

ACHIEVE HIGHER COMPUTER STUDIES

STUDENTS REVISION BOOK



FORM 1 – FORM 4



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FORM ONE WORK

Mr. C.

INTRODUCTION

This book is published with the objective of guiding students in secondary schools and specifically to those who are preparing to sit for the National examinations KCSE. In addition, the book will help teachers, students and the lovers of this subject computer studies in the Kenyan education curriculum.

All that are written here are the results of the wide research that focused on the secondary syllabus from form one to form four.

After using this book well, the student will have the recommended skills in the computer both theoretically and practically in various capacities.

The objectives of this book enable the student to gain elementary computer skills that are helpful in the current digital society.

Take this book and read it, analyze it and use it maximumly in all dimensions.

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Chapter Objectives

By the end of this chapter, the learner should be able to:

- a) *Define a computer*
- b) *Draw and label specific parts of a computer*
- c) *Explain the development of computers*
- d) *Classify computers into their respective categories*
- e) *Explain application areas of computers*
- f) *Describe a computer laboratory*
- g) *Describe the safety precautions and practices in the computer laboratory*
- h) *Demonstrate skills mastered for practical hand-on skills in using the computer*

Definition of a Computer

A **computer** is an electronic device that accepts users input called **data**, process it by use of a set of instructions called **programs** (software) to produce the desired output called **information**.

Characteristics of a computer

1. **Accurate.** A computer produces accurate results of huge calculations with no errors as compared to human beings.
2. **Versatile.** A computer is a flexible machine that can perform more than one task at a time.
3. **Fast.** A computer is a high-speed machine that can perform millions of calculations per second, that a human being would take a lot of hours doing.
4. **Large storage capacity.** The in-built memory of a computer can store a lot of data that is very easy to retrieve as compared to a human being.
5. **Diligence.** A computer does not get bored since it can perform repetitive tasks without getting bored, fatigued, tired or losing concentration.
6. **Reliable.**
7. **Reduction in Paper Work.** The use of computers for data processing in an organization leads to reduction in paper work and speeds up the process. • As data in electronic files can be retrieved as and when required, the problem of maintenance of large number of files gets reduced



A computer is made up of two key components: the **hardware** and the **software**.

A digital computer has the ability to perform the following functions:

- Takes data as input. (Accepts data)
- Stores the data/instructions in its memory and can use them when required. (Stores data)
- Processes the data and converts it into useful information. (Processes data)
- Outputs the information.
- Controls all the above four steps.

The basic computer operations can be presented diagrammatically, as shown.



Data: is a raw fact that is entered into the computer and has no meaning to the user. Data is found in the user environment. They can include facts and figures, numbers, letters etc.

Information: this is the processed data that is meaningful to the user. It is the output.

Components of a computer

A computer is made up of two key components:

- hardware**
- software.**

Computer hardware

A computer hardware refers to the physical tangible parts of the computer. These are computer components that can be seen and touched.

They include **screen**(monitor), **keyboard**, **cables etc.**

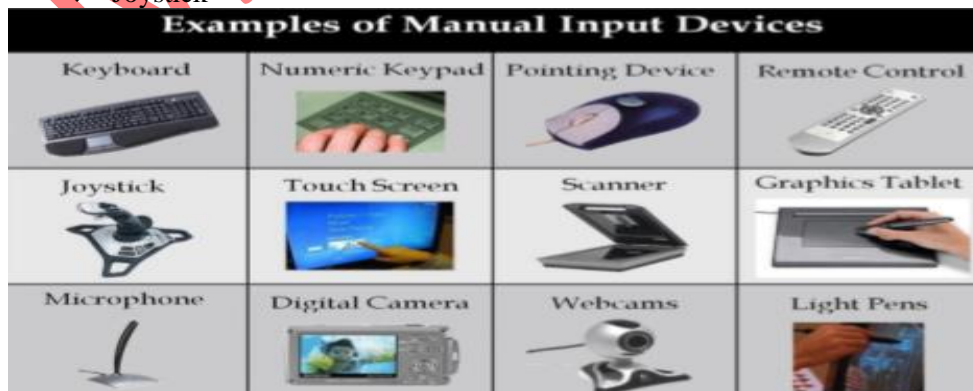
The computer hardware is further divided into four major categories, namely;

- input devices
- Output devices
- Storage devices
- The central processing unit (CPU)

Input devices

These are devices that are used for entering data into the computer for processing. They convert data from user understandable form into a format that a computer can understand. The most common input devices include;

- | | |
|------------|---------------------------|
| ❖ Keyboard | ❖ Scanners |
| ❖ Mouse | ❖ Trackball |
| ❖ Webcam | ❖ Touch sensitive screens |
| ❖ Joystick | |



The Central Processing Unit. (CPU)

This device is called the processor. It is the most important element of the computer

It is used for data processing. The device is housed inside the system unit and it is the brain of the computer.

The CPU is comprised of two main parts:

*** Arithmetic Logic Unit (ALU):**

Executes all arithmetic and logical operations. Arithmetic calculations like as addition, subtraction, multiplication and division. Logical operation like compare numbers, letters, or special characters

*** Control Unit (CU):** controls and co-ordinates computer components.

1. Read the code for the next instruction to be executed.
 2. Increment the program counter so it points to the next instruction.
 3. Read whatever data the instruction requires from cells in memory.
 4. Provide the necessary data to an ALU or register.
 5. If the instruction requires an ALU or specialized hardware to complete, instruct the hardware to perform the requested operation.
- ✓ The speed of the processor is measured in hertz (HZ). It is also important to note that the power of the processor depends on its speed.

Output devices

These are devices that display the output (information). They convert the information from a computer understandable form into a form that humans can understand.

They include;

- ❖ Monitor
- ❖ Printers
- ❖ Speakers
- ❖ Projectors
- ❖ Plotters



There are two forms of output.

- a) Softcopy output.** This is an output that can be seen, listened to but cannot be touched
- b) Hardcopy output.** This is an output that can be seen, and can be touched, it is usually displayed on a paper.

Storage devices

These are devices that store data before and after processing. The storage devices are categorized into two. Namely;

- a) Primary memory**
 - ❖ Hard disk
 - ❖ Floppy disks

Onboard devices. These are hardware devices that come fixed into the system unit.

b) Secondary memory

Primary memory. Offers temporary storage of data that are already processed

The primary memory is divided into two;

- Random Access Memory (RAM)
- Read Only Memory (ROM)

Secondary memory. Offers permanent storage of information. They are mostly used to backup data

Back up: refers to the process of creating extra copies of data, in case the original is Lost or damaged, the data can be retrieved.

Secondary storage devices include;

- ❖ Compact disk (CDs)

They include the CPU, primary memory and the chipset.

A **port** is an opening in a computer device or network into which devices can be plugged.

A **peripheral device**: is an external device that is connected to the system unit through a port by the use of interface cables.

Peripheral devices include monitors, keyboards, mouse, disk drive

Software

Software refers to a set of instruction that enables a computer hardware to perform a specific function.

Classified into system software and application software.

Development of computers.

Here, the history of computers is discussed in two periods namely;

(i). **pre-electronic age.** (ii) **Generation of computers**

Pre-electronic age

- ✚ This deals with the study of computers before electricity was discovered.
- ✚ Abacus was the first computer was discovered in the Asia minor about 5000 years ago.
- ✚ In this era, computers were only used for calculations and arithmetic operations.
- ✚ The abacus computer used a system of sliding beads that were fastened on a wire and arranged on a rack.

- ✚ The beads on the upper row next to the cross bar represented a five (5) while the beads on the lower row next to the crossbar represented a one (1). All heads away from the crossbar represented a zero (0).

- ✚ This means that multiplication was done by adding the beads repeatedly.

- ✚ 12 centuries later, **Blaise Pascal** invented a **numeric wheel calculator** in 1642.

- ✚ **Charles Babbage**, an English and mathematics professor later invented a machine that resembles the modern computers in 1822. **Charles Babbage** is therefore known as “the father of modern computers”

Generation of computers

These involves the inventions that they were done in the field of hardware and software after the pre-electronic age.

Computers have evolved through 5 different generations i.e., first generation, second generation, third generation, fourth generation and fifth generation.

First generation computers

Characteristics of first generation

- ❖ Technology used was Vacuum tube.
- ❖ The computers were here huge in size.
- ❖ The computers consumed a lot of power.
- ❖ The computers occupied a very large space due to their large size.
- ❖ They used magnetic tape to store data.
- ❖ Storage capacity was too low i.e., 2kb
- ✓ Examples of computers in this generation included **ENIAC** (electronic variable integrated automatic computer) and **UNIVAC** (universal automatic computers).

- ❖ Generated less heat as compared to first generation.
- ❖ Had higher processing speed as compared to first generation.
- ❖ Consumed less power compared to first generation.
- ❖ Smaller in size compared to first generation computers.

Third generation computers

Characteristics of third -generation computers.

- ❖ The main technology used was integrated circuits (ICs). Which is a combination of several transistors
- ❖ Memory- magnetic core and magnetic tape/disk.
- ❖ Had higher processing speed as compared to second generation computers.
- ❖ Size- smaller, cheaper and more efficient than second generation computers.
- ❖ Programming languages like **FOTRAN**, **Pascal** etc. were used
- ❖ Input/output devices – punched cards and magnetic tape, keyboards, monitors etc.

Second generation computers.

Characteristics of second-generation computers.

- ❖ The main technology used was a transistor. (a transistor is a semiconductor component that amplify electrical signals and power)
- ❖ Memory- magnetic core and magnetic tape/disk.

