



# FIRM FOUNDATION COUNTRY SCHOOL

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CANDIDATE  
NAME

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CLASS

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## COMPUTER SCIENCE

0478

Paper 1

HOLIDAY WORK TERM 1 2026

Form 1

You must answer on the question paper

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### INSTRUCTIONS

- Write your name in the space at the top of this page.
- Answer **all** questions.
- Use a black or dark blue pen.
- Write your answer to each question in the spaces provided.
- Do not use an erasable pen or correction fluid.
- Use a pencil for all drawings.
- Do not leave blank spaces.
- The Hexadecimal Conversion Sheet has been provided for this exam

DO NOT WRITE IN ANY OTHER SPACES.

### INFORMATION

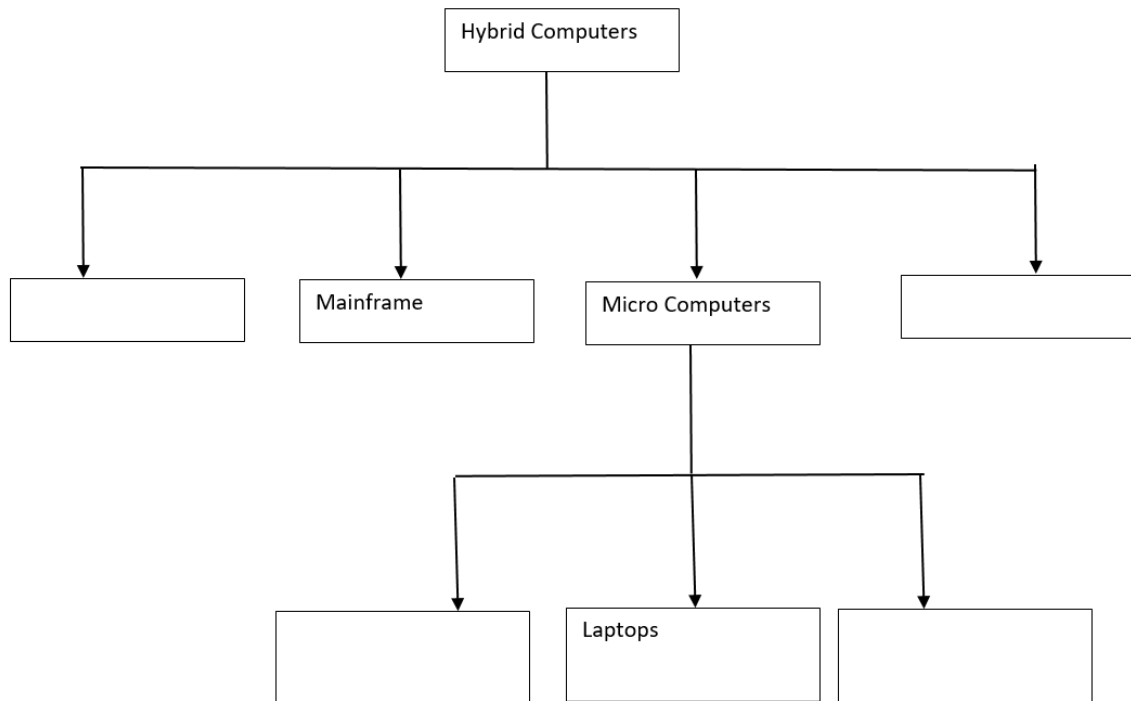
- You are required to print this document.
- The number of marks for each question or part question is shown in brackets [ ].

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This document has 33 pages.

