

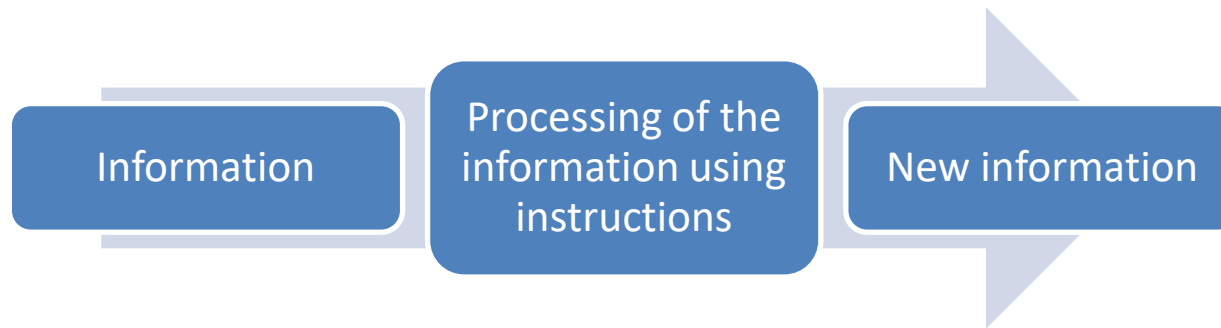
# Types and Components of Computers

- Hardware and Software
- Main hardware components of computer system
- What is Operating System?
- User Interfaces
- Types of computer
- Impact of emerging technologies



# What is a Computer?

- A computer is a device that stores and processes information according to a set of instructions.
- A computer is an information processing system...



# Computer

One of the first electronic computers was invented in the 1940s by a team of code breakers working at Bletchley Park in the UK. They were trying to decode messages sent by German forces during World War II.

In the years since then, many different types of computers have been developed – mainframes, personal computers and laptops.



A smartphone – a mobile phone that is also a handheld computer

# Hardware

Hardware is the **physical** parts of the computer – the parts that you can **touch** and **see** –make up the computer's **hardware**.

A motherboard, a CPU, a keyboard and a monitor are all items of hardware.

***‘If I can touch it, it is hardware; if I cannot touch it, it is software’***



# Hardware

## *External hardware:*

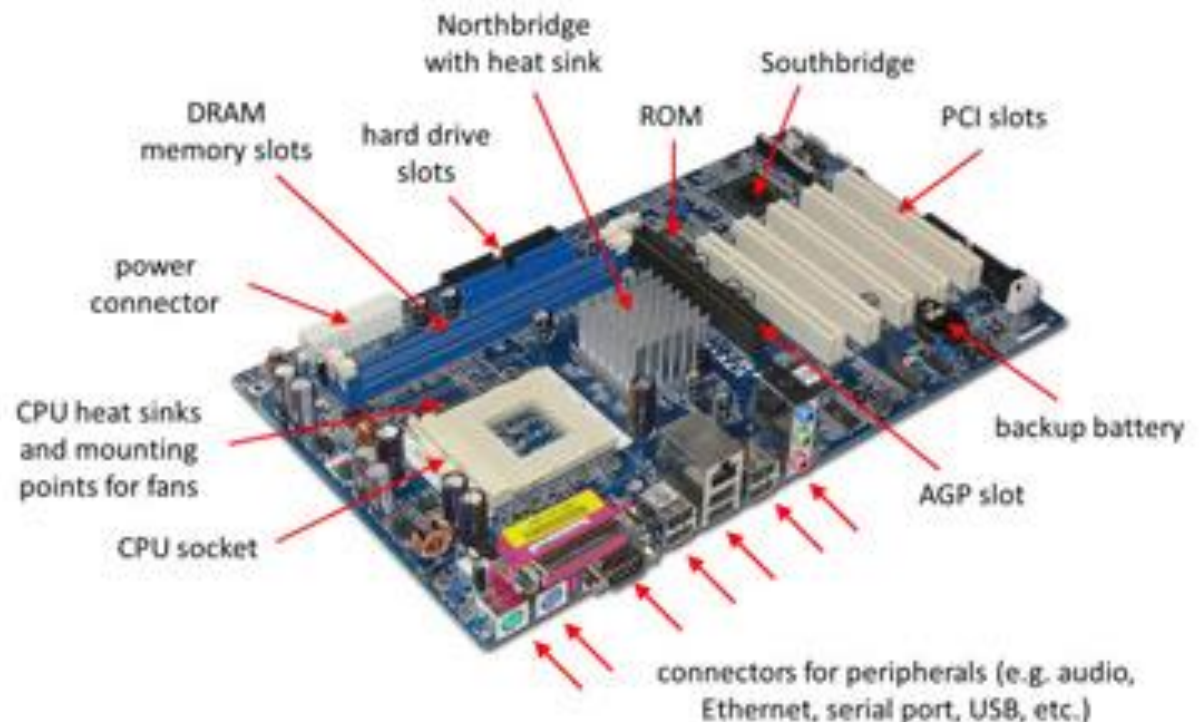
- input, output and storage devices

## *Internal hardware:*

- the motherboard
- random access memory (RAM)
- Read only memory (ROM)
- video card
- sound card
- internal storage devices: hard disk (HDD) and solid state drive (SSD)