- ✓ Examples of computers in this generation included IBM 360, IBM 370, PDP-11, UNIVAC 1108, etc.

Fourth generation computers

Characteristics of fourth -generation computers.

- ❖ Main technology used- very large-scale integration. Which is a collection of very many integrated circuits.
- ❖ Memory-used semiconductor memories such as RAM, ROM etc. The memory size also expanded up to several MBs.
- ❖ Size-smaller, cheaper and more efficient than third generation computers.
- ❖ Input /output devices- keyboards, monitors, pointing devices.
 - ✓ Examples included Apple Macintosh etc.
 - ✓ **This generation marked the origin of mini computers used today.**

Fifth generation computers

Characteristics of fifth generation computers.

- ❖ The technology used- artificial intelligence (AI). Artificial intelligence is the ability of a computer to emulate human behaviors.
- ❖ They consume less power and produce less heat.
- ❖ Input /output devices- keyboard, monitor, mouse, scanners etc.
- ❖ Size- portable and small in size.
- ❖ Memory- they have very huge storage capacity.

Classification of computers

Computers can be classified into different categories based on the following criteria.

- Functionality.
- Size.
- Purpose.

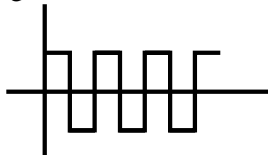
Classification of computers according to functionality

Here computers are classified according to the form in which they process data, they are therefore classified into;

- Digital computers
- Analog computers.

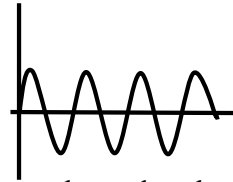
Digital computers

These are computers that process data in discrete form. They commonly applied in Scientific and Engineering World



Analog computers

These are computers that process data in continuous form



Commonly used analog computers includes;

1. Car Speedometer - Measures Speed of the Approaching Bodies e.g., Cars
2. Hygrometer - Measures Humidity
3. Wind Anemometer - Measures Speed of the Wind.
4. Thermometer - Measures the Temperatures of a place.
5. Barometer - Measures Atmospheric pressure of a place
6. Voltmeter - Measures Voltage of the Electronic device

Hybrid computers

These are computers that process data in both discrete and continuous form. They have characteristics of both digital and analog computers.

Classification according to size

i). Microcomputers

This is also referred to as a personal computer. They are small in size and their CPU has been implemented using a microprocessor.

Microcomputers includes;

Laptops-these are designed to be placed on the lap while in use.

Desktop- these are designed to be placed on the office desk while in use.

Palmtop – these are small to even fit in the user's pockets.

ii). Minicomputers.

These are medium sized computers larger than the microcomputers. minicomputers can serve two or more users at a time. They are mostly used in banks and supermarkets.

iii). Mainframe computers.

These computers are used in large organizations such as International Monetary Fund and World Bank, Insurance Companies etc. and can serve several users at a time since they are equipped with several microprocessors in their central processing unit.

iv). Supercomputers.

These are the largest computers in size. They are mostly used in large organizations. They have

uncountable microprocessors in their central processing unit.

Classification of computers according to purpose.

According to purpose, computers are classified into;

- i. General purpose computers
- ii. Special purpose computers
- iii. Dedicated purpose

General purpose computers.

These are computers with the ability to perform wide variety of tasks so as to meet user's needs. i.e., processing data and instruction. They include desktops, notebooks etc.

Special purpose computers.

These are computers designed for one specific task or a class of tasks. They include calculators used only for calculation, televisions, washing machines etc.

Dedicated purpose computers.

These are general purpose computers that have been setup to perform a specific category of tasks. For example, in a school, a computer that the teachers use to set exams for printing becomes a dedicated computer, the same applies to a computer that the bursar uses to keep fee records.

Application areas of computers.

i. Homes

In homes, computers are used for several purposes like, paying bills, watching movies.

ii. Education

- Computers have facilitated e-learning through online classes and again leaning materials for download on the internet.
- Used to keep student records in schools and academic progress of students.
- Students can get additional learning through online tutoring.

- Computer aided learning and computer aided instruction

iii. Medical field

- Computers are used in hospital to keep patient records.
- Computers are used to control life support machines in the intensive care unit (ICU).
- Computer are used in diagnosis of diseases.
- X-rays also uses computers.

iv. Businesses

- Computers have made transactions for businesses very easy and accurate.
- People can easily analyze their investments, sales, expenses, markets and other aspect of business using available computer software's.
- E-commerce have been made possible by computers and the business people can sell their commodities everywhere in the world on these e-commerce platforms.

v. Entertainment

- Computers helps in playing games and watching movies
- Computers have also led to the creation of jobs for disk jockey (DJs).
- Video and photo editing features are also available with amazing features.
- Video animations is done using computers.

vi. Banking

- Computers are used in banks to process cheques.
- Keeping customer records.
- Keeping daily transaction records.
- Conducting automatic transactions especially through the Automatic Teller Machines (ATMs)

Computer laboratory

A computer laboratory is a special room equipped with computing facilities for the purposes of learning computer studies and information sharing.

Factors to consider before setting up a computer laboratory

- | | |
|--|---|
| ✚ Security of the place. | ✚ Ensure there is enough for space |
| ✚ Good ventilation. | ✚ There should be firefighting equipment (fitted with gaseous fire extinguishers) |
| ✚ The place should be away from dust and moisture. | |

Safety precautions and practices in the computer laboratory

The computer lab, just like any other lab should be setup with safety precautions in mind
The safety precautions can be divided into two;

1. Measures to protect the computers
2. Measures to protect users

Measures to protect the computers

- Burglar proofing the room. Includes fitting grills on doors, Windows and the roof to deter forceful entry into the computer room, alarm installation and employing guards.
- Installing fire prevention and control equipment e.g., smoke detectors, non-liquid based and non-powder based. **Liquid based extinguisher is not used because;**
 - i. Water is a good conductor of electricity hence can cause short circuiting to the computer leading to damage,
 - ii. Water will cause rusting to the metallic computer parts.
- The room would be well played out leaving enough space for movement.
- Providing stable power supply. This can be done through installing Uninterruptible Power Supply (UPS).

Roles of UPS.

- i. Ensure stable power supply by preventing power surges.
- ii. Alerts the user in case of blackout by producing a keeping sound.
- iii. Provides power temporarily in case of blackout enabling the user to save their work and shut down the computer using the correct procedure

- Dust and dump control.
- Insulating cables and power sockets well. To reduce risk of electric shocks
- Users should NOT drink nor drink anything in the laboratory. This is because when drinks spill on metallic parts of the computers, they can cause rusting. Solid foods can cause clogging to the keyboards leading to malfunctions upon dropping on the computer parts.

Measures to protect the users.

- All cables should be insulated, To avoid dangers of electric shocks to the users.
- Providing standard furniture. To avoid poor sitting posture which may lead to strain injuries and limb fatigue.
- Cables should be laid away from the user paths to avoid stripping on them.
- Providing antiglare screen (light filters) and adjustable screens to avoid eyestrains and fatigue caused by over bright CRT monitors, LCD do not strain the eye.
- The room should be properly ventilated to avoid dizziness caused by lack of enough oxygen. This also allows computers to cool.
- The users should not overcrowd in the computer room it may lead to suffocation.

Practical hand -on- skills.

Starting up(booting) a computer.

1. Before switching on a computer, make sure that all components are properly connected and the computer is connected to the active power source.
2. Turn on the switch at the **source of power supply**.
3. Turn on the switches on the system unit and the monitor. After the power is on, the computer goes through a process known as **booting**.

Bootting- is the entire process of making a computer ready for use.

There are two types of booting.

- i. Cold booting.
- ii. Warm booting.

Cold booting

This occurs when a computer that was initially off is switched on by pressing the power button on the system unit.

Warm booting.


This occurs when a computer that was initially on is forced to restart by pressing the restart button on the system unit. It can also be done by pressing a combination of keys from the keyboard (**Ctrl+Alt+Del**).

When the power is switched on, the computer starts by checking all its component to determine whether they are all available and functioning correctly. It does this executing a small program called **Power-On-Self-Test (POST)**.

The small program that directs POST called **Basic Input Output System (BIOS)**.

Shutting down a computer.

A computer should be shut down using the correct procedure. If the correct procedure is not followed when shutting a computer down, then, loss of data, damage of programs and computer components like the hard disk may occur. To shut down a computer, proceed as follows

- i. Ensure all the work has been properly stored. Through *saving*.
- ii. Close all programs that may be currently running
- iii. Click the “start button” 
- iv. On th “start” menu click on “shutdown”. The computer will go through the shutdown process.

Keyboard and mouse skills.

Keyboard and the mouse are most widely used devices in a computer.

Basics

keyboard

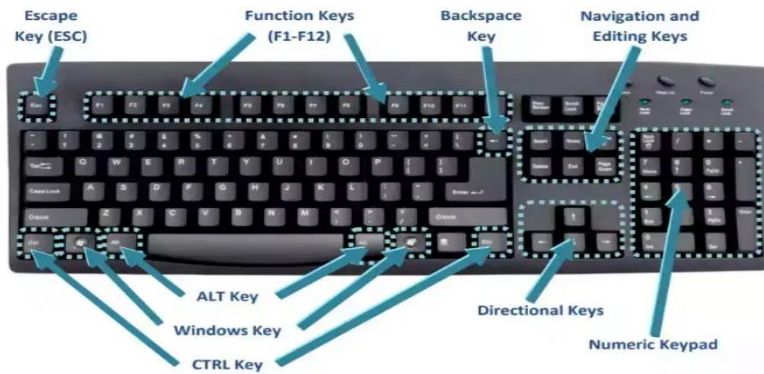
Keyboard layout

Like a typewriter, the first typing keys on the upper left of a typical computer are Q, W, E, R, T, Y. it is commonly referred to as QWERTY keyboard.