## COMPUTER SCIENCE EXERCISES

### 1 Complete the diagram



2. State the advantages and disadvantages of desktop computers

3. What is a laptop?

### HEXADECIMALS

1. What is a MAC address?
2. The hexadecimals below are part of Kundai's MAC address

AB : 60 : B6 : 63

Can you clearly show the binary equivalence of that MAC address

3. State any 3 uses of hexadecimals in computer science.

### HEXADECIMAL CONVERSION

1. Convert the following hexadecimal numbers into denary

a) A 0 1

b) B B 4

c) C A 8

d) 1 2 A E

e) A D 8 9

### BINARY CONVERSION

1. Convert the following binary numbers to denary

a) 011011011

b) 111100001

c) 10101010

d) 11110101

e) 10111

Revision 1

1. Define the following terms as they are used in computers science

a) input device

b) computer

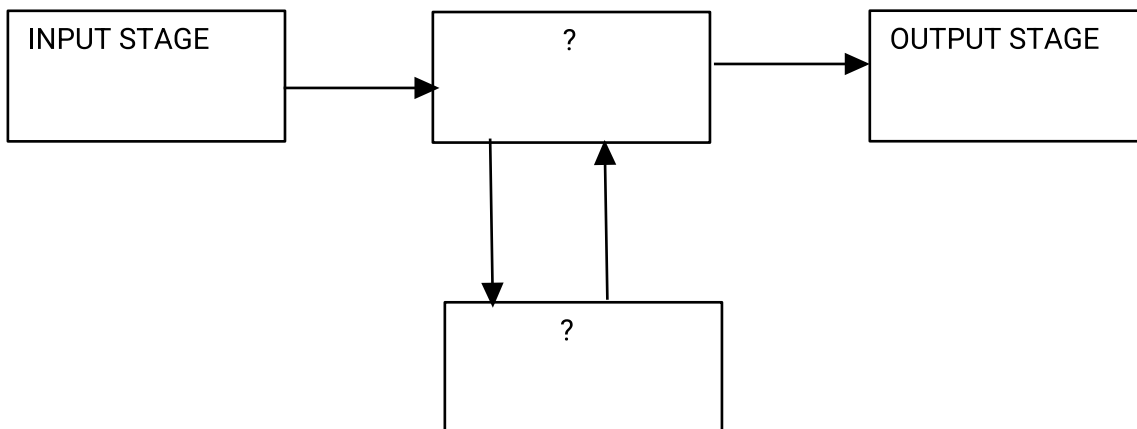
c) peripheral devices

2. State any 3 types of computers

3. State 2 advantages and 2 disadvantages of desktop computers

4. State any 5 input devices you are familiar with

5. Complete the diagram below



6. What is the difference between analogue and digital signals ?

Revision ex 2

1. Convert the following numbers to binary

a) 178

b) 230

c) 180

2. State any 5 input devices you are familiar with

3. State 2 advantages of a keyboard

4. State any 3 pointing devices

5. What are the disadvantages and advantages of using laptop computers ?

## Practical exercise

### MS-WORD

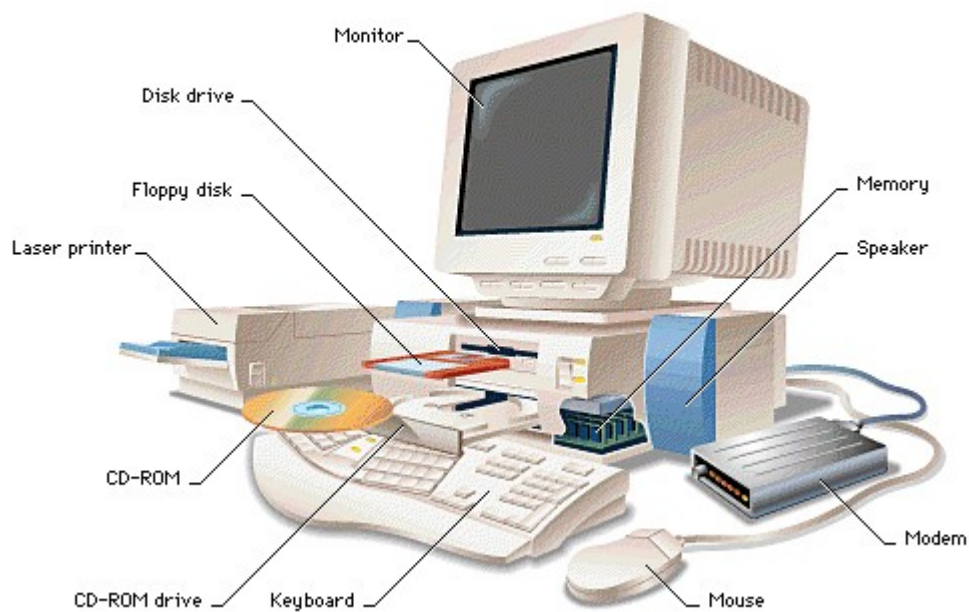
Microsoft Word is a word processor developed by Microsoft. It was first released in 1983 under the name Multi-Tool Word for Xenix systems. MS Word is a popular word-processing program used primarily for creating documents such as letters, brochures, learning activities, tests, quizzes and students' homework assignments.

There are many simple but useful features available in Microsoft Word to make it easier for study and work. That's why so many people would prefer to convert the read-only PDF to editable Word and edit PDF in Word.

1. Type the paragraph above as it is using "Calibri font" , font size 12 [10]
2. Copy and paste the whole paragraph to page 2 . [3]
3. Change the font type to "Lucida Calligraphy" and size to 14. [4]
4. Bold and underline the heading. [4]
5. Change font colour for second paragraph to green [2]
6. Save and print [2]

25 marks

# COMPUTER OPERATIONS AND PACKAGES



### Computer studies

- Computer studies deals with the features of computers, and the ways and methods of using computers, so as to provide a basis for understanding the impact of computers on individuals, organizations and society.
- **Information Technology (IT)** is the technology which supports activities involving the creation, storage, manipulation and communication of information together with their related methods, management and applications.
- IT includes radios, televisions, telex, telephone, fax machines, satellites and computers.

### Data

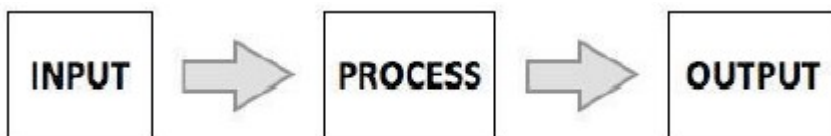
- Data – these are raw (unprocessed) facts entered into a computer for storage or processing.
- In other words, data is simply any numbers, letters or symbols that can be entered into a computer system.
- Here are some items of data: **Hellen Bright 590809 156 BR BK**
- Data values don't have any meaning unless we process them.

### Information

- Information - is data that has been processed so that it has meaning.
- For information to be produced, data is collected and then subjected to a transformation process. Only when 'meaning' is assigned to the data do we get information.
- In this case when the line **Hellen Bright 590809 156 BR BK** is processed, the computer might print the following information, assuming **BR** is the code for brown and **BK** for black.

### A system

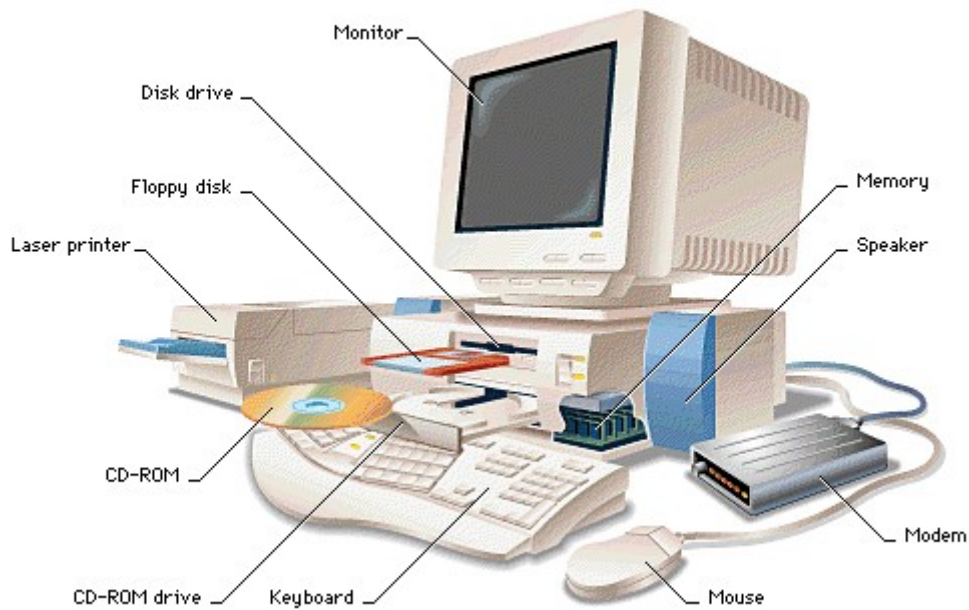
- A system can be defined as a collection of components that work together towards a common goal. The objective of a system is to receive the inputs and change them into outputs.
- A computer system has three stages.



1. Something feeds into the computer system (the input).
2. The system does something with the input (the process).
3. The process gives a result (output).

### Computer

- A computer is an electronic device that accepts input data, process it according to *programmed* instructions, and give an output which can be stored for future use.
- Computers come in a huge variety of shapes, and sizes. You will be familiar with desktop computers and laptops. There are some computers that fill whole rooms and others that are small enough to fit into your palm (hand).



### **How a computer works**

A computer functions in the following manner:

#### **1. The computer accepts input data**

- Computer input is whatever is entered or fed into a computer system. Input can be supplied by a person (through the use a keyboard) or by another a computer or device (such as a diskette or CD ROM).
- Some examples of input include the words and symbols in a document, numbers for a calculation, instructions for completing a process, pictures etc.

#### **2. The computer processes data**

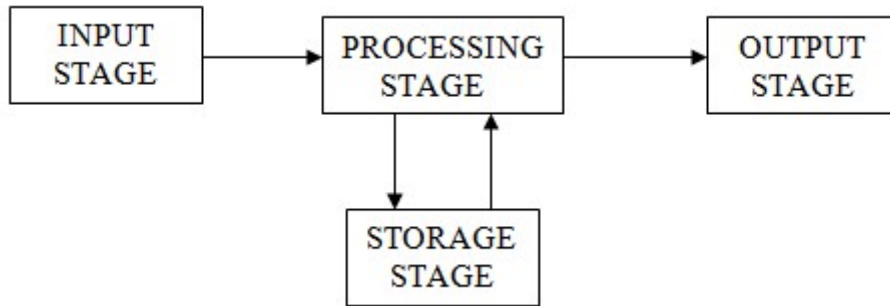
- Data entered into a computer is manipulated /changed in some ways. This manipulation is called processing. Examples of processing include performing calculations, sorting lists of words/numbers, modifying documents according to user instructions.
- A computer process data in the CPU. A process is a systematic series of actions a computer uses to manipulate data.

#### **3. The computer stores data**

- A computer must store data so that it is available for processing. Most computers have more than one location for storing data.
- The storage of data in the computer is called 'online storage' while the storage of data on computer tapes, diskettes or CD ROMs is called 'offline storage'.

#### **4. The computer produces output**

- Computer output is information that has been produced by a computer. Some examples of computer output include documents, music, graphs and pictures.
- Computer output can be in several different formats, such as paper, diskette or on screen.



