8, 10, Apple Mac OS and Linux

FUNCTIONS OF OPERATING SYSTEM

- An operating system basically consist of two main parts namely: **shell** and **kernel**

- Shell is outer part of an operating system used to interact with the operating system
 - Kernel is the core of the operating system responsible for managing and controlling computer resources such as processor, main memory, storage devices, input devices, output devices and communication devices
 - The following are the functions of operating system
1. *Job/processor scheduling*
 - Processor scheduling refers to allocating each job, waiting for execution, a processor time at each given interval
 - Since computer may have many concurrent jobs waiting for execution, it is the operating system that determine which task will be processed first. It schedules job according to priorities, the higher the priority, the first to be allocated CPU time
 2. *Resource allocation*
 - Each resource in a computer has unique Interrupt Request (IRQ) number. The operating system uses the IRQ number to identify the resource being requested
 - Poor allocation of resource result in a condition called Deadlock
 - Deadlock is a situation where a particular job holds a requested resources a fails to release it, ye it is requesting for resources held by the other job.
 3. *Memory management*
 - Operating system manages the RAM by determining which task remains in memory awaiting for execution and which one to be kicked back to the secondary device.
 - To manage RAM, the operating system organize the main memory (RAM) into page frames. Processors are also divided into piece called pages. Then to manage memory, the operating system swaps between the main memory and secondary storage.
 4. *Input/output management*
 - Operating system coordinates between the various I/O and other peripheral devise ensuring that data is transmitted securely. For example, when printing, operating system searches for printer, choose the correct one and send the document for printing
 5. *Communication control and management*
 - The operating system is responsible for managing the various communication devices and provide an environment within which communication protocols operates
 - The term protocol refers to rules that govern communication between devices on the network
 6. *Error handling*
 - The operating system alerts the user of error that occur out of illegal operations or software or hardware failure. It expresses what the error is and give suggestions on how to correct the error
 - The operating system monitors the status of the computer in terms of performance and checks on users, hardware and software.
 7. *Interrupt handling*
 - An interrupt is a break from normal sequential processing of instructions in a program
 - When a critical request causes the processor to stop executing the current program and execute this request first. Operating system controls this.

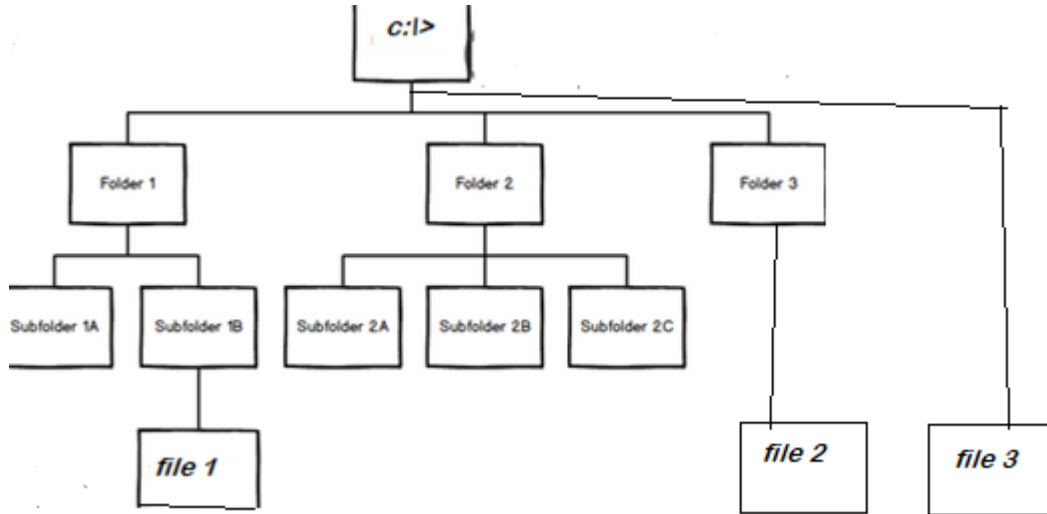
Factors to consider when choosing an operating system

1. The hardware configuration of the computer such as memory capacity, processor speed and hard disk size
2. The type of computer in terms of size and make.
3. The application software intended for the computer
4. User-friendliness of the operating system
5. The documentation available

6. The cost of the operating system
7. Reliability and security provided by the operating system
8. The number of processors and hardware it can support
9. The number of users it can support

How operating system organizes information?