The keys on the keyboard can be classified int five categories namely;

- › Alphanumeric (typing) keys
- › Function keys
- › Arrow/cursor movement/ editing keys
- › Special keys
- › Numeric keypads/number keys

KEY TYPE	DESCRPITION	EXAMPLES
Alphanumeric keys	-also known as typing keys -they are labeled letters A to Z arranged in line with 1,2,3...0 and special symbols such as,? %, @, &	A-Z Also includes caps lock, enter, tab space, backspace
Function keys	Located at the top of the keyboard. They are used for tasks that occur frequently in various programs.	Labeled F1, F2 up to F12
Arrow/cursor movement/ editing keys	Used to move cursor on the screen	Page up, page down, Home, End and the four arrow keys
Special keys	Used in combination with other keys to give certain commands to the computer	Esc, Tab, Shift, Alt,

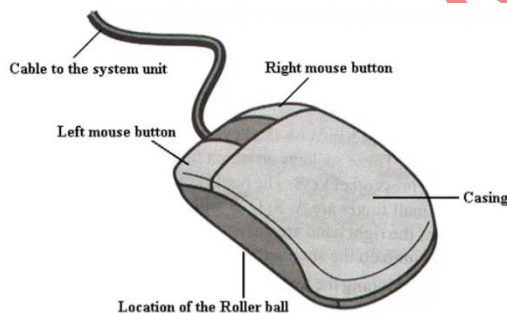


Mouse

A mouse is a pointing device that enables the user to issue instructions to the computer by controlling a special house pointer displayed on the screen.

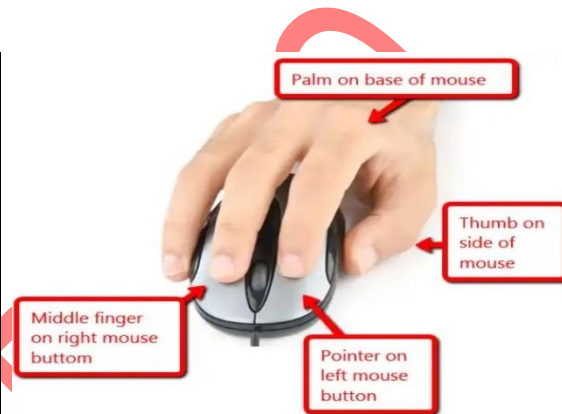
A mouse consists of four parts: -

1. **Casing** – to assist in holding the mouse.
2. **A roller ball**- used to slide/ move the mouse on a flat surface. It also enables the cursor to move on the screen as required.
3. **The sensor buttons (left and right)**-used for making selections.
4. **A cable**- connects the mouse to the system unit.



Using the mouse.

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



The four main operation of a mouse are;

1. Clicking
2. Right clicking
3. Double clicking
4. Drag and drop.

Clicking- the pressing and releasing the left mouse button once. Usually used to select an object/item in screen.

Right -clicking- the pressing and releasing the right mouse button once, usually used to open menus, and selecting an item/object.

Double- clicking- pressing and releasing the left mouse button twice in a quick succession. Used to open files and start a program.

Drag and drop- used to drag an item from one location to another location on the screen. using the procedure below; -

1. point to the item you want to drag
2. Press the left-hand mouse button and hold on it down
3. Slide the mouse until the pointer reaches the desired location the screen.
4. Release the mouse button and the item gets dropped in the new location

Chapter Objectives.

By the end of this chapter the learner should be able to;

- a. Describe computer system
- b. Explain the functional organization of the elements of a computer system
- c. Describe input devices of a computer system.
- d. Describe the central processing unit (CPU)
- e. Describe the output devices of a computer system
- f. Describe the secondary storage devices and media
- g. Distinguish between power and interface cables
- h. Explain basic computer setup and cabling.
- i. Distinguish between system software and application software
- j. Evaluate the criteria for selecting a computer system.

Introduction.

System: - a collection of entities that collectively work together you achieve a specific goal. An entity can be a person, places or an object. Systems are made up of smaller systems known as sub systems. A school can be a system with teachers, students and administration as the subsystems

Description of a computer system.

A computer system is a collection of three entities namely **hardware**, **software** and **liveware**. These entities work together to receive, process, manage and present information in a meaningful format.

i. Hardware

Consists of the physical tangible components of the computer.

The computer hardware is further divided into four major categories, namely;

- i). input devices
- ii). Output devices
- iii). Storage devices
- iv). The central processing unit (CPU).

ii. Software

Refers to asset of instructions that enables a computer hardware to perform a specific task. Softwares are intangible, they are also called programs or applications. They are mainly classified into two categories namely; -

- a. System software
- b. Application software.

iii. Liveware

This refers to the computer user. Also called humanware.

Input devices

These are devices that are used for entering data into the computer for processing. They convert data from user understandable form into a format that a computer can understand. The most common input devices include;

Input devices can be classified according to how they are used to enter data:

This includes:

1. **Keying devices** such as keyboard, keypad, key to storage etc.

2. **Pointing devices** such as mouse, trackball etc.
3. Scanning devices
4. **Speech recognition** devices
5. Touchscreen and digital cameras.

Keying devices.

These are devices used for entering data into the computer by pressing a set of keys. They include keyboard, keypad and key to storage.

1. Keyboard.

This is a device that converts letters, numbers and other characters into electrical signals that are machine readable, so that they can be recognized by the computer processor. The keyboard is used to enter textual data.

Types of keyboards.

1. **Traditional keyboard.** Is the most common type of keying device.
2. **Flexible keyboard;** is more portable and can be folded and packed into a bag.
3. **Ergonomic keyboard;** is specially designed to provide comfort and alleviate wrist strains.
4. **Braille keyboard;** is a keyboard designed for use by the blind. The keys are identified by raised dots.
5. **Keypad;** these are small/ miniature which is mostly used on portable keyboards such as mobile phones and PDAs.

2. Key-To -Storage.

In the key-to-store method, data is input directly, saved or stored in a hard disk magnetic tape or a diskette.

Pointing devices.

Pointing devices are used to control the cursor on the screen. The items entered are either selected by pointing or by clicking on them. Pointing devices include;

- i. Mouse.
- ii. Joystick.
- iii. light pens
- iv. touch sensitive screens.

Scanning devices

A scanner is a device that captures the image of an object directly and converts it into an electronic form. Two main types of scanners are;

- ❖ handheld scanners.
- ❖ Flatbed scanners

Optical scanners.

Optical scanners use a beam of light to capture data.

Examples of optical scanners include;

i. Optical Mark Readers/Recognition. (OMR)

OMR detects marks made on a paper using ink or soft pencil, by passing an infrared beam over them. The computer then interprets the data as input.

Uses of OMR.

- ⊕ Reading order forms
- ⊕ Reading time sheets
- ⊕ Marking multiple choice examination scripts.
- ⊕ Reading insurance payments.

ii. Optical Bar Reader/Recognition. (OBR)

Used to capture barcodes or universal product code (UPC). Barcodes hold manufacturer's details and the product name but not price details because prices vary from one place to another.

iii. Optical Character Reader/Recognition. (OCR)

An OCR scanner is used to read typewritten, computer printed or handwritten characters and transforms the images into a soft copy that can be manipulated using a word processor.

Uses of OMR.

- ⊕ Handling sales orders
- ⊕ Clearing cheques.

iv. Magnetic ink character readers. (MICR)

MICR uses a principle of magnetism to convey its data inputs. The document characters are typed or printed using ink with particles of iron (ii) oxide that give them the magnetic property the MICR does the reading.

Uses of MICR

- ⊕ Used in banks for cheque processing.

Advantages of MICR

- ✦ It is more secure against forgery than OCR.
- ✦ Reading speed is high.

One **disadvantage** of MICR is that the system is expensive.

Speech Recognition devices

They are also called voice recognition devices. Here data is entered in terms of spoken words using devices like microphones.

- ✓ This method is suitable for the handicapped especially for those with impaired hands.

Advantages;

- ⊕ It is faster and easier method.
- ⊕ It is suitable for high multitude.

Disadvantages;

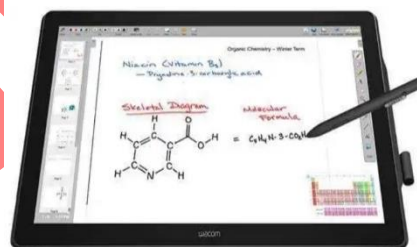
- ⊕ It is complex to develop
- ⊕ It does not take care of speech related problems such as accents, inflections and tones.



Touch screen, Digitizers and Digital cameras

Touch screen.

Touch screen input method utilizes the technology of a touch sensitive screen. When the user touches the screen, the computer detects the position of the finger and responds accordingly. Touch screens are mostly used in places like public halls, hotels in airport to provide guidance information.



Digital Cameras.

A digital camera stores images in digital form. The images can be entered directly into the computer for editing or printing.



Digitisers.

A digitiser is a graphic tablet that is almost similar to a light pen but instead it has a tablet on which the user writes on using a device that is similar to a pen, called a stylus. Digitisers are mostly used for architectural and engineering designs.

Central Processing Unit (CPU)

The CPU is also known as the processor. It is the most important component of the computer. This is so because all data processing and control operations are coordinated here. The CPU is housed inside the System unit. It is mounted on a circuit board known as the *motherboard*.