# Motherboard

A **motherboard** is a printed circuit board found in all computer. It holds and allows communication between many of the crucial electronic components of a system, such as the [central processing unit](#) (CPU) and [memory](#), and provides connectors for other [peripherals](#).



# Random access memory (RAM)

Random access memory is an internal chip where data is temporarily stored when running applications. This memory can be written to and read from. Since its contents are lost when power to the computer is turned off, is often referred to as a volatile or temporary memory.



How much is enough?



# Read only memory (ROM)

Read only memory is a memory used to store information that needs to be permanent. The information stored on the ROM chip is not lost even when power is turned off to the computer. They are often referred to as non-volatile memories.

## ROM vs RAM



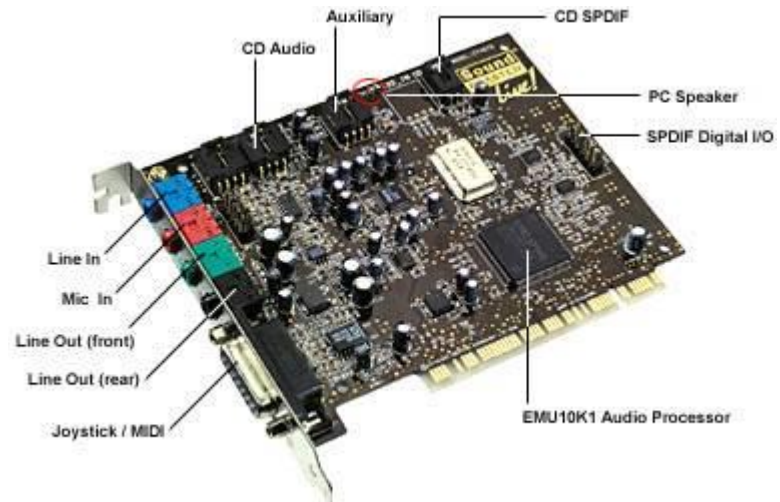
# Video card

A video card allows the computer to send graphical information to a video display device such as a monitor, television or projector. It usually connects to the motherboard.



# Sound card

A sound card is an integrated circuit board that provides a computer with the ability to produce sound these sound can be heard by the user either through speakers or headphones.



# Internal hard disk drive

Hard disk drives are magnetic in nature and are one of the main methods for storing data, files (text, photo and music) and most of the system and application software.



# Revision question

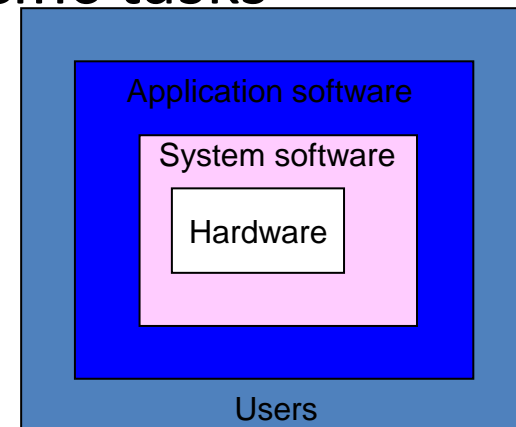
- What is computer hardware?
- Give four examples of internal and external hardware.
- When was first computer invented?
- Describe the differences between RAM and ROM.