- Most operating system organizes information in a three-tier hierarchy
 - o Drive
 - o Folders or directories
 - o Files



Files

- A file is a collection of related data given a unique name for easy access, manipulation and storage
- Every file has the following details
 1. A unique name and optional extension. The name and the extension are separated by a period eg JUNE.DOC
 2. The size, date and time he file was created or modified

Types of files

- There are three types of files namely:
 1. System file
 2. Application file
 3. Data file
- *System file* contain information that is critical for the operation of the computer
- *Application file* hold programs and are executable
- *Data files* contains user specific data

NB: system files has file extension .bat and .sys, application file has file extension .exe only while the rest extensions are for data files e.g. .gped, .doc, .txt etc

Table below show some file extension and its type

| Extension | File type | Description |
|-----------|------------------|--|
| .doc | Data | A Microsoft word document file |
| .txt | Data | A plain txt file created using notepad or DOS editor |
| .tif | Data | A graphic file created using application such as Adobe Photoshop |
| .exe | Application file | The file that launches a particular application |

| | | |
|------|-------------|---|
| .bat | System file | File containing a series of command loaded during boot up |
| .sys | System file | System file that perform fundamental operations in the computer |

Folders or directories

- A folder also known as a directory in some operating system is a named storage location where related files and other folders can be stored
- All folders originate from a special directory called root directory or folder
- The root directory is represented by a slash (\)
- A folder may be inside another folder called sub-folder or sub-directory

Drive

- The operating system recognize storage media or device as drive.
- Drive may be given a label such as letters A-Z to identify them
- Table below gives summary of how Microsoft operating system identify drives

| Storage location | Drive | Remarks |
|-------------------------|---------------|---|
| Floppy drive | A and B | If computer has two floppy drives, one will be assigned letter A the other B |
| Hard disk | C, D, E, F | If a computer has 4 hard drives, they will be assigned letters A-F |
| Optical drive | D, E, F, G | If a computer has one hard disk and three or more CD/DVD drives, they will take up any number between D and Z |
| Other removable storage | D, E,....., Z | If a computer does not have an optical drive, any removable drive attached to the computer ca take any letter between D and Z |
| Network drive | Logical | Network drive takes D-Z depending on the number of physical drive installed or attached |