The CPU has three different functional units called *arithmetic and logic unit*, *control unit* and the *main memory*.



Arithmetic and Logic Unit (ALU).

The arithmetic and logic unit of a central processing unit is where all the arithmetic and logical operations are carried out. Arithmetic operations include; addition, subtraction, multiplication and division. Logical operations are where two or more values are compared, these includes greater than, less than and equal to etc. in order for ALU to process data, it's has a temporary storage location that hold data just before and after processing.

Control Unit (CU).

Control unit coordinates all processing activities in the CPU as well as input, storage and output operations. It determines which operation or instruction is to be executed next. The control unit coordinates its activities using the *system clock*. The clock sends electrical signals as it's means of communication. The number of pulses per second determines the speed of the microprocessor.

Main memory.

The main memory is also known as the primary memory. It provides storage locations for data and instructions accessed by the control unit. the computer memory can be classified into; *Read Only Memory*. (ROM) and *Random Access Memory* (RAM)

i. Read Only Memory. (ROM)

Read only memory is used to store programmed instructions and data permanently. Data stored in ROM remain unchanged over a long period of time. e.g., booting instructions, special purpose computers and computerized fuel pump instructions.

There are four types of ROM namely;

a). Mask Read Only Memory; - once the content is written by the manufacture, it cannot be changed.

b). Programmable Read Only Memory (PROM); -allows the user to alter it only once after the content is written on it.

c). Erasable Programmable Read Only Memory (EPROM); -its contents can be

erased by exposing it to ultra-violet (UV) light, then reprogrammed for another use.

d). Electrically Erasable Programmable Rom (EEPROM); - this type of ROM can be erased and reprogrammed using electricity. An example of EEPROM is the memory that store the basic input/output system (BIOS).

Characteristics of ROM

- ⊕ One can only read its content but cannot write on it unless it is a special type of ROM.
- ⊕ It is non-volatile i.e.; its content is not lost when the computer is switched off.
- ⊕ Stores permanent instructions from the manufacture called firmware.

ii. Random Access Memory. (RAM)

This is the most common type of memory. It is called random access memory because; - its contents can be read directly regardless of the sequence in which it was stored.

Characteristics of RAM.

- ⊕ Data can be read and written on it.
- ⊕ It is volatile; - its content disappears when the computer is switched off.
- ⊕ Its content is user defined i.e., the user dictates what is to be contained in the RAM.

There are two main types of RAM namely;

- a. Static RAM; -fast compared to dynamic RAM and holds data as long as there is power. It is expensive. it is mostly used to make special types of memories.
- b. Dynamic RAM; - can hold data for a short while even when the power is on. To maintain the content in the dynamic RAM, its content is refreshed severally per second.

Special purpose memories.

Apart from ROM and RAM, there are several types of special purpose memories inside the CPU or in the input output devices. They include **buffers, registers** and **the cache memory**.

i. Buffers.

This is a temporary holding place that may be part of the CPU or built in an input or output device. Because the CPU is very fast compared to the input or output devices, buffers provide temporary storage so that the CPU is set free to carry out the other activities instead of waiting.

ii. Registers.

As opposed to buffers, Registers hold one piece of data at a time and are inside the CPU.

Examples of registers are:

- a). **An accumulator;** - temporarily holds the results of the last processing step of the ALU.

b). **Instruction registers**- temporarily holds an instruction just before it is interpreted in the form that the CPU can understand.

c). An **address register:** - this temporary holds the next piece data waiting to be processed.

d). **Storage register:** - temporarily holds data that is on its way to and from the CPU and the main memory.

iii. Cache memory.

This is a small high-speed type of static RAM. Its purpose is to allow the process access data and instructions even faster than it would have taken to fetch it from a relatively slow Dynamic RAM.

Memory capacities

Memory storage capacity is measured in **bytes**. A byte is equivalent to a single character. Characters can be from 0-9, letters A-Z or a special symbol. A number like 56432 has five bytes while the words my friend has several bytes since the space between them has one byte.

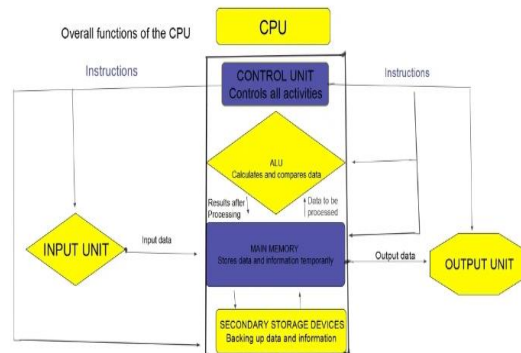
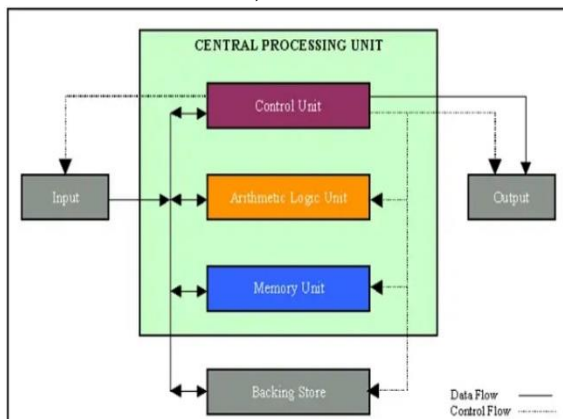
Units for measuring the computer memory

1 kilobyte (KB) = 1024 bytes
1 megabyte (MB) = 1024 KB
1 gigabyte (GB) = 1024 MB
1 terabyte (TB) = 1024 GB

Overall functional organization of the CPU.

The arithmetic and logic unit, the control unit and the main memory use electrical pathways called **buses**. There are three types of buses namely; -

- i. **Control bus;** - controls functions sent by the control unit to other parts of the system.
- ii. **Address bus;** - locates the storage position in a memory where the next instruction data to be processed is to be found.
- iii. **Data bus;** - this is where the actual data transfer takes place.



Output devices

Output devices are peripheral devices that a computer uses to give out information produced after the processing. There are two types of output devices namely **softcopy** output devices and **hardcopy** output devices.

Softcopy refers to intangible output mainly displayed on the screen or through other output devices like speakers.

Hardcopy is a tangible output mostly displayed in papers by devices such as printers and plotters.

Softcopy output devices.

They include; -

i. Monitors/screen.

A monitor/screen/visual display unit (VDU) is the most common output device. It displays information on its screen hence helping the user to monitor the operating carried out by the computer. There are two main designs for the monitor

a). cathode ray tube (CRT) monitors



b). Flat-panel display monitors.



Differences between CRT and the flat-panel display

CRT monitor	Flat-panel display
The screen is slightly curved outwards	The screen is flat
Heavy hence less portable	Lighter hence more portable
Consumes a lot of power	Consumes less power
Poor resolution	Higher resolution

The sharpness or the clarity of an image on the screen depends on the type of the monitor used. Monitors that display clear images are said to have higher resolution. Images on the screen are formed by pixels. A **pixel** is an individual tiny dot of light. The higher the number of pixels per

square centimeter, the higher the resolution hence the clarity.

There are two types of monitors namely **monochromatic** monitors and **polychromatic** monitors.

Monochromatic monitors; - display images and text in only one color mostly black and white.

Polychromatic monitors/color monitors; - display images and text in multiple colors.

Small portable laptops, notebooks and even desktop computers use flat-panel display.

The common type of flat-panel display includes:

a). **Liquid crystal display (LCD);** - do not display light by emitting light of their own. They have a tiny liquid crystal that reflect light falling on them. They are widely used on watches, digital camera and calculators.

b). **Gas-plasma display (GPD);** - they use a gas that emits light in Presence of electric current.



c). **Thin film transistor (TFT)**

d). **electro-luminescent (EL)**

ii. Sound output.

Speakers are used to output sound in computers. The sound may be informed of music, warning, video etc.



iii. Light Emitting Diodes (LED).

These are light emitting components that displays light when electric current flows through them. E.g., the red or green light displayed on the system unit to help the user know where it is on or off. Traffic lights and motorist indicators are used to give warnings to road users.



Hardcopy output devices.

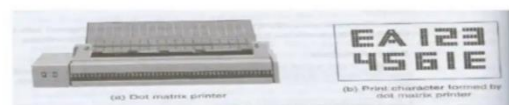
The most common hardcopy output devices are **printers** and **plotters**.

i. Printers.

Printer produce hardcopy output on papers. The quality of the hardcopy depends on the printers printing mechanisms. There are two types of printers namely; **impact** and **non- impact** printers.

a. Impact printers

These produce characters by using a special light hammer with characters held on the printing head. To print a character, spare is placed behind an ink ribbon. When the hammer strikes on the head, character mark is stamped. Impact printers includes **Dot matrix printers** and **Daisy wheel Printers**



Characteristics of impact printers.

- ✦ They are slow
- ✦ The print is of low quality
- ✦ They are noisy

b. Non- Impact printers

These printers do not use the striking mechanism. The major non-impact printers are **inkjet**, **thermal transfer** and **laser** printers.

Inkjet printers.

Inkjet printers form characters by spraying ink from tiny nozzles through an electrical field that arranges charged ink particles into characters.

- ✓ Inkjets are cheap to buy but expensive to run because of the high cost of ink cartridges.



Thermal printers.

Thermal printers use heat to transfer characters on to a piece of paper. They are an inexpensive alternative to inkjets.



Laser printers.

Laser printers print by passing a laser beam back and forth over a rotating drum. The laser

beam draws the image on the drum by static electricity. The charged areas pick up the ink toner from the cartridge, and press it on paper.