- Computers can perform complex and repetitive procedures quickly, precisely and reliably. Modern computers are electronic and digital.
- The actual machinery (wires, transistors, and circuits) is called hardware; the instructions and data are called software. All general-purpose computers require the following hardware components:
  1. Central processing unit (CPU): The heart of the computer, this is the component that actually executes instructions organized in programs ("software") which tell the computer what to do.
  2. Memory - Enables a computer to store, at least temporarily, data, programs, and intermediate results.
  3. Mass storage device (slower, cheaper, long-term memory): Allows a computer to permanently retain large amounts of data and programs between jobs. Common mass storage devices include disk drives and tape drives.
  4. Input device: Usually a keyboard and mouse, the input device is the conduit through which data and instructions enter a computer.
  5. Output device: A display screen, printer, or other device that lets you see what the computer has accomplished.

#### . Analogue signals and digital data

- Analogue data is one whose value continuously changes/varies. Examples of analogue data include pressure data, temperature data, humidity data, sound data etc.
- Digital data is one which is in the form of digits. Computers and most other modern electron devices such as cameras, mobile phones etc are 'digital' devices because they process data in the form of numbers.
- When data is input into a computer, the numbers or words we understand are translated into a binary number. Binary is the language of computers. Binary only uses 0s and 1s to represent information in the computer.
- Computers are unable to process analogue signals because they are digital devices. For digital devices such as computers to work with analogue data, it must be first converted to digits.
- A device that converts analogue data to digital data is called an analogue to digital convertor (ADC).

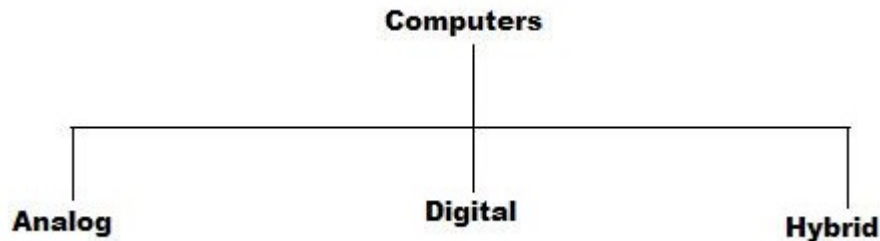
#### Types of computers

Computer classification is the grouping of computers according to chosen criteria. The criteria used to classify computers include:

- Type of data signal used by computers
- The size of the computer.
- The processing speed of the computer.
- The application area of the computer.

### 1. Classification by data signal

- Data are raw facts entered into the computer for processing or storage. A signal is a method by which the data is transmitted from one computer to another.
- There are three different types of computers according to the types of data signals they make use of. Those three types of computers are
  1. Analogue computers.
  2. Digital computers.
  3. Hybrid computers.



#### 1. Analogue computers

- Analogue data is in the form of continuously varying signals.
- Analogue computers use variations in electric voltage or current to represent an aspect of the problem.
- By manipulating these electrical signals using various electronic components, results are obtained and displayed using meters.
- Analogue computers generally deal with physical variables such as voltage, pressure, temperature, speed etc.
- Scientists and engineers are the ones who usually work with analogue computers.
- The accuracy of all analogue computers is limited by the fact that numbers are represented by physical quantities.

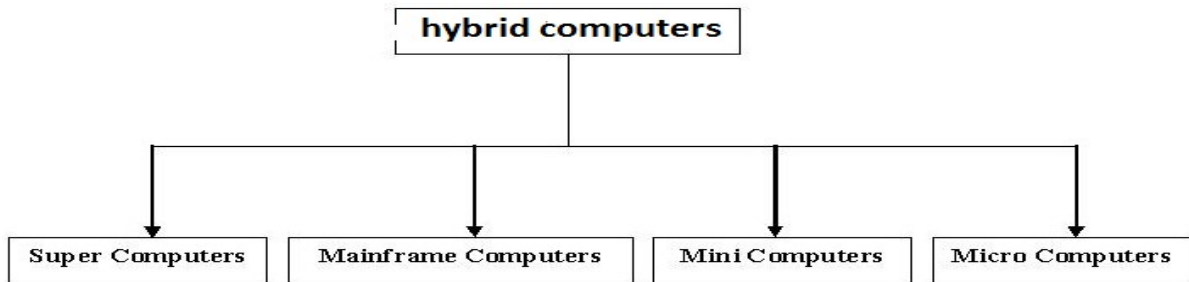
#### 2. Digital computers

- Digital computers operate on digital data such as numbers.
- All input data is converted into binary expressions. This means all processing is carried out in terms of 0s and 1s and the output is converted from this form back to human readable form.
- Digital computers can give more accurate and faster results. They are mainly suited for solving complex problems in engineering and technology.
- Hence digital computers have an increasing use in the field of design, research and data processing.
- Examples of other digital devices include digital watches, digital calculators and digital cameras. These devices manipulate numerical data by converting it to binary form for processing and back to human readable form.

#### 3. Hybrid computer

- A hybrid computer is a mixture of an analogue and a digital computer.
- It combines the desirable features of an analogue computer and those of a digital computer.
- Hybrid computers are mostly used for automatic operations of complicated physical processes and machines.
- In today's world analogue to digital (ADC) and digital to analogue convertors (DAC) are used for changing the data into suitable form for either computation.

- There are four basic classes of computers discussed under the term hybrid, namely: supercomputer, mainframe, minicomputer, and microcomputer.



### 1. Supercomputers

- A high level computer designed to perform highly complex and time consuming tasks.
- Supercomputers can process billions of instructions per second. Normally they will be used for applications which require intensive numerical calculations such as stock analysis, weather forecasting etc.
- Supercomputers are different from other types of computers in that they are designed to work on a single problem at a time, devoting all their resources to the solving of the problem.
- Supercomputers are normally very expensive and are thus shared resources.
- Because of the expense, usually only large companies, universities, laboratories and government agencies can afford them.

### 2. Mainframe computers

- A high level computer designed to carry out the most intensive computational tasks as fast as possible.
- They have become commonly known as **servers**.
- They are physically larger than minicomputers and microcomputers.
- Mainframe computers are often shared by multiple users connected to the computer via terminals.
- They have very high processor power i.e. they can process hundreds of millions of instructions per second.
- They have very high storage capacity, ranging up to many terabytes.
- They need an environmental control system e.g. air conditioning, temperature control etc.

### 3. Minicomputers

- A middle-level computer built to perform complex computations.
- They are general purpose computers that are larger and more powerful than most microcomputers but are smaller and less powerful than mainframes.
- A minicomputer is a multiprocessing system capable of supporting from up to 200 users simultaneously.
- Minicomputers are used heavily in transaction processing systems and as interfaces between mainframe computer systems and wide area networks.
- They cost less to buy, operate and maintain than mainframe computers.
- They can function in ordinary operating environments (i.e. they do not need air conditioning, temperature control systems etc).

#### 4. Microcomputers

- They have become commonly known as personal computers (PC).
- A microcomputer can be defined as a small, inexpensive computer designed for an individual user.
- The basic characteristic of PCs is that they are single-user systems and are based on microprocessors.
- Through the microprocessor technology, the entire Central Processing Unit is put on a single chip.
- Microcomputers are mainly used in homes, offices, schools and in business.
- The usefulness and capabilities of personal computers can be greatly enhanced by connection to the Internet and World Wide Web, as well as to smaller networks that link to local computers or databases.
- They may be divided into three categories namely:
  1. Desktop computers.
  2. Laptop computers.
  3. Handheld computers.