TOPIC 7: USING COMPUTERS

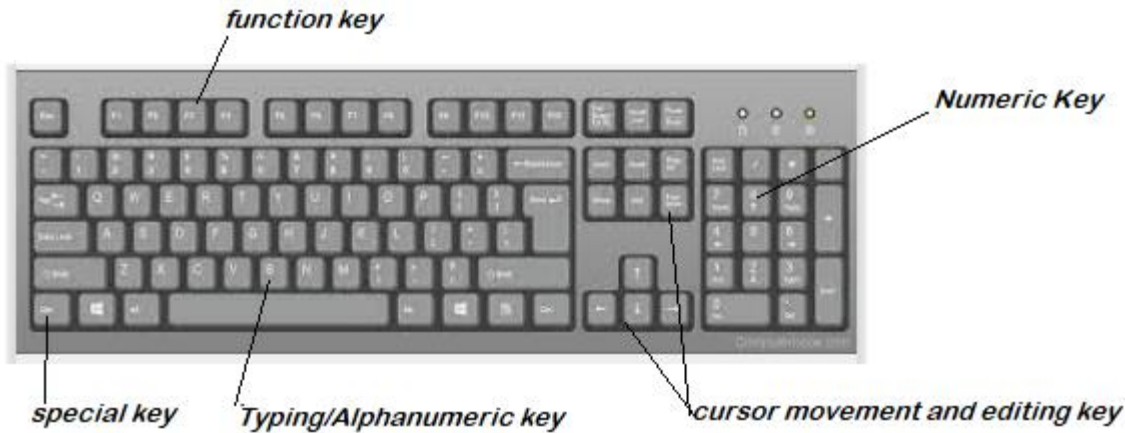
THE COMPUTER KEYBOARD

- A keyboard is a device made of keys that enable a person to communicate to the computer by processing them.
- The keyboard converts human language into machine language.
- There are many types of computer keyboards categorized according to various criteria including:
 1. *Classification by function of extra key*: there are two types of keyboards in this category i.e. standard keyboard and multimedia keyboard. The multimedia keyboard has extra key that support multimedia such as multimedia application launch, volume control etc. while standard keyboards do not have extra key that support multimedia
 2. *Classification by arrangement of keys* on the first row of alphabetical keys and these are AZERTY, QWERTY, DVORAK ect.
 3. *Laser keyboard*. This is the new version. The device project that keyboard on the flat surface and the user type on the projected image
 4. *Flexible/roll up keyboard*: It can be rolled up and fitted in bags easily for easier portability

The keyboard layout

- The keys on the keyboard can be classified into five categories namely

1. Alphanumeric (typing) key
2. Function key
3. Cursor movement and editing key
4. Special key
5. Numeric keypad



Alphanumeric key

- Alphanumeric key also known as typing keys and these are
 - Alphabetic letters A-Z
 - Numbers arranged 1, 2 0
 - Special symbols such as ?,], %, \$, * etc
 - Caps lock key: Lets the user type uppercase letters
 - Enter key (return key): Enter key has two functions: *To move the text cursor to the beginning of the next line and to instruct a computer to execute command*
 - Tab key: This key is used to move the text cursor at a set interval on the same line
 - The spacebar: This key creates a space between words during typing
 - The backspace key: This key deletes characters from right to left on the same line

Function key

- Function keys are usually located along the top of the keyboard. They are labelled f1, f2 up to f12
- They are used for tasks that occur frequently in various programs

Cursor movement and editing keys

- Cursor movement keys are used to move the cursor on the screen. They include:
 1. *Arrow keys*: There are 4 arrow keys left, right, upwards and downwards. They are used to move the text cursor up, down, left and right.
 2. *Page Up (pg up) and page Down (pg dn)*: Pressing Page Up moves the cursor up one page in case the document has many pages while pressing Page down moves the cursor down one page.
 3. *Home and End key*: Pressing Home key moves the cursor to the beginning of the current line. Pressing End key moves the cursor to the end of the current line
- Editing keys are used to delete or insert characters in the document. They include:
 1. *Insert key*: This key helps the user to insert or replace character at the cursor position
 2. *Delete key*: This key deletes characters at the cursor position from left to right

Special purpose keys

- Special purpose keys are used in combination with other keys o give certain commands to a computer.

- For example, Ctrl +Esc is used to display start menu, Ctrl + Alt + Del is used to display Task Manager
- Examples of special purpose keys are SHIFT, CTRL, ALT, and ESC

Numeric keypads

- The numeric keypads consist of set of numbers 0 to 9 and the arithmetic sign like +, -, * and /
- They are located at the right hand side of the keyboard
- It is meant to help the user to rapidly enter numeric data.
- The numeric numbers can only be used when the *Num Lock key* is turned on
- When the Num lock key is turned off, the numeric keys are used as cursor movement and editing keys

Typing and good typing posture

- in order to increase your typing speed and accuracy, typing software offers lessons on how you can type. Some typing software comes as games to make typing more interesting
- examples of typing software available are: Mavis Beacon Teaches Typing, Typing Pal, TypingMaster, Touch Tutor among others