- ✓ Although these printers are more expensive to buy, they are faster, they are cheaper to run than inkjets.



ii. Plotters.

A plotter resembles a printer but specializes in producing big charts like maps, pictures and drawings. They are mostly used for printing geographical architectural and engineering drawings e.g., maps, posters, machine parts etc.



Secondary(auxiliary) storage devices and media.

These are alternative storage devices that are not part of the main memory. These devices are not directly accessible by the CPU. Secondary storage devices are not housed inside the system unit and hence can be carried around to be used with another computer they are therefore called **removable storage media**.

Secondary storage devices can be classified according to the technology used to record data. The technology can be **magnetic** or **optical**.

Magnetic storage devices.

i. Magnetic tapes

A magnetic tape is a plastic-like material coated with a thin layer of iron oxide. The tape resembles the music cassette used in home tape recorders.

In order to read/write data records on the tape, the tape must be inserted in a tape drive that rotates the tape allowing a read/write head to perform the read/write operation.

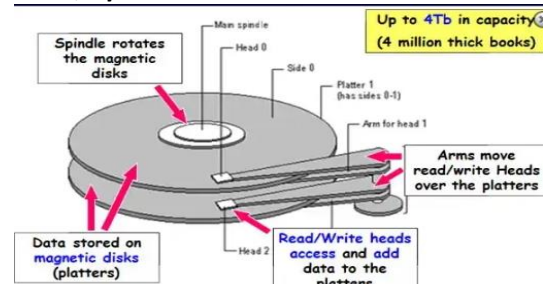


Disadvantages of using magnetic tapes.

- ❖ Magnetic disks are slow because of the linear storage or data records on the tape. This means that you have to access the proceeding records before you get the required.
- ❖ There is space between successive data records which results into wastage of storage space.

ii. Magnetic disks.

They have a magnetic disk platter that stores data. Examples of magnetic disks include **floppy disks**, **zip disks** and **Jaz disks**.



Care for the magnetic storage media

To care for magnetic media, the following rules are to be observed.

1. Do not expose them to strong magnetic fields, this would erase data recorded on the disk. Hence magnets should not be carried into the computer room.
2. Keep them away from excessive heat because energy weakens magnetic media's ability to store data.
3. Do not drop the disk on the ground, because it will be affected by dust.

Optical storage devices.

These are disks on which data is recorded using a laser beam. A laser beam is a very strong concentrated light. The laser beam is used to read, record data on the disk.

Advantages of optical storage media.

- ⊕ They store very large volumes of data.
- ⊕ Data stored in them is more stable and more permanent than the magnetic media.
- ✓ Examples of optical storage disks include; - *Compact Disks (CDs)*, *Digital Versatile Disks (DVDs)*, *optical card* and *optical tape*.

i. Compact disks (CDs).

Compact disks hold large quantities of data and information. One disk can hold as much as 700 MB. they are mostly used to store data and information that requires a lot of space e.g., audio, videos, music images etc.



There are three forms of compact disks namely;

- 1. Compact Disk Read-Only memory (CD-ROM):** once data is stored in them, one can neither change them nor add anything on them they are mostly used to store music recordings.

2. Compact Disk Recordable (CD-R): are initially blank. The user can record data, programs or information on it. However, once data has been written on it, one can only read but cannot change it.

3. Compact Disk -rewritable (CD-RW): these compact disks allow the user to record, erase and rewrite new information on it just as one would with a floppy disk.

NOTE: Both CD-Rs and CD-ROMs are referred to as WORM (Write Once Read Many) because they allow the user to record data on them once but read data as many times as possible.

ii. Digital versatile disks (DVDs).

Also called **digital video disks**. They reassemble compact disks in every aspect. The only difference is that they have higher storage capacity of up to 17GB. They offer better sound

and picture qualities than CDs hence they are suitable for recording motion pictures like videos.



Power and interface cables.

i. Power cables

Inside the system unit is a special power supply unit that supplies power to the motherboard and other internal devices. In order to connect the computer to the mains power outlet, you need power cables that link the power supply unit to the outlet.

ii. Interface cables.

These are cables used to connect the peripheral devices into the motherboard. An interface cable is connected to the device on one end, and to the motherboard via ports on the other end. The difference between the power cables and the interface cables is that the power cable supplies power to a component while interface cables transmit data signals.

Parallel cables and ports

Parallel cables transmit information simultaneously using a set of many conductors(wires). The advantage of using such cables is that they transmit data faster over a short distance. These cables are mostly used to connect printers and removable storage drives like the zip drive.



Serial cables and ports

Unlike the parallel cables, serial cables transmit one bit at a time. Although they are slow, they are much more reliable than the parallel ports and therefore, their connector cables can be as long as 15m. Serial cables are generally used to connect devices such as the mouse and some serial printers.



Universal serial bus (USB) cable and port

Universal serial bus is a new standard serial interface that is set to replace the conventional parallel and serial cables and ports. Currently most peripheral devices are coming with universal serial bus ports and interface cable. Although it transmits only 1-bit at a time, it

provides very high-speed and quality data transmission over distances of approximately 5 metres. USB supports a wide range of peripheral devices ranging from external storage drives to digital cameras



Ports and connectors

Basic computer setup and cabling

Having learnt about various devices and how they function, it is important for us to learn how to set up a computer

The following precautions should be observed before attempting to set up any activity.

1. Disconnect all devices from power source before starting to work on them.
2. Do not work on any peripheral device without the guidance of the teacher.
3. Never work alone because you may need help in case of an emergency.
4. Discharge any static electricity that might have built upon the hands by touching an earthed metallic object and then wearing an anti-static wrist member. This is because your body can hold as much as 200 volts of static charge that can damage sensitive components on the motherboard.

Tools and other requirements

The tools and requirements include;

1. Different sizes and shapes of screwdrivers.
2. Anti-static wrist member.
3. Pliers with narrow nose.
4. Manufacturers manuals for motherboard and other components.
5. Necessary software.
6. A dismantled system unit.
7. Peripheral devices.
8. Interface and power cables.
9. Any other as needed.

Connecting devices to the motherboard

The following are steps for connecting

devices to the motherboard.

Step 1: Identifying motherboard slots and components.

Before you connect any device to the motherboard, carefully study the manufacturers manual in order to identify the components labelled in

Step 2: Connecting the hard disk, floppy drive and optical drive. These devices are connected to the motherboard using special ribbon cables like the one.

The following **instructions** should be observed while connecting the devices:

1. Wear anti-static wrist member to discharge any static charge on the body.
2. Check that a free drive bay exists to hold the disk drive.
3. Slide the disk into its bay and screw it in to place.
4. Ensure that there is a free power connector from the power supply unit and connect it to the drive. Notice that it is designed to fit in its socket in only one direction.
5. Identify pin 1 as labelled on the drives socket and match it with the red or brown continuous line of the ribbon cable. Most cables will only fit in one direction.
6. Connect the cable both to the drive then to the motherboard.
7. Repeat this for all the drives.

8. If installation is complete replace the system unit cover.

Step 3: Connecting other peripheral devices

To connect a device to the system unit, you need to identify its port and interface cable.

1. Gently and carefully connect the interface cable of each device to the correct port and to the device if it is not already fixed permanently.
2. Connect the computer to the power source and switch it on.
3. Observe bootup information on the screen to see whether power-on-self-test (POST) displays any error message.
4. A successful boot means that the computer was properly setup.



Computer software

A computer software is a set of instructions that guides a computer on what to do. Computer software are classified according to *purpose* and *acquisition*.

Classification according to purpose.

A software can either be classified as either *system* or *application* software.

i. System software.

System software performs a variety of fundamental operations that avails computer resources to the user. These functions include:

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.

System software is further divided into:

- a. Operating system
- b. Firmware.
- c. Utility software
- d. Networking software.

a. Operating system.

This is a set of complex programs that work together to control execution of user programs called applications and acts as a go between(interfaces) between the applications of the computer hardware. It manages input/output and storage operations in a computer. Examples of common operating systems are Microsoft Windows 95/98/2000/XP, UNIX, Linux, Macintosh (Mac OS) and OS/2.

b. Firmware.

Firmware, also referred to as stored logic is a combination of both the software and hardware recorded permanently on electronic chips.

Usually, a firmware is a read-only memory chip that is mounted or plugged into the motherboard. Firmware may hold an operating system, utility programs, language processors etc.

c. Utility software.

Utility software is a special program that performs commonly used services that make certain aspects of computing to go on more smoothly. Such services include sorting, copying, file handling, disk management etc. The two basic types of utility software are:

1. **System-level utility software:** These help the user to work with the operating system and its functions. For example, a utility software tells the user when he/she enters a wrong command and gives suggestions how the error can be corrected.

2. **Application utility software:** These make the use of an application program smoother and efficient. These utility programs are commonly purchased separately or may be part of an operating system.

d. Networking software.

This type of software is mostly used to establish communication between two or more computers by linking them using a communication channel like cables to create a computer network. Networking software enables the exchange of data in a network as well as providing data

security. Network software may come as independent software or integrated in an

operating system. An example of networking software is novel NetWare, windows explorer

ii. Application software.

These are programs that are designed to help a user accomplish specific tasks.

The following table shows the summary of examples and uses of common application software.

Software	Uses	Examples
Word processor	Typing documents like letters.	Ms Word, Lotus, Word Pro, Word Star.
Spreadsheets	Manipulation of numeric data e.g., Calculating budgets.	Ms Excel, Lotus 123
Desktop Publisher	Designing publications like newspapers, books.	Adobe Page Maker, Ms publisher.
Computer aided Design	Technical drawing	Auto CAD, Arch CAD
Database	Keeping records and files.	Ms Access, D base.
Graphics software	Creating and manipulating pictures.	Corel Draw, Adobe Photoshop

Classification according to acquisition.