##### a) Desktop computers

- A computer designed to fit comfortably on top of a desk, typically with the monitor sitting on top of the computer.
- They are usually easier to use and more affordable.
- They are normally intended for individual users for their word processing and other small application requirements.

##### b) Laptops



- A small portable personal computer, often battery operated, which consist of a case that opens to reveal a screen in the upper part and a keyboard in the lower part.
- A small, portable computer -- small enough that it can sit on your lap. Nowadays, laptop computers are more frequently called notebook computers.
- Laptop computers have the obvious advantage over desk top computers (PCs) in that they are fully portable. This is of particular value if a user wishes to do work away from the office (e.g. when travelling) or if they want the freedom to work anywhere within a building taking full advantage of Wi-Fi technology.
- One of the main considerations when buying a laptop is the battery life. This can depend on a number of things but one major factor is the processor specification. The following is a list for consideration:
  1. The processor should consume as little power as possible thereby prolonging internal battery life.

2. The processor should run as cool as possible minimizing the problems associated with heat dissipation.
3. No fans needed to cool the processor thus reducing the load on the internal battery.

**c) Personal Digital Assistant (PDA)**

- A portable computer that is small enough to be held in one's hand.
- A PDA mainly helps with such tasks as taking notes, scheduling appointments, sending faxes and electronic mail.
- Unlike portable computers, most PDAs are pen based, allowing users to enter notes into the computer using a special pen like device rather than with a keyboard.

**Components of a computer**

- The six primary components of a computer are input devices, the processor (control unit and arithmetic/logic unit), memory, output devices, storage devices, and communications devices.
- The processor, memory, and storage devices are housed in a box-like case called the system unit.

**Computer hardware**

- Hardware is the physical parts of the computer system, those parts that you can touch and see.
- Hardware is useless without software to run on it. Software refers to the instructions that tell the computer hardware what to do. Software is useless unless there is hardware to run on it.
- Hardware can be grouped into four groups which are input devices, the central processing unit, internal and external memory and output devices.

**a) Input devices**

- Input devices are used to enter data or instructions from outside the computer into the computer system.
- A mouse and keyboard are good examples of input devices.

**b) Output devices**

- Output is data that has been processed into information.
- An output device is a piece of hardware that is used to display or output data which has been processed.
- All output devices take information from the computer and convert it into real world things (images, paper hardcopy, sound etc.).

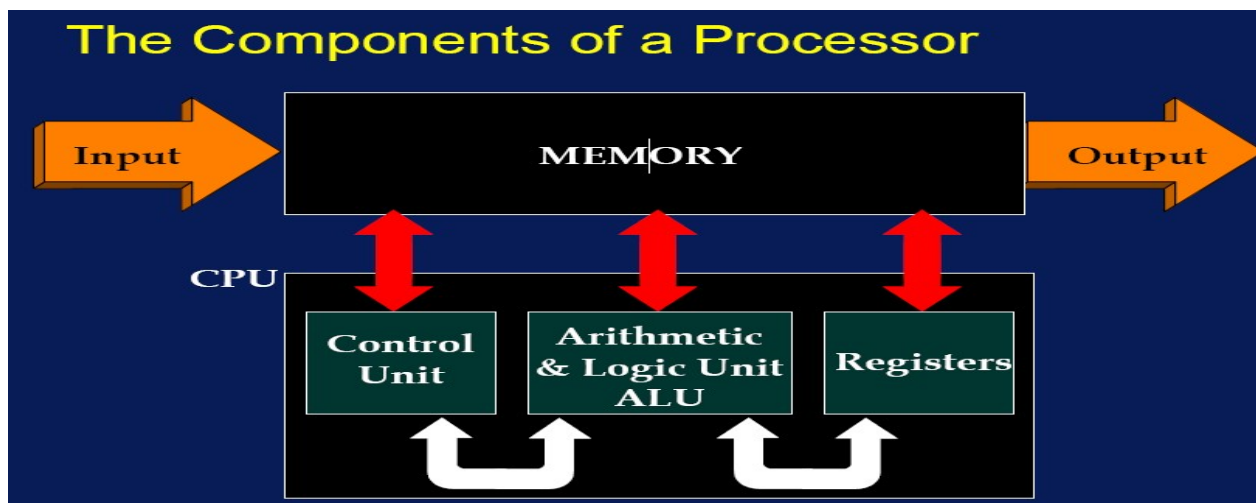
**c) Peripheral devices**

- A peripheral device is any hardware device which is connected to the computer and is controlled by the CPU.
- Generally speaking, peripheral devices include all input devices, output devices and storage devices.
- Examples of peripheral devices include monitor, keyboard, mouse, printer, scanner, speaker and external hard drive.
- Peripheral devices depend on direct connection to the CPU of a computer system. Thus, all peripherals are online devices.
- This is the opposite of off-line devices, which are separate from and not under the control of the CPU.

**d) Central processing unit (CPU)**



- It is also called the processor.
- The CPU of a computer can be divided into three main parts. These are the main memory, control unit as well as the arithmetic and logic unit (ALU).
- Under the control of the processor, data is received into main storage and then processed. The results of the processing are initially held in main storage but the processor may send them to output units or backing storage.
- The speed of a CPU is measured in Hertz (Hz).the speed generally refers to the number of instructions that can be executed per unit second. 1MHz (1Mega Hertz) is equivalent to 1million hertz and 1GHz (1Giga hertz) is equivalent to 1billion hertz.
- A typical, modern, fast CPU runs at around 2.8GHz. That means it can perform almost 3billion actions every second.
- The main functions of the central processing unit are to
  - 1) Retrieve instructions from main memory.
  - 2) Retrieve data (operands) from main memory.
  - 3) Perform the processing/operation.
  - 4) Store the results in memory.
  - 5) Issue commands to all parts of the computer system.



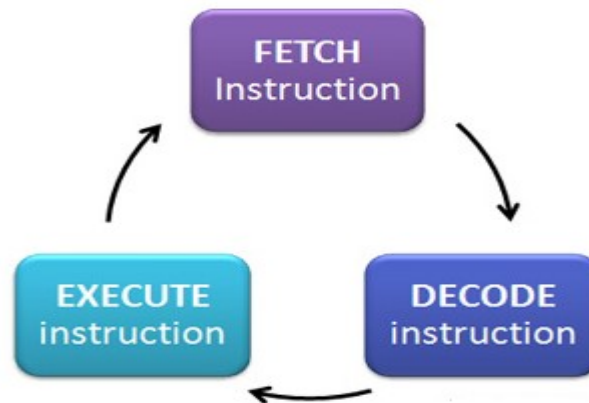
### Control unit

- The control unit is the “brains” of the computer.
- The control unit receives instructions from the main memory, decodes (interprets them) and breaks each instruction into a sequence of individual actions. In so doing, the CU controls the operation of the computer.
- Some of the major functions of the Control Unit include:
  - 1) Executing program instructions.
  - 2) Coordinating and controlling all hardware operations.
  - 3) Controlling input and output operations when requested by programs.

- 4) Ensuring that data is accurately moved from one storage area to another.
- 5) Locating the next instructions to be processed.

### How the control unit works

- The control unit deals with each instruction in turn in a three stage operation called the fetch-decode and execute cycle.
- First of all, both the data and the program that acts upon that data are loaded into main memory (RAM) by the operating system. The CPU is now ready to do some work.