Good keyboarding posture

- when typing using typing tutor, observe the following
 1. sit upright with both feet firmly on the ground maintaining an alert posture
 2. rest both hands on the keyboard with fingers resting on the Home arrow key
 3. always return the finger to the home row position after striking other keys
 4. start typing slowly at first. Do not look at your fingers when typing

MOUSE SKILLS

- Moving a mouse on a flat surface makes the pointer on the screen to move in the same direction as the mouse itself.
- To make a selection, the mouse must be on the object that is to be selected
- After selecting then press the mouse button

Good mouse use

1. Place the mouse on the flat smooth surface
2. Gently hold the mouse on with your right hand, using thumb and two fingers
3. The index finger should rest on the left button while the middle finger rest on the right button

The four common mouse operations are

1. **Click**: This means pressing and releasing the left button once. A click selects an object
2. **Double clicking**: This means pressing and releasing the left button twice in a quick succession. Double click open file or start program
3. **Right clicking**: This is pressing the right hand button once. Right click displays the menu from which user can make selection
4. **Drag and drop**: This is where a user drags and item from one location to another. The procedure to accomplish this is as follows:
 - i Point to the item you want to drag
 - ii Press the left button and hold it down
 - iii Slide the mouse until the pointer reaches the desired position on the screen
 - iv Finally release the mouse button and the item will be dropped in the new location

Identifying the power button

- The power button is usually located somewhere on the front of system unit. Pressing it switches on the computer.

Cold booting a computer

- Once you turn on a computer, it automatically goes through a process of Self-test.. This process is called cold booting or bootup
- Once you turn on a computer, you may hear the sound of a cooler fan running. After few seconds, lines of text start scrolling up on the screen. This process is referred to as Power-On-Self-Test (POST)
- POST check the existing drive, basic input and output devices such as keyboard, monitor and mouse. If the problem is encountered, the process is halted and an error message is displaced on the screen
- POST is accomplished by a special firmware program called Basic Input/output System (BIOS) which is held in the ROM chip mounted on the motherboard
- After POST, the computer reads some instructions such as the current date and time from a special memory known as Complementary Metal-Oxide Semiconductor (CMOS)
- CMOS is powered by a dry cell that mostly resembles that of digital watch. If the cell is depleted, the computer requires the user to enter the current date and time
- Lastly, a special type of computer program used to manage computers called Operating System is loaded in the computer memory

Logging on and off the computer

- When the operating system first loads, it requires the user to authenticate him/herself by providing a user name and a password. This security feature helps to ensure that only authorized users use the computer.
- This process is called login in the computer. The user may want to leave the computer for a while without switching it off. This process is called log off and is done by click start the Log off

Shutting down the computer

- It is important that the user follows the correct procedure of shutting down the computer at all times.
- If the procedure is not followed, it may result in
 1. Loss of data
 2. Damage of programs
 3. Damage of computer components
- **To shut down a computer**
 - Ensure all the work has been properly saved
 - Close all programs that may be currently running
 - Click Start then click Turn Off Computer then click Turn off

Introduction to Microsoft Windows

- Microsoft Windows is a graphical user interface operating system produced ny Microsoft.
- Windows was first introduced as operating system in 1985

Windows desktop features

- Once you turn on the computer, the first window you see is called Desktop
- The desktop has three main features
 1. Background
 2. Icon
 3. Taskbar

Background

- Background is the work area on the monitor on which in=cons and running tasks are placed
- You can customize the background by applying theme and wallpapers

Icons

- Icons are manipulated using pointing device such as mouse. Examples of icons are My computer, Recycle bin, My Document etc.