According to how software is obtained they can be classified into *in-house* developed software and *standard software* (Vendor off the-shelf software).

In-house developed programs

These are programs that are uniquely designed and tailored to meet a particular user need. For example, a bank may decide to manage its banking operations using a unique program developed by hired programmers. These programs are not available in the shops and once developed for one company or user may not address the needs of other users.

Standard software (Vendor off-the-shelf software)

These programs are developed by software engineers, packaged and then made available for purchase through a vendor, a distributor or directly from the developer. A developer may bundle more than one but closely related software into one package to form a suite or integrated software as opposed to single purpose software. Examples of suites are Lotus Suite, Microsoft-Office and Corel Word Perfect while those of single purpose are Quick Books and Sage Line 50.

Advantages of standard software over the in-house developed programs are:

- 1.They can easily be installed and run.
2. They are less expensive to acquire than the cost of developing in-house software.
3. They are readily available for almost any task.
4. Since they are thoroughly tested before they are released, chances of errors in them are rare.
5. They can easily be modified(customized)to meet specific user's needs without involving expert programmers

Criteria for selecting Computer System.

i. Hardware considerations.

Factors considered when selecting computer hardware are;

Processor speed: The processing power and speed of a computer mainly depends on the processor speed. A good computer must have high processor speed.

Memory capacity: Although, a computer may have a very fast processor, it may not perform as expected if it has low memory capacity as expected. Because of the current multimedia driven applications, a good computer should have sufficient memory to handle the heavy applications that require a lot of memory space in order to run. A computer with at least 128 MB of RAM is recommended for most contemporary applications.

RAM is packaged as either dual in-line memory Module. (DIMM) or single in-line memory module (SIMM).

Cost: The cost of a computer system depends on:

1. Its processing capability.
2. Whether it is branded or a clone. Branded computers are more expensive than their equivalent clones.

Warranty: A warranty is an agreement between the buyer and the seller that spells out terms and conditions of, after selling a product in case of failure or malfunction

Portability: The size of electronic devices including computers has become a major consideration because smaller devices enhance mobility.

User needs: When selecting computer hardware, consider the unique needs of the user. For example, if the users have special disability like in ability to use their hands, consider buying input devices that capture data through voice input. The user needs also determine the type of data that will be processed hence, the choice of the type of hardware most appropriate to satisfy the needs. For example, in a supermarket a special computerized device called a point of sale (POS) terminal is most suitable to record transactions.

ii. Software considerations

The following factors should be considered when selecting software:

Authenticity: The term authenticity refers to genuineness, validity and or legitimacy of an item. When you acquire software from the vendor, make sure it is an original copy that is accompanied by the developers license and certificate of authenticity. This is because some people illegally produce pirated copies which is an offence.

Documentation: It refers to the manuals prepared by the developer having details on how to install, use and maintain the software. These include installation guide, maintenance guide and a user guide. This documentation enables the user to work with the software with minimum guidance.

User needs: The needs of the user determine the type of operating system and application programs that should be considered for acquisition. For example, if the user needs to type documents most often, he/she would go for a word-processor. People with special disability

will require software that of input like voice and natural sound. A good example is software used in mobile phones to store voice and allow the user to make a call by just calling a name instead of keying in the number.

Reliability and security: People are more comfortable with software that offers good security to confidential and private information.

User friendliness: One of the most important features normally considered when using a computer program is its user-friendliness. This is a measure of how easily the users can be able to operate the computer. Some programs are more user friendlier than others.

A lot of research and effort has been dedicated in trying to come up with more user-friendly software. The ease of use of a program will most likely influence whether the user will prefer it or not.

Cost: The cost of software is perhaps one of the most controversial issues that must be considered

carefully. One cannot just go for software because it is cheap. Many other factors may force a person to buy far much more expensive software even with cheaper alternatives available. However, it is illogical to buy expensive software if there is a reliable cheaper alternative that will meet ones needs. In case the off-the-shelf software does not fit the needs of the users it would be advisable to develop in-house software solution seven though they may be a bit more expensive.

Compatibility and system configuration:

Software compatibility refers to the ability of the computer to run the software depending on the system setup (configuration). For example, some

software may only run on a computer that has 32 MB of RAM and above. Any computer with lower than this, will be said to be incompatible.

It is important that one reads the installation guide and system requirements that comes with the software in order to avoid disappointment.

Portability: Portability in this aspect refers to whether a program can be copied or installed in more than one computer. Although, most software in the market today is portable some developers produce software which can be installed on one machine only. This means that if one has twenty computers, one should buy a license for each.

Chapter revision questions and answers.

Computer Systems

1. **What is a computer system?**
 - ✓ A computer system is a collection of 3 entities namely; hardware, software and liveware that work together to receive, process, manage and present information in a meaningful format.
2. **Differentiate between a computer and a computer system?**
 - ✓ A computer is an electronic device capable of accepting data as input, process it and give out information as output while A computer system is a collection of 3 entities namely; hardware, software and liveware that work together to receive, process, manage and present information in a meaningful format.
3. A scanner used at points of sale terminals in supermarkets is an example of Optical Bar Recognition (OBR) scanner.
4. The automated input technique where keying of input data is eliminated is sometimes referred to as Typing.
5. The type of scanner used to grade multiple choice examination is called Optical Mark Recognition (OMR) Scanner.
6. **Name three factors one would consider when selecting data entry method, and give a reason why each is important.**
 - ✓ Type of data to be inserted into the computer
 - ✓ Target group of the data
 - ✓ User friendliness of the input device
 - ✓ Number of audiences
 - ✓ Amount of data
7. **Explain how banks use MICR scanners for cheque processing**
 - ✓ The document characters are typed or printed Using ink particles of iron (II) Oxide that gives them magnetic property. After forming the characters on the document, the magnetic ink encoded characters are magnetized by passing the document through a strong magnetic field. Reading is done by the MICR.
8. **Describe two situations in which speech recognition devices may be useful as a method of data entry**
 - ✓ When addressing more audience
 - ✓ Suitable for physically challenged people i.e., the blind
9. **Optical scanning of universal product code is now widely used as input method. Give an example of a place where it is used and explain how it is used.**
 - Used in supermarkets/chemists, wholesale shops.

The Optical Bar Recognition (OBR) scanner is used to capture data as lines of varying lengths known as barcodes or UPC (universal product code). Barcodes hold manufacturer's details and the product's code but not the price details because prices vary from one place to another.
10. **Describe three different optical and two magnetic scanning techniques used for input. Give an example of the use of each.**

Optical Barcode Recognition (OBR): Used to capture data coded as varied lines of varying

thickness known as barcodes or Universal Product Code

Uses

- Marketing manufactured products and published materials
- In supermarkets, libraries and other retail market outlets.
- Keeping sales records for the purpose of accounting, taking stock, restocking and identifying slow moving products.

Optical Mark Recognition (OMR): Detects marks made on a piece of paper using ink or a soft pencil, by passing an infrared beam over them.

Uses

- To mark multiple choice questions
- Analysing responses to structured questionnaires
- Selecting correct number combinations from lottery tickets.
- Reading order forms
- Reading time sheets
- Reading insurance payments

Optical Character Recognition (OCR): Used to read typewritten, computer-printed or handwritten characters and transforms the images into a soft copy that can be manipulated using a word processor.

Uses

- Handling sales orders
- Clearing cheques

Badge Readers: are devices used to read data from rectangular plastic cards. the data is both in machine-readable and human-readable form.

Uses

- Recording employees' check in and check out times in factories
- Adjusting the speed of conveyer belts in manufacturing industries

- Obtaining job details of employees when needed.

Magnetic Readers.

A magnetic reader is a scanning device that reads data made using magnetic ink.

Magnetic Ink Character Recognition (MICR): Uses the principle of magnetism to convey its data inputs.

Uses

- Used in banks for cheques processing. The details of the cheques, for example, serial number, bank branch number, and account holder's number among others.

Application.

The document characters (e. g cheque) are typed or printed using ink with particles of iron (II) Oxide that gives them magnetic property. After forming the characters on to the document, the magnetic ink encoded characters are magnetized by passing the document through a strong magnetic field. Reading is done by the MICR. Through the reader, the magnetized characters cause current to flow through the reading head depending on the magnetized surface area occupied by the individual characters. The characters are discriminated depending on the magnetic pattern that induces the different amount of current. The MICR recognizes these patterns and sends them into the computer system as input in form of electric signals.

Magnetic Stripe Readers (MSR): A magnetic stripe is a layer of magnetic material on the surface of a plastic card. The magnetic stripe is read using a magnetic stripe Reader.

Uses

- Reading plastic cards in banks
- Reading telephone calling cards.

Output Devices

1. Differentiate between soft copy and hard copy.

Soft copy refers to intangible output that can be seen or heard; such as screen display and sound.

(Can be listened to or be viewed) while hard copy refers to tangible output that can be felt such as a paper.