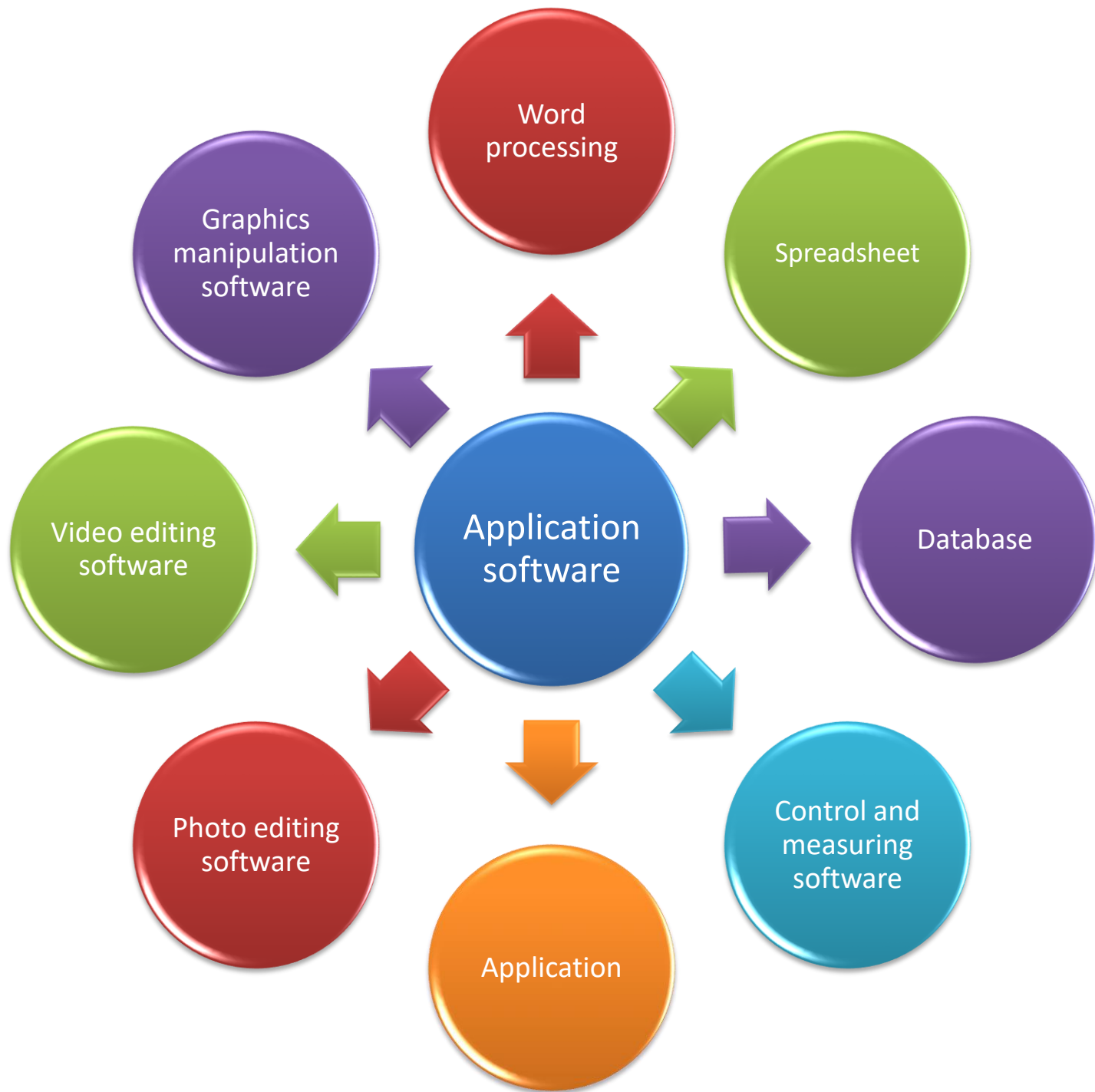
# Software

**Software** is a general term for the programs that control the computer system.

There are two types of software: **application** and **system**.

- Programs that allow the hardware to run properly and allow the user to communicate with the computer
- Programs that allow the user to do specific tasks





# Word processor

Word processing software is used to manipulate text documents, such as an essay or a report.

Some of the functions include:

- creating, editing, saving and manipulating text
- copy and paste functions
- spell checkers
- import photos/images into a structured page format



# Spreadsheet

Spreadsheet software is used to organise and manipulate numerical data (in the form of integer, real, date, and so on). Numbers are organised on a grid of lettered columns and numbered rows. The grid itself is made up of cells, and each cell is identified using a unique combination of columns and rows (for example, B6). Some of the functions include:

- use of formulas to carry out calculations
- ability to produce graphs

# Database

Database software is used to organise, manipulate and analyse data. A typical database is made up of one or more tables. Tables consist of rows and columns. Each row is called a 'record' and each column is called a 'field'.

This provides the basic structure for the organisation of the data within the database.

Some of the functions include:

- ability to carry out queries on database data and produce a report (dbms)
- add, delete and modify data in a table.

# Control and measuring software

Control and measuring software is designed to allow a computer or microprocessor to interface with sensors so that it is possible to:

- measure physical quantities in the real world (such as temperatures)
- control applications (such as a chemical process) by comparing sensor data with stored data and sending out signals to alter process parameters.

# Apps

Apps (short for Applications) normally refers to the type of software that runs on mobile phones or tablets. They are usually downloaded from an 'Apps Store'.