Taskbar

- Taskbar enable the user to easily switch between different programs and tasks that are currently running
- The task bar has three
 1. *Start button*: Is the left button on the taskbar that the user clicks to display start menu.
 2. *Task manager*: This is a band where the button of the currently running program s are displayed
 3. *System tray*: This is at the right part of the taskbar. It has tasks running at the background but are not displayed on the screen. Examples are time and calendar, volume control etc

The start menu items

- When you click start button, a list of choices appears called start menu. The menus are as follows
 1. *Program menu*: Programs or All Programs menu display a list of programs installed in the computer
 2. *My recent documents*: It lists the last fifteen recently accessed files
 3. *Control panel*: It provides tools used to maintain and make changes to the computer setup
 4. *Search*: Helps the user to search for a file or folder
 5. *Help and support*: The help command provides detailed information on how to use operating system and solve some computer related problems incase computer fails to function properly
 6. *Run*: it enables us to:
 - Install programs on hard disk
 - Open files and folders on storage locations
 - Run programs from removable media without necessarily installing it on *hard disk*
 7. *Log off*: To log off is to terminate the current user session
 8. *Turn Off/shut Computer*: This options lets user shut down, restart, make computer go on standby or hibernate

NB: Hibernate saves everything in memory to disk and turn off the computer while standby makes the computer consume less power in idle mode but remain available for immediate use.

MANAGING FILES AND FOLDERS USING WINDOWS

1. Creating a file or folder
 - Right click where you want the file/folder to be
 - Click New
 - Click Folder or any type of file
 - Type the name of the file/folder
 - Press enter
2. Renaming a file/folder
 - Right click the file/folder
 - Click Rename
 - Type the new name for the file/folder
 - Press Enter
3. Deleting a file/folder
 - Right click the file/folder
 - Click delete
 - Click Yes to confirm

NOTE: When a file/folder is deleted from hard drive, it is stored in the Recycle bin of the computer. To delete permanently from the computer, delete from the Recycle n=bin or Empty the recycle bin by

- Right click the Recycle bin
- Click Empty Recycle Bin

You may also decide to restore a file that has been deleted and it is in the recycle Bin by restoring it. This is done by

- Open the Recycle Bin and locate where the file/folder is
 - Right click the file/folder
 - Click Restore
4. Copying and moving (cutting) files or folder
- Right click the file/folder to copy or cut
 - Click Copy or Cut
 - Right click where want the file/folder to be
 - Click Paste

NB: Copy leaves the original file/folder on same location while taking the duplicate while **Cut** takes with the original without leaving a copy of it.

5. Sorting files/folders
- Sorting means arranging files and folders in a particular order either alphabetically or by size or date of last modification or creation.
 - Open the folder where the contents to sort are
 - Click View then point Arrange Icon By
 - Click Name, Size, type or Modified

Manipulating files/folders using Drag and drop

Situations that requires Drag and drop

1. *To copy a file/folder:* just hold CTRL button key while you drag the file/folder to a new location
2. *To move file from one location to another:* simply press the file using mouse and drag to a new location
3. *To delete a file/folder:* Just drag it to the Recycle bin
4. *To copy a file/folder from one disk to another:* simply drag the item to the destination drive
5. *To move an item:* Hold down the shift key while you drag to the new location

To select multiple files

- Click the items while holding the **SHIFT** or **CTRL** button

To search for a file

- Click start
- Click search
- Type the name of the file/folder

Parts of an application window

1. **Tile bar:** This bar displays the name of the current application program or task and is found on top. On the right of this bar, there are three tiny buttons namely
 - *Minimize button:* It reduces the size of the window
 - *Restore or maximize button:* It stretches the window to cover the entire desktop or restore it to its original size
 - *The close button:* Used to exit the application
2. **Menu bar:** Provide list of command that can be used to manipulates a task fo
3. **Toolbars:** These are buttons arranged in a row and are shortcut to menu commands
4. **Document window:** Is a work area where you can create our document
5. **Status bar:** Is interactive strip at the bottom of the window that act as communication link between the user and the application
6. **Scroll button:** Are horizontal and vertical buttons at the borders of the window used to scroll through a long document.