2. What is the difference between a CRT monitor and a flat-panel display.

Cathode Ray Tube (CRT)	Flat Panel Display
It is bell shaped Has poor resolution Heavier; hence less portable Occupies more space Cheaper	Its screen is flat shaped Has a high resolution Light, hence more portable Occupies less space Expensive

Produces high amount of radiation
Consumes more power

Produces a low amount of radiation
Consumes less power

3. Give three examples of flat-panel monitors available in the market today.

- ✓ *Liquid Crystal Display (LCD)*
- ✓ *Gas Plasma Display (GPD)*
- ✓ *Thin-Film-Transistors (TFTs)*
- ✓ *Field Emission Displays (FESs)*

4. Name four criteria used when selecting a printer.

- ✓ *Print quality*
- ✓ *Initial cost*
- ✓ *Running cost*
- ✓ *Speed*
- ✓ *Colour printing*

5. Distinguish between impact and non-impact printers and give two examples of each.

Impact printers	Non-Impact printers
<ul style="list-style-type: none">i. Speed of printing is lowii. Use inked ribbons, which may be black or colourediii. Multiple copy production is possible when carbonated paper is usediv. Cheaper to buy and maintain. The ribbons are not expensive.v. Noisy printers hence cannot be used in quiet places like hospitals	<ul style="list-style-type: none">i. Speed of printing is highii. Use electrostatic or thermal principles or tonersiii. Multiple copies are almost impossible.iv. Costly to purchase and maintain. The toners and cartridges are expensive.v. Quiet printers. Appropriate to use in a quiet environment, for example in hospitals

6. State one advantage and one disadvantage of laser and inkjet printers respectively.

Advantages.

- High quality printouts are produced with option of using colors
- Relatively cheap
- Relatively faster

Disadvantages

- Not very reliable, especially when quality of paper used is compromised.
- Have smaller cartridges, hence cannot produce many copies.
- Relatively slow
- High maintenance cost as ink cartridges are expensive to purchase.
- If printout is used before it fully dries up, some information may end up being deleted or distorted due to formation of ink smudges

7. Give two examples of sound output devices.

- ✓ Sound card
- ✓ Speakers or headphones
- ✓ Audio playing program e.g., windows media player, iTunes, DVD or power DVD player
- ✓ A video Graphics Array (VGA) monitor
- ✓ A CD/DVD drive.

8. Pamtex construction company intends to buy an output device they can use to produce road maps. Which device would you advise the company to buy and why?

Plotters

Plotters are specialized output devices designed to produce high quality graphics in a variety of colours. Mostly used for printing geographical, architectural and engineering drawings e.g., maps, advertisement posters.

Central Processing Unit

1. Define the term central processing unit?
 - ✓ *The CPU also known as the processor is the part of the computer that is regarded as the brain of the computer because all processing activities are carried out inside the processor.*
2. Describe three functions performed by the CPU.
 - *It coordinates all processing activities in the CPU as well as input, storage and output operations.*
 - *It determines which operation is to be executed next.*
3. What is a microprocessor?
 - ✓ *Is the CPU of microcomputers.*
4. Explain the functions performed by
 - a) The control unit
 - ✓ *Coordinate all processing activities in the CPU as well as input, storage and output operations. It allocates time slices to the CPU during processing by the help of the system clock.*
 - b) The arithmetic logic unit
6. Define and explain the difference between RAM and ROM.

Random Access Memory (RAM)	Read Only Memory(ROM)
a) Data can be read(retrieved) and written (stored) in it b) Is temporary (volatile) storage because its content disappears when the computer is switched off. c) Its content is user defined i.e., the user dictates what is to be contained in the RAM	a) One can only read its content but you cannot write on it unless its is a special type of ROM b) It is non-volatile i.e.; its content is not lost when the computer is switched off. c) Stores permanent or semi-permanent instructions from the manufacturer called firmware

7. How many characters (bytes) of data are held in each of the following memories?
 - ✓ *4KB-4000 Bytes*
 - ✓ *640KB-640,000 Bytes*
 - ✓ *16MB- 16,000,000 Bytes*
 - ✓ *20GB-20,000,000,000 Bytes*
8. Name three special purpose memories found either inside or outside the microprocessor, and explain what each does.

1. Cache memory

- ✓ *This is the first memory which high speed retrieval of data and instructions are possible.*
- ✓ *Is the first type of RAM*

- ✓ *This is where all arithmetic and logical operations are carried out.*
- ✓ *Arithmetic operations (addition, subtraction, division & multiplication)*
- ✓ *Logical operations (greater than (>), less than (<), equal to (=))*
- ✓ *Also contains temporary storage locations called registers*

c) The main memory

- ✓ *Also known as primary storage. Is a type of storage that is directly accessible by the processor. Contains the ROM and RAM memories*

5. Define the terms: volatile memory and non-volatile memory.

- ✓ *A volatile memory is the one whose contents may be lost in case of power outage (RAM) while non-volatile memory is the one which retains its contents even when power goes off (ROM)*

Three types

- ✓ *Level 1-also known as primary cache located inside the microprocessor*
- ✓ *Level 2-also known as external cache that may be inside the microprocessor or mounted on the motherboard.*
- ✓ *Level 3- is the latest type of cache that works with L2 cache to optimize system performance.*

2. Buffers

- ✓ *This is a temporary storage area for data waiting to be processed. It is in both input and output devices.*
- ✓ *Input is data is held in the input buffer, while output is held in output buffer.*

3. Registers/Virtual memory

- ✓ This is space on the hard disk which can be used just like the primary memory.
- Examples**
- ✓ Accumulator-This temporarily holds the results of the last processing step of the ALU.
 - ✓ Instruction Register-This temporarily holds an instruction just before it is interpreted into a form that the CPU can understand.
 - ✓ Address Register-Tis temporarily holds the next piece of data waiting to be processed.
 - ✓ Storage Register; This temporarily holds a piece of data that is on its way to and from the CPU and the main memory.
9. In reference to arithmetic and logic unit, explain the meaning of logic operations and give an example of this processing operation.
- ✓ Logic operations are comparison operations. In this case, it's the computers capability to compare two or more values e.g., greater than, less than equal to.
10. What are the differences between the mainframe's CPU and that of a microcomputer?
- ✓ The mainframes CPU are large in size and higher processing speed compared to microcomputers which are slightly slow and less powerful.
11. Explain the purpose of the system clock?
Used by the control unit to coordinate all processing activities. Sends electric signals as its means of communication. The number of pulses per second determines the speed of a microprocessor. The faster the clock pulses, the faster the CPU, hence the faster the computer can process data.
12. What is the meaning of BIOS, and what role does it play in a computer?
- ✓ BIOS-Basic Input Output System.
 - ✓ Is a special firmware that accomplishes the POST process during bootup(cold booting).
13. List three buses found in the CPU.
- ✓ Control bus
 - ✓ Address bus
 - ✓ Data bus

Computer software

1. Differentiate between system software and application software giving an example in each case.
- ✓ System software refers to programs whose main task is to manage computer system resources. Examples: Operating system, networking software, firmware, utility software while application software refers to programs that are designed to help the user accomplish specific tasks. Examples: word processors, spreadsheets, desktop publishing, databases.
2. What is the importance of an operating system?
- ✓ It provides an interface and a platform through which the computer user or client interacts with the computer system.
 - ✓ Because it controls execution of user programs called applications and acts as a go between (interface) between the applications and the computer hardware.
 - ✓ It manages input, output and storage operations in a computer.
3. Give five examples of application software and their respective uses.

APPLICATION SOFTWARE	APPLICATIONS	EXAMPLES
Word processors	Typing documents like letters, reports, curriculum vitae among others	Microsoft word, WordPerfect, WordStar, AmiPro, Corel, WordPro, K- word
Spreadsheets	Calculating budgets	Ms Excel, Lotus 1-2-3, Quattro Pro, Smart Suite
Desktop publishing	Designing publications like newspapers, brochures, and books among others. It combines both text and graphics.	Adobe PageMaker, Microsoft publisher, Adobe Photoshop, Adobe Indesign

Database management system (DBMS)	Keeping records and files	Ms Access, MySQL, FoxBASE, Paradox dbase III+, dbase IV, Dbase V, Oracle, Informix, Ingress, Progress, Sybase, Interbase, pinpoint, SQL Server.
Graphics software	Designing and manipulating graphics. Used to create artwork for printing.	Corel Draw, Photoshop, Adobe Illustrator, Microsoft paintbrush
Accounting packages	Used to carry out accounting tasks	QuickBooks, Sage, Quickens ACCPAC, System tactics
Presentation software	Used to present talks and discussion, for example to deliver lectures to live audiences	Microsoft PowerPoint, RM Illuminatus

4. What are the advantages of standard software over the in-house developed software?

- ✓ Relatively cheap and readily available
- ✓ Can be use to accomplish many tasks for example DTP, word-processing, spreadsheets, accounting and records management.
- ✓ They are easy to learn and use, hence suitable for people with basic computer skills.
- ✓ They are provided with supportive documentation, which is available both in soft-copy and hard-copy.

5. What is the difference between single-purpose programs and integrated software?

Single-purpose programs are software written by programmers to perform a specific job. They are created on demand, based on a problem that has been identified by a client that is they

are customer-tailored while integrated software is a type of program that are developed by software engineers, packaged and then made available for purchase through vendor, a distributor or directly from the developer. A developer may bundle more than one but closely related software into one package to form a suite or integrated software

6. Why do computers need network software?

- ✓ To establish communication between two or more computers by linking them using a communication channel like cables or create a computer network.

7. Give three examples of operating systems.

- ✓ Microsoft Windows (95, XP, Vista, 2000, 7, 8, 10)
- ✓ UNIX
- ✓ Linux
- ✓ Macintosh (MacOS).
- ✓ Ubuntu

Chapter Objectives.

By the end of this chapter the learner should be able to;

- a. *Explain resources under the under operating system control.*
- b. *Explain functions of an operating of system.*
- c. *Discus types of operating system.*
- d. *Explain the factors to consider when choosing an operating system.*
- e. *Explain how windows organizes information.*
- f. *Describe management of files and folders.*
- g. *Explain disk management using Windows.*

Understand how to install windows operating system.**Introduction.**

Operating system (OS) - a program that acts as an interface between the computer hardware. The operating system controls and manages the operations in the computer.