- 1)** The first step the CPU carries out is to *fetch* some data and instructions (program) from main memory then store them in its own internal temporary memory areas. These memory areas are called 'registers'.
- 2)** It then *decodes*/interprets the instructions i.e. it determines what the instruction is saying.
- 3)** The data required for processing is then moved from the memory to the CPU.
- 4)** The instruction is carried out upon the data (*executed*). This is the part of the cycle when data processing actually takes place.
  - The result of this processing is stored in yet another register. Once the execute stage is complete, the CPU sets itself up to begin another cycle once more.

### Arithmetic and Logic Unit

- It provides the computer with its computational capabilities.
- Data is brought to the ALU by the control unit and the ALU performs the required operation.
- The ALU has two main functions which are:
  - 1)** Carrying out arithmetic/mathematical operations – e.g. addition, subtraction, division and multiplication.
  - 2)** Carrying out logic operations – e.g. comparing whether one value is greater than the other.

### Main memory

- Any data or instructions that are to be processed by the CPU must be placed into main memory (primary memory).
- The memory size of a computer is measured in bytes.
- More generally, the memory of a computer consists of a number of 'units of storage.'
- A unit of storage can be a bit, a byte or a word.
- A bit is defined as a unit of storage used to store a 0 or a 1.

- A byte is the amount of storage required to store one character. A byte is a collection of 8bits. (1byte=8bits).
- Storage capacity is frequently measured in:
  1. **Kilobytes** – is a measure of storage capacity abbreviated as KB and 1KB=1024bytes.
  2. **Megabyte** – is a measure of storage capacity abbreviated as MB and 1MB=1024bytes\*1024bytes.
  3. **Gigabyte** – is a measurement of storage capacity abbreviated as GB and 1GB=1024\*1024\*1024bytes.
  4. **Terabyte** - is a measurement of storage capacity abbreviated as TB and 1TB=1024\*1024\*1024\*1024bytes.
  5. The larger the memory of the computer, the more expensive the computer will be.
  6. There are two types of main memory namely Random Access Memory (RAM), and Read Only Memory (ROM).

### Random Access memory (RAM)



- RAM is the volatile memory that temporarily stores data and instructions currently being used by the computer.
- RAM is a volatile storage device. This means that if the computer's power is turned off, the contents of the RAM are lost.
- It is also called Read/Write memory. Read means you can retrieve/read information from the memory. Write means you can store/add information in the memory.
- RAM has a great impact on the speed and power of a computer. The more RAM a computer has, the more tasks it can do and the faster it can perform tasks.
- A typical home computer will have about 1 to 4 Gigabytes of RAM whilst a supercomputer will have Terabytes in order to process a huge amount of data.

### Functions of the Random Access Memory

1. Storing data waiting processing.
2. Storing instructions waiting processing.
3. Storing data awaiting output or storage.
4. Storing data and instructions that are being processed.

### Read Only Memory (ROM)



- ROM is a non-volatile memory used for permanent storage of data.
- Unlike RAM, ROM is a 'non volatile' storage – meaning that it does not lose its contents even when the computer is switched off.
- The contents of ROM are 'read only', meaning that the data can be read but not changed or erased by the user.

- The instructions and programs of ROM are permanently “burned in” to the ROM storage cells during manufacturing. This permanent software is also called firmware.
- ROM stores instructions which the computer uses when it ‘boots up’ – the bios (Basic Input Output System).

### **Functions of the ROM**

1. To store system software.
2. To store programs to boot up the computer.
3. To store BIOS (Basic Input/output System) used to control the use of input and output devices.
4. To store Firmware -programs in ROM put in by manufactures.
5. To store system date and time.

### **Microprocessors**

- A microprocessor is an electronic chip, which performs the functions of a CPU.
- They are found inside the CPU of all computers, laptops and net books.
- However, they are also found in every electronic device that you are likely to use, be it in your home, school or everyday life.
- Microprocessors vary in size and processing power but essentially they all perform the same function i.e. processing data and instructions in order to ensure that the device works as intended.

### **Microprocessors in the home**

Here are some examples of devices in your home which contain microprocessors.

#### **Washing machines**

1. Microwave cookers.
2. Dishwashers
3. Electronic kettles
4. Fridges
5. DVD players
6. Remote control TVs
7. Hair dryers.
8. Electronic tooth brushes.
9. Central heating systems.
10. Burglar alarm systems.
11. External security lights.

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## Input devices

- These are devices that are used to input data into the computer.
- There is a variety of such devices, from the common mouse and keyboard to the more specialized devices such as barcode readers and magnetic ink character readers, as well as the type of input devices used in computer control. These will all be described in this section.

## The keyboard



- The keyboard is the standard input device on microcomputers used to enter textual and numeric data into the computer for storage and processing. It is made up of buttons called 'keys'.
- Most keyboards are 'QWERTY' keyboards. This name comes from the first six letters on the top row of the alphabet keys. The keys are arranged into sections.
  1. Alphabet keys.
  2. Function or Keys (F1, F2.)
  3. Numeric keys (of number).
  4. Arrow keys.
  5. Command keys (insert, delete, home, page up).

## Uses

1. Keyboards are used to input text, for example into a word-processed document. There are other devices used for copying text, so keyboards tend to be used where the text concerned is original and is entered directly by the author of the document. Examples of such documents are letters, business documents, user guides etc.
2. Keyboards are also used to type commands into a computer.
3. They are also used to type in unusual selections of characters, such as passwords.

## Advantages of a keyboard

1. Most computers come with a keyboard supplied.
2. People are used to using keyboards to enter data, they need very little training.
3. Specialist keyboards are available e.g. gaming keyboards.
4. They allow quick entry of original text.
5. They are robust devices.

## Disadvantages of a keyboard

1. It is easy to make mistakes when typing in data with a keyboard.
2. Keyboards are not suitable for creating diagrams.
3. Disabled often find keyboards difficult to use.
4. Excessive use can lead to health to health problems such as repetitive strain injury (RSI).
5. They are not very quick for inputting data compared with direct data entry devices such as barcode readers, and magnetic ink character recognition (MICR) and optical mark recognition (OMR) devices.
6. They take up more space than other input devices.

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## Numeric keypads



A numeric keypad is used specifically to enter numbers, although alphabetic characters can be entered by using the function key.

### Uses

They are used in situations where only digits have to be entered, for example:

1. At electronic point of sale (EPOS) terminals.
2. With automated teller machines (ATMs).
3. On mobile phones.
4. When inserting personal identification numbers (PINs), such as for chip and PIN credit/debit cards.

### Advantages of numeric keypads

1. They are small and compact and can be carried easily.
2. Many devices can be connected to the same computer at conventions.
3. They are easy to cover up when entering a PIN.

### Disadvantages of numeric keypads

1. It is difficult to enter text.
2. They can be too small for the numbers to be used effectively.

## The Mouse



- A mouse is also called a 'pointing device' because it enables you to control what happens on the screen.
- A mouse usually has two buttons, a right and left one and also a central wheel which allows you to scroll up and down the page. The left and right buttons have different functions.
- Left clicking usually lets you choose a menu item. Right clicking brings you up a list of relevant menu items from which you can select a task.
- Many of the older styles of mice used a ball which moved against two internal rollers to record the direction that the mouse was being moved in.
- Recent versions of mice use 'optical' or 'wireless' technology to track mouse movement.

### Uses

1. Mice are used to move the pointer on the screen as well as for selecting items such as check boxes, radio buttons and options from a drop-down menu.
2. They can be used to draw objects in drawing and art packages.