Common examples include:

- video and music streaming
- GPS (global positioning systems which, together with satellite navigation, help you find your way to a chosen location)
- camera facility (taking photos and storing/manipulating the images taken).

# Photo editing software

Photo editing software allows a user to manipulate digital photographs stored on a computer; for example, change brightness,, alter colour saturation.

# Video editing software

Video editing software allows a user to manipulate videos to produce an edited video. It enables the addition of titles, colour correction and altering/adding sound to the original video. Essentially it includes:

- rearranging, adding and/or removing sections of video clips and/or audio clips
- creating transitions between clips in the video footage.

# Graphics manipulation software

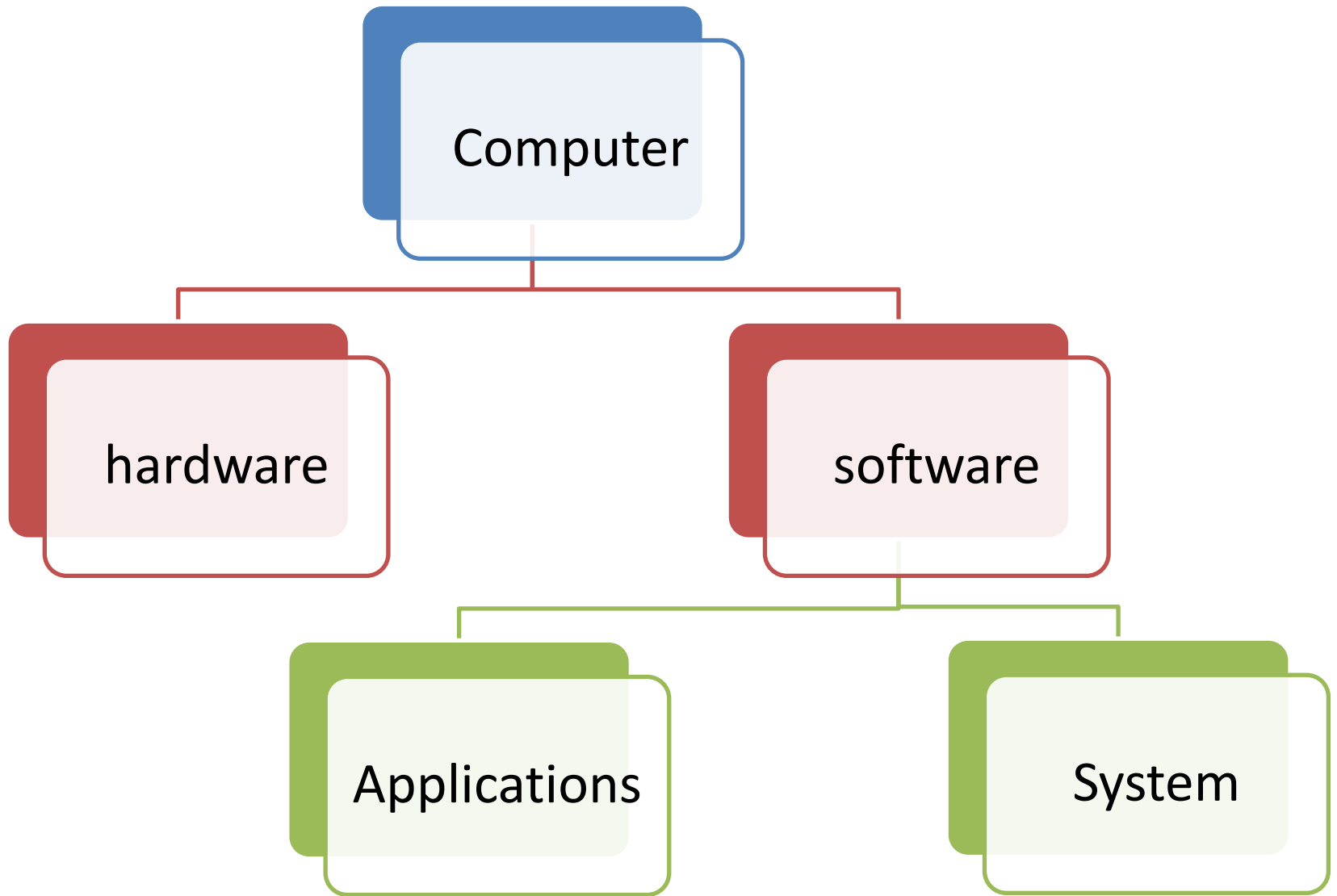
Graphics manipulation software allows bitmap and vector images to be changed. *Bitmap images* are made up of pixels that contain information about image brightness and colour. Bitmap graphics editors can change the pixels to produce a different image. (MS Paint)