An OS basically consists of two main parts; - the *shell* and *kernel*.

Shell: is the outer part of the operating system.

Kernel: is the core of operating system, the kernel that is responsible for managing resources as the processors, main memory, storage devices, input output devices and the communication devices.

Resources under operating system control.

A computer is made up of a set of software-controlled resources that enable the movement, storage and processing of data and information. The resources under the control of operating system include: the processor, the main memory(RAM), input and output devices, secondary storage devices and communication devices.

i. The processor

The processor executes tasks called processes. The operating system arranges take in order of priority at any time that's there is several takes to be processed. The operating system has the ability to stop a particular task to allow the processor to carry out another task.

ii. Input/output devices.

The operating system controls and information output tasks. Because most input output devices are slower than the processor, the operating system controls the flow of data from the time data is input up to the time the information is output. It also ensures the right data reaches the processor at the right time.

iii. Communication devices and ports.

In this case communication refers to how various devices send message to one another. The opening system controls the overall communication process between various take and computers.

iv. Secondary storage devices.

The operating system manages the storage and retrieval of data on the storage devices. It also utilizes the free space on the hard disk to enhance the performance of the computer.

v. Main memory (RAM).

The operating system determine which tasks remains in the main memory awaiting execution and which one will be sent to the secondary storage device to wait.

Functions of the operating system.

The functions of the operating system are:

- Job scheduling
- Resource control and allocation
- Input /output handling
- Memory management
- Error handling
- Job sequencing
- Interrupt handling
- Communication and control management.

i. job scheduling.

The processor can only handle one task at a time. Therefore the operating system determine which task will be processed first. The operating system may decide to process smaller tasks before later tasks. Job scheduling may also be based on first in first out (FIFO)

ii. input output handling.

The operating system coordinates between the input output devices and other peripheral devices making sure that data flows smoothly between them and sorting out any possible confusion.

iii. Error handling.

The operating system alerts th user of errors that may arise out of illegal, hardware or software failure. The operating system then makes possible suggestions on how to correct the error.

iv. Interrupt handling.

An interrupt is a break from the normal sequential processing of instructions in a program. An external request causes the processor to stop executing the current task and do something else before returning the control back to the program that was interrupted.

v. Memory management.

All data and instructions must be temporarily stored in the main memory before and after processing. The operating system ensures each program has enough memory to execute processes.

vi. Job sequencing.

The operating system keeps list of jobs currently being run and gives the timing in and out f the processor. It also arranges them in an order that makes work easier for the processor to execute them.

Types of Operating system.

Operating system can be classified to:

- a). Number of tasks
- b). Number of users.
- c). User interface.

Classification according to number of tasks

Single program operating system.

These allows only one program in the main memory at a Time. The user can only run one interactive program at a time. The user must exit the program before loading another program. Examples of single task operating

system include MS DOS from Microsoft corporation.

Multitasking operating system

This type of operating system allows the CPU to execute more than one program at a time.

Classification according to number of users.

Single user operating system

Single user operating system is designed for use by only one person. It only supports one user and runs only one user application at a time.

Multi user operating system

This allows more than one user to interactively use the computer at a time. It can be installed in a computer that is accessed by many people at the same time. Examples include UNIX, Novell and windows NT/2000, Linux

Classification according to user interface.

Human computer interface refers to the methods of interaction between the computer and the user. It determines how easy the user can access the computer.

These include: *command line interface*, *menu driven interface* and *graphical user interface*.

Command line interface

The user interacts with the computer by typing executable commands at the prompt found on a command line which the computer reads and executes. Descriptive verbs e.g., Print, copy etc. are used. The user must press the enter key for the command to be executed. Examples include: MS DOS, PC DOS, OS/2 and UNIX.

Menu driven interface

This type of interface provides the user with a list of options to choose from. The interface is therefore suitable for beginners who have difficulties recalling commands.

Graphical user interface (GUI).

The GUI makes the user interface more friendly. In addition to menus, GUI has a rectangular work area called windows, graphical objects called icons and most commands executed using the cursor. The features are given an acronym WIMP which stands for windows, menus, icons, and pointing devices. Examples include Linux, Microsoft Windows, Apple Macintosh.

Factors to consider when choosing an operating system.

1. **Hardware configuration.** E.g., memory size, hard disk capacity, type of processor etc.
2. **Basic design of the computer** e.g., is it an IBM or IBM compatible or an Apple computer.
3. **Applications intended for the computer.**
4. **User friendliness** or computer human interface i.e., is it command line based, menu driven or graphical user interface based.
5. **Availability in the market** e.g., Microsoft Windows-based operating systems are very common.
6. **Cost-** how expensive is the operating system.
7. **Reliability-** can it run without crashing or hanging?

How windows organize information.

Features of windows operating system

1. They have similar user interface
2. They support multiple tasks and multiple users.
3. They have ability to handle long file names.

Windows manages data and information stored in storage devices by organizing it into easily accessible units called files and folders.

Files.

A file is a collection of related data and information stored in one location and given a unique name for easy access and retrieval.

There are two types of files namely: *system files* and *application files*.

System files.

These files contain information that is critical to the operation of the computer. For example, all hardware devices are tested and made ready during the boot up by having the computer read information.

Application files.

They are also called program files. They have extensions such as .exe.

Below is a list of some common extensions and suggests the type of information the file could be.

Extensions	Type of information
DAT	Data files
EXE	Executable files that start an application
TXT	Text files.
DOC	Document files

Folders.

Also, folder called directory.

A folder is named storage location where the user can store related files to enable easy access.

A folder enables the user to divide a storage media into small manageable storage locations.

The figure below shows a folder icon and a folder named CASTRO



Subfolders.

A larger folder can be divided into smaller unit called subfolders. Therefore, a subfolder is a folder inside another folder. Folders and subfolders mostly appear in yellow icons n windows while field icons are mostly white with

Windows desktop.

Once a computer is switched on, windows is automatically loaded into the main memory and an empty screen called desktop appears. This shows that the computer is ready for use. The figure below shows windows desktop.

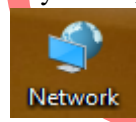


Desktop features.

The desktop has features like icons and along thin bar called taskbar.

Icons.

Icons are mostly manipulated using a pointing device like the mouse. The most common icons on the desktop are My computer, Recycle bin, My documents and Internet explorer.



The task bar.

The taskbar enables the user to easily switch between different programs and tasks that are currently running. Whenever a program is started or a file is opened, its button appears on the task bar and stays until the user closes the program. The user can switch between the various programs and tasks in windows by clicking in these buttons. This is a process called multitasking.

The taskbar has three main parts.

- Start button:** the left most button on the task bar that user clicks to display the start menu.
- Task manger:** this displays buttons of all currently running tasks.
- system tray:** it is the rightmost part of the task bar. It has icons of tasks running in the background but are not displayed on the screen. These tasks include time, calendar, antivirus programs and volume control.

The start menu.

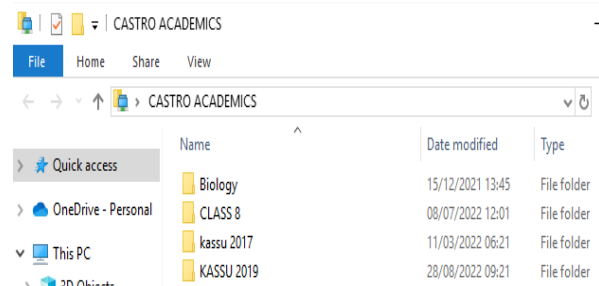
Clicking the start button gives a list of choices called the start menu. Items on the menu varies depending on the version of windows you are using.

Programs.

This is a menu that displays a list of all programs installed in the computer. The menu has a small solid arrow which when you click or point at, another list of menus called the side kick menu is displayed.

Recent documents.

a fold top right-hand corner. The figure below illustrates a folder inside another folder. The folders named: Biology, CLASS 8 and Kassu 2019 are folders found inside a folder named CASTRO ACADEMICS.



My document in windows XP list the last fifteen recently accessed files. You can open any of the files listed by clicking its name.

Settings/control panel.

The control panel provides tools which the user can use to maintain and make changes to the computer setup. This menu can interfere with the computer functionality hence should not be tampered with.

Find/search.

This feature helps the user to search a file or folder incase the user forgets its name or location.

Help/help and support.

This command on the start menu displays detailed information on hoe to use the operating system and solve computer related problem in case the computer fails to function properly.

Run.

This is a command that enables the user to

1. Install programs on the hard disk.
2. Open files and folders from a storage location.
3. Run programs from removable storage media without necessarily it on the hard disk.

Logon/log off.

This is security measure.

Logon- prompts for a username and password in order to gain acces. After using the computer, **log off** the computer before leaving it on the hard disk.

Shutdown.

This feature lets the user shuts the computer or restart the computer.

A computer must be shut down before turning it off. To this, the correct procedure has to be followed as below.

1. Click on the start button.
2. Point and click shut down a prompt for windows 98 will appear.
3. If you want to shut down, click shut down button.
4. Click or press enter
5. The computer is now safe to turn off.

CHAPTER REVISION QUESTION.

1. Describe the classification of operating system.
2. Define the following terms as used in operating systems
 - a) Multitasking
 - b) Time Sharing
 - c) Object oriented programming
 - d) Multi-user computing
3. What is the function of a **recycle bin** in computers?
4. Name various resources that can be shared among computers in a network.