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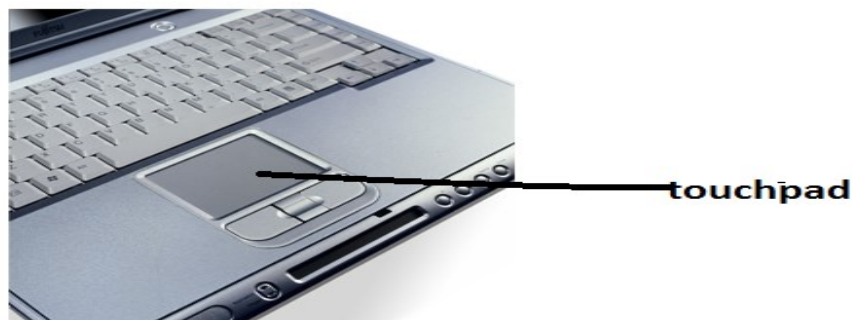
### **Advantages of a mouse**

1. Ideal for use with a desktop computer.
2. Usually supplied as part of a new computer.
3. Most computer users are familiar with them and require little training.
4. They allow faster entry of the chosen option, compared with typing on a keyboard.
5. They allow fast navigation through slideshows/websites.
6. They are smaller and more compact than keyboards

### **Disadvantages of a mouse**

1. They need a flat space close to the computer.
2. Older style mice which have roller balls can fail due to dirt getting inside the mouse.
3. Excessive use can lead to health problems such as repetitive strain injury (RSI).
4. If the battery wears out in a wireless mouse, it cannot be used until it has been replaced.
5. They can be difficult to use for people with disabilities.
6. They can be difficult to use for entering data other than choices on a menu, radio buttons or by means of hyperlinks.

### **Touchpad**



- A standard external mouse that is physically independent of a computer is not practical for use with laptops or other portable computers.
- A touch pad usually takes the place of a mouse. It is a small rectangular touch-sensitive surface usually placed below the keyboard.
- The user drags a finger across the flat surface of the touchpad, causing the cursor to move in the corresponding direction. The sensors underneath the touchpad only react to a fingertip and not a pencil or other object.
- There are usually two buttons next to the touchpad which are used to replace the left and right mouse button.

### **Advantages of touchpad**

1. They allow faster entry of the chosen option compared with typing on a keyboard.
2. They allow fast navigation through slideshows/websites.
3. They are integrated within the laptop computer and don't have to be plugged in.

### **Disadvantages of touchpad**

1. Takes practice and skill to control the position of the cursor using the touchpad.
2. Moist, sweaty fingers can disrupt the signals picked up by the sensors in the touchpad.
3. People with disabilities can find them difficult to use.

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4. Many users find them difficult to control compared to a mouse.
  5. They can be difficult to use for entering data other than menu choices, radio buttons or by means of hyperlinks.

### **Joystick**



- A joystick carries out similar functions to the mouse and tracker ball.
- It consists of a stick that is gripped by the hand and moved around and buttons that can be used to select options.
- The stick is used to control the cursor, pointer or other objects on the screen.
- Generally, the stick is used to move people or other objects around a screen and the buttons for firing weapons or increasing/decreasing speed when playing a game.

### **Uses**

1. They are used with video/computer games.
2. They are used in the training of airline pilots to control various aspects of flying an aircraft.
3. Used with virtual reality systems.

### **Advantages of a joystick**

1. They give a better gaming experience for racing or flying styles of computer games.
2. They allow faster entry of the chosen option compared with typing on a keyboard.
3. They can be used to control objects in three dimensions.

### **Disadvantages of a joystick**

1. Some people find joysticks more difficult to use than the traditional mouse.
2. Joysticks are not particularly robust and can break easily if too much force is used on them.
3. They can be difficult to use for entering data other than menu choices, radio buttons or by means of hyperlinks.
4. It is more difficult to control the pointer than other windows, icons; menu and pointer (WIMP) input devices.

### **Remote control**



- A remote control is used to control other devices remotely by emitting an infrared signal to the external device.
- Buttons are pressed to choose different options such as selecting channels on the television or radio, changing the sound volume, setting times for recordings, and much more.

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- Remote controls are small, so that they can be held in the hand, and wireless, communicating with the device by means of infrared signals.

#### **Uses**

They are mainly used with home-entertainment devices such as televisions, satellite boxes, video / digital versatile disk (DVD) recorders and stereo systems.

#### **Advantages of remote control**

1. They can be any distance from the device and still operate it.
2. People who have difficulty walking find it easier to control devices.

#### **Disadvantages of remote control**

1. People with disabilities or RSI can find it difficult to use.
2. If somebody or an object comes between the remote control and the device, the device can no longer be controlled remotely.

#### **Touch screen**



- A touch screen is the only device which works as both an input and an output device.
- You view the options available to you on the screen (output) and you then use your finger to touch the option that you have chosen (input). Touch screens work particularly well with a menu driven interface.
- Touch screens are easy to use and are often found in public places such as cash points at banks, ticket collection terminals at theatres or airports, information centres at museums.
- Touch screens are not commonly used to input large amounts of data because they are not very accurate and they would be tiring on the hands to use for long periods of time.

#### **Uses**

They are used in many applications, including:

1. ATMs by bank customers
2. EPOS terminals in cafes and other retail outlets, with buttons on the screen representing prices for products.
3. Tourist-information kiosks and for public-transport enquiries
4. Personal digital assistants (PDAs), for choosing options and handwriting recognition.
5. Interactive whiteboards in education.

#### **Advantages of a touch screen**

1. Easy to use, you do not need much training.
2. No extra peripherals such as mouse are needed.
3. Require no extra working space.
4. It is easier to select options than when using a mouse.
5. There is less likelihood of selecting the wrong option.

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### **Disadvantages of a touch screen**

1. Not suitable for inputting large amounts of data.
2. Not very accurate - selecting detailed objects can be difficult with fingers.
3. Tiring to use for long periods i.e. it can lead to arm fatigue.
4. More expensive than alternatives such as a mouse.
5. Not robust - can soon become faulty if misused.

### **Trackball**



- A trackball is an upside-down mouse-like device. It has been designed for users who have limited ability regarding movement of their fingers or hands.
- A trackball is commonly used instead of a mouse on a laptop or notebook computer. The key feature is the large ball in the middle of the device that is controlled by using the palm of the hand and enables the user to control the pointer on a screen.
- There are also two buttons on its sides, which acts in the same way as the left -and right-click buttons on a mouse.

### **Uses**

1. They can be used for any application by people with disabilities or RSI where the use of a mouse would be too difficult.
2. They are used in control applications where objects on a screen are used to control a process.
3. Pilots on fast ferry ships and air traffic controllers use them to control the appearance of radar screens and their contents.

### **Advantages of a trackball**

1. They do not require the fine control that a mouse does.
2. They are easier for people with disabilities or RSI to use.
3. They can be more accurate when positioning the pointer on a screen.
4. They are fixed, so they cannot be knocked accidentally (for example, onto the floor, where a disabled person could have problems retrieving them).

### **Disadvantages of a trackball**

1. It is difficult to enter data that the button has not been programmed for.
2. They can be slower for selecting options compared with using a mouse.

### **Scanner**



**handheld scanner**



**flatbed scanner**

- A scanner is a device used to convert images or text on paper into digital/electronic form that can be used by the computer.
- A scanner works by shining a beam of light onto the surface of the object that you are scanning. This light is then reflected back onto a sensor that detects the color of the light.
- This is then used to build up the digital image. Items that are scanned are usually stored in an image format.
- There are two types of scanners i.e. the flatbed scanner and the handheld scanner. The most common type is the flatbed scanner, where the user places the document flat on a glass panel and closes the lid.
- An array of sensors and a light source move underneath the document, producing a scanned image that can be stored in a computer.
- Handheld scanners are usually only a few inches wide and are held in the hand whilst they are rolled across the document to be scanned. The images produced are generally not as large or as high quality as those captured with a flatbed scanner.

#### **Uses**

1. They are used to scan old documents for keeping records; for example, birth, death and wedding certificates.
2. They are used to scan images that can be transferred as faxes.
3. Photographers use scanners to obtain digital images of photographs.
4. They are used as barcode readers.

#### **Advantages of a scanner**

1. Flatbed scanners are very accurate and can produce reasonably high quality images.
2. Any image which is digitized by the scanner can then be included on electronic documents.
3. Images once digitized can be enhanced with a graphics application.
4. Using a barcode scanner is quicker than typing in the barcode

#### **Disadvantages of a scanner**

1. Images produced by the scanner can take up a lot of memory space.
2. Images lose some quality in the scanning and digitizing process.
3. The quality of the final image is dependent on the quality of the original image.

#### **Graphics tablet (pad)**



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### **A graphics tablet**

- A device that allows an end user to draw or write on a pressure-sensitive tablet and has their handwriting or graphics digitised by the computer and accepted as input.
- A graphics tablet consists of a pad (tablet) and a special pen. As you draw on the pad with the special pen, this data is relayed to the computer, which can display the drawings on the screen or have them printed.
- This form of input is useful in engineering and art design; it is very easy for the user to try out different designs.

### **Uses**

1. Graphics tablets are often used to create computer graphics.
2. In East Asia, graphics tablets are widely used to write Chinese, Japanese and other language characters, as users find it easier than typing these characters on a keyboard.
3. Tablets are used to produce technical drawings and in computer-aided design (CAD).
4. In some situations, users prefer to use a graphics tablet rather than a mouse as a pointing device.

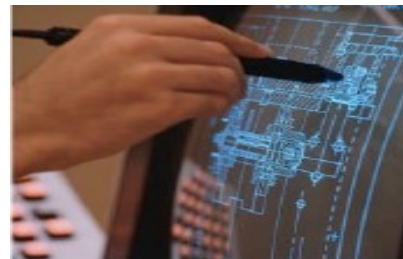
### **Advantages of a Graphics tablet**

1. It is much more natural to draw diagrams with a pencil (the stylus) rather than with a mouse.
2. They allow alterations to occur as the drawings are input, rather than later, as happens with a scanned image.
3. They are a more accurate way of drawing than using a mouse.

### **Disadvantages of a Graphics tablet**

1. Not really suitable for general selection work such as pointing and clicking on menu items.
2. Graphics tablets are much more expensive than a mouse.

### **Light pen**



- A light pen is used mostly by engineers and artists. The light pen is similar in shape to a ball point pen and is used to input data via a light sensitive screen.
- A light pen is used to draw lines of all shapes on the screen or on a surface, which then creates an appropriate image in the computer memory. The image can then be printed if desired.
- The light pen can also be used to make a selection from a given list of 'menu' items. The selection is made simply by pointing the pen at the selection required and pressing a button on the pen.

### **Advantages of a light pen**

1. Easy to use compared to a keyboard.
2. It removes the need to learn and type commands.
3. Makes it faster to select menu options and icons.

### **Disadvantages of a light pen**

1. An expensive special light sensitive screen must be used in conjunction with the light pen.
2. Stylus pen can be easily lost.

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3. Use of a light pen can result in arm fatigue/tiredness.
  4. Light pens sometimes give false readings due to background lighting in the room.

### **Microphone**



*A microphone*

- Microphones can be connected directly to the computer. They are used to input sounds, which can then be stored and manipulated.
- The sound input to the microphone is converted into an analogue electrical signal, which has to be converted in turn into a digital signal so that the computer can process it.
- This is usually done by the computer's sound card, which acts as an analogue-to-digital converter.

### **Uses**

They are used to input dictated text for use with voice recognition software. The software is used to convert the speech into text so that it can be used with other software packages such as word processors

### **Advantages of a microphone**

1. It is quicker to input text by speaking into the microphone rather than typing it in.

### **Webcam**



- A webcam is short for 'web camera'. A webcam is an input device because it captures a video image of the scene in front of it.
- It is either built in to the computer (e.g. laptop) or it is connected through an USB cable. The video signal is made up of a series of individual 'image frames' which are an instant snapshot of the scene in front of it.
- Each image frame is sent to the computer for further processing by webcam software. Webcams are commonly used to allow people to see each other whilst chatting over the internet.

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- Formally this is called 'teleconferencing'. Webcams can also be used to capture an image only if movement is detected in the scene in front of it so they are widely used in burglar alarm and other security equipment.

### **Digital camera**



- This is a special device used to capture images in digital form. Instead of storing the image like a conventional camera on a film for subsequent chemical development, it stores the images on a memory card or in a computer chip.
- Digital cameras are now being used far more frequently than traditional cameras. The major difference is that the camera can be connected directly to a computer and photographs uploaded to a photo library on the user's computer.
- Alternatively, software packages such as photo-editing packages are used to manipulate the photographs; for example, cropping, resizing or recolouring them.
- Many digital cameras can also be connected directly to photo printers for immediate printing.
- Most cameras have the capacity to store many photos and the number can be increased by adding an additional memory card, which can then be temporarily removed from the camera and inserted directly into a PC. Digital cameras can also take short videos.

### **Uses**

1. They are used by professional photographers in their work and by amateur photographers for personal use.
2. They are used to insert photographs directly into all types of software, including presentation software, word processors, desktop-publishing software and database software.
3. Digital cameras are also included in some mobile phones.

### **Advantages of a digital camera**

1. The digital pictures produced can be attached to email and be sent to others quickly and easily.
2. The memory card or chip is re-usable, normal photographic film is not.
3. No film is needed, no developing costs to view the pictures
4. Digital cameras produce better quality photographs than a traditional camera.
5. It is quicker to upload images than to have a film developed.
6. A memory card can hold more images than a roll of film.
7. Portable.
8. Images can be edited, enlarged or enhanced.

### **Disadvantages of a digital camera**

1. They are more expensive than traditional cameras.
2. Batteries need changing/charging more often than with traditional cameras.
3. Images often have to be compressed to avoid using too much memory.

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## Barcode Reader



- Barcodes are used to represent information about products. A barcode is normally a pattern of thick and thin, dark and light lines.
- A form of scanner called a barcode reader is used to read them. Some are handheld and some are built into the EPOS terminal. The different thicknesses of lines are converted by the computer into a number.

### Uses

1. They are used in all kinds of shops, wherever the details of products represented by code numbers need to be input.
2. In libraries, they are used to input the book number and library-card number.

### Advantages of a barcode reader

1. They are faster than typing the number in using a keypad.
2. It is a more accurate method of data entry compared with typing the number in.
3. Price change only needs to be made to the database and not every single product package.

### Disadvantages:

1. A Barcode reading system may be expensive to set up.
2. If the barcodes have been scratched, errors may occur when attempts to read the code are made

## Optical Mark Reader



### Optical mark reader

- Optical mark recognition (OMR) is the machine identification of pencil or pen marks on a document by light sensitive devices for input into a computer.
- An OMR can sense the presence of a pen or pencil mark. In optical Mark Recognition, the receiver of the document is expected to shade marks corresponding to his/her responses to questions or information required by the sender.

- The documents are scanned by a special piece of equipment called an 'optical mark reader'. The OMR will detect the presence of your pen/pencil marks by reflecting light onto it. Less light is reflected where a mark has been made.
- The OMR software only detects marks, not characters such as letters or numbers.
- The OMR then interprets the pattern of marks and sends the results to the computer for storage, analysis and reporting.

### Applications of OMR



### A multiple choice answer sheet

1. OMR is used to scan answer sheets of multiple choice exams. The OMR then interprets the pattern of marks and sends the results to the computer for storage, analysis and reporting.
2. Used with questionnaires to identify shaded respondent's responses to questions.
3. Lottery entry forms.

### Advantages of OMR

1. A fast method of inputting large amounts of data - up to 10,000 forms can be read per hour depending on the quality of the machine used.
2. Only one computer needed to collect and process the data.
3. OMR is much more accurate than data being keyed in by a person.

### Disadvantages of OMR

1. If the marks don't fill the space completely, or aren't in a dark enough pencil, they may not be read correctly
2. Only suitable for recording one out of a selection of answers, not suitable for text input
3. Forms have to be carefully designed, and this can be expensive.

### Optical Character Reader



- Optical character recognition (OCR) is the machine identification of printed or handwritten characters through the use of light sensitive devices for input into a computer.
- The resulting text can then be processed by other software packages such as word processors and spreadsheet and database packages
- An OCR scans the document, and using a photoelectric device, converts the shape sensed into electronic signals that are then accepted as input into the computer system.
- OCR devices are used by companies, which do a large amount of processing on a regular basis.
- Typical users are public utility companies, insurance companies, airlines, banks, examination boards, the postal services (for reading postal codes) as well as the government (in processing government forms).

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### **Uses of Optical Character Recognition**

OCR can be used to read characters on

1. Product labels.
2. Credit card receipts.
3. Utility bills.
4. Insurance premiums.
5. Airline tickets.
6. A page from a textbook, by a student.
7. Process business and government forms.

### **Advantages of OCR**

1. It is a faster method of data entry compared with manually typing in the document.
2. It is an easier method of entering data for people with disabilities.
3. Cheaper than paying someone to manually enter large amounts of text.
4. The latest software can recreate tables and the original layout.

### **Disadvantages of OCR**

1. Not 100% accurate, there are likely to be some mistakes made during the process.
2. All documents need to be checked over carefully and then manually corrected.
3. If the original document is of poor quality or the handwriting difficult to read, more mistakes will occur.
4. Not worth doing for small amounts of text.

### **Turnaround document**

- A turnaround document – is a document produced by a computer, filled in manually and then used as input to the computer.
- A good example is those ZIMSEC registration forms for students. The document contains some preprinted information on them made by a computer.
- A student is supposed to add information such as name, surname, centre number, candidate number and subjects to be registered on the form.
- The computer is then used again to read and process this information.

### **Magnetic ink character reader**

- Magnetic Ink Character Recognition (MICR) - is machine identification of characters printed in magnetic ink for input into a computer e.g. those found at the bottom of bank cheques.
- The technology allows details from bank cheques to be read into a computer quickly and accurately.
- MICR reader recognizes numbers written in a standard font/shape using magnetic ink at the bottom of cheques.
- The numbers recognized by MICR are customer account number, cheque number, cheque value, cheque date, bank's code. These items should exist on the cheque before the cheque is processed.
- The MICR reader can read the characters even if they are covered by dirt or by a signature. Magnetic ink provides security since changes made in normal ink will be ignored by the reader.

### **Uses**

They are used in banking applications for the processing of cheques. The customer accounts are updated after processing.

### **Advantages of MICR**

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1. MICR can process 300 cheques per minute with 100% accuracy, thus it's a faster method of data entry than typing.
  2. It is a more accurate method than OCR or manually inputting the information.
  3. Cheques can be read even if they have been overwritten.
  4. They are more secure than OCR as they cannot be tampered with.

#### **Disadvantages of MICR**

1. There is a limit to the character set that can be used.
2. Both the Reader and the magnetic ink are expensive and so are generally only used by banks.

#### **Magnetic strip readers**



#### **Magnetic stripe**

#### **Magnetic stripe rider**

- Magnetic stripes are thin strips of magnetic tape found at the back of most bank/credit cards and on the cards of some hotels. When the card is used, data is read and processed and information is displayed on the computer screen
- A magnetic strip reader is an input device that reads data from the strip of the magnetic tape found on the back of a card.
- These magnetic stripes can be found in bank cards, driver license cards, employee cards and insurance cards. Magnetic strip readers can be found in the main entrance of a company or in ATMs (Automatic Teller Machine).
- A limited amount of data can be found on a strip (can contain up to 60 characters, stored magnetically). It is neither hard nor costly to produce a magnetic strip. If the card gets exposed to a magnetic field, then the data in the strip may be corrupted.

#### **Uses**

Some of the uses of magnetic strip readers include:

1. In bank ATMs, to withdraw cash.
2. As part of electronic funds transfer at point of sale (EFTPOS) terminals in supermarkets and other types of shops and restaurants.
3. In security, they are used to prevent unauthorized access to restricted buildings or hotel room (as shown in the image above).

#### **Advantages of magnetic strip readers**

1. Simple to use
2. Cheap to produce
3. Data can be altered if necessary
4. Security has been improved by the use of PIN numbers which must be entered into a machine to confirm that you are the rightful card owner.
5. They allow faster entry of data compared with typing on a keyboard.

#### **Disadvantages of magnetic strip readers**

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1. Very limited storage capacity for data.
  2. Data can be easily destroyed by strong magnetic fields.
  3. Not always secure as thieves can obtain the readers and read the data on the card.
  4. If the strip is damaged, data has to be entered manually.
  5. If the strip is damaged or the card is lost, the holder cannot gain access to the building or hotel room.

### Smart card reader



- Smart cards are often referred to as chip cards. They are similar in appearance to a magnetic strip card, but information is stored on a chip on the card. This can be used for storing a PIN or other personal data.
- The chip can be updated and so, in the case of a payment card, can be used to store the amount of money left on the card.
- Smart cards have greater memory storage and security of data than a magnetic strip card.

### Uses

1. Smart cards are used as payment cards (e.g. phone cards), loyalty cards, identification cards and public transport tickets.
2. They are used with satellite broadcasters to decode television programmer e.g. DSTv.
3. They are used with subscriber identification modules (SIMs) in mobile telephones e.g. in your Econet or Telecel line.
4. They are used as electronic passports and in driving licenses.

### Advantages of smart card

1. They allow immediate updating, thereby preventing fraud.
2. The cards do not need to be in immediate contact with the reader and so receive less damage through regular use.
3. Data entry is more secure than using a magnetic strip.
4. Chips are more robust than magnetic strips.
5. Their use prevents entry to restricted areas without a card.
6. They allow secure transactions to take place, as without the PIN the transaction cannot proceed.

### Disadvantages of smart card

1. There is a lot of information on some cards – if the card is stolen, hackers can use it for fraudulent purposes and identity theft.
2. If the customer forgets their PIN, the transaction has to be cancelled.
3. The card holder needs to be very careful to protect their PIN when using their card.

### Biometric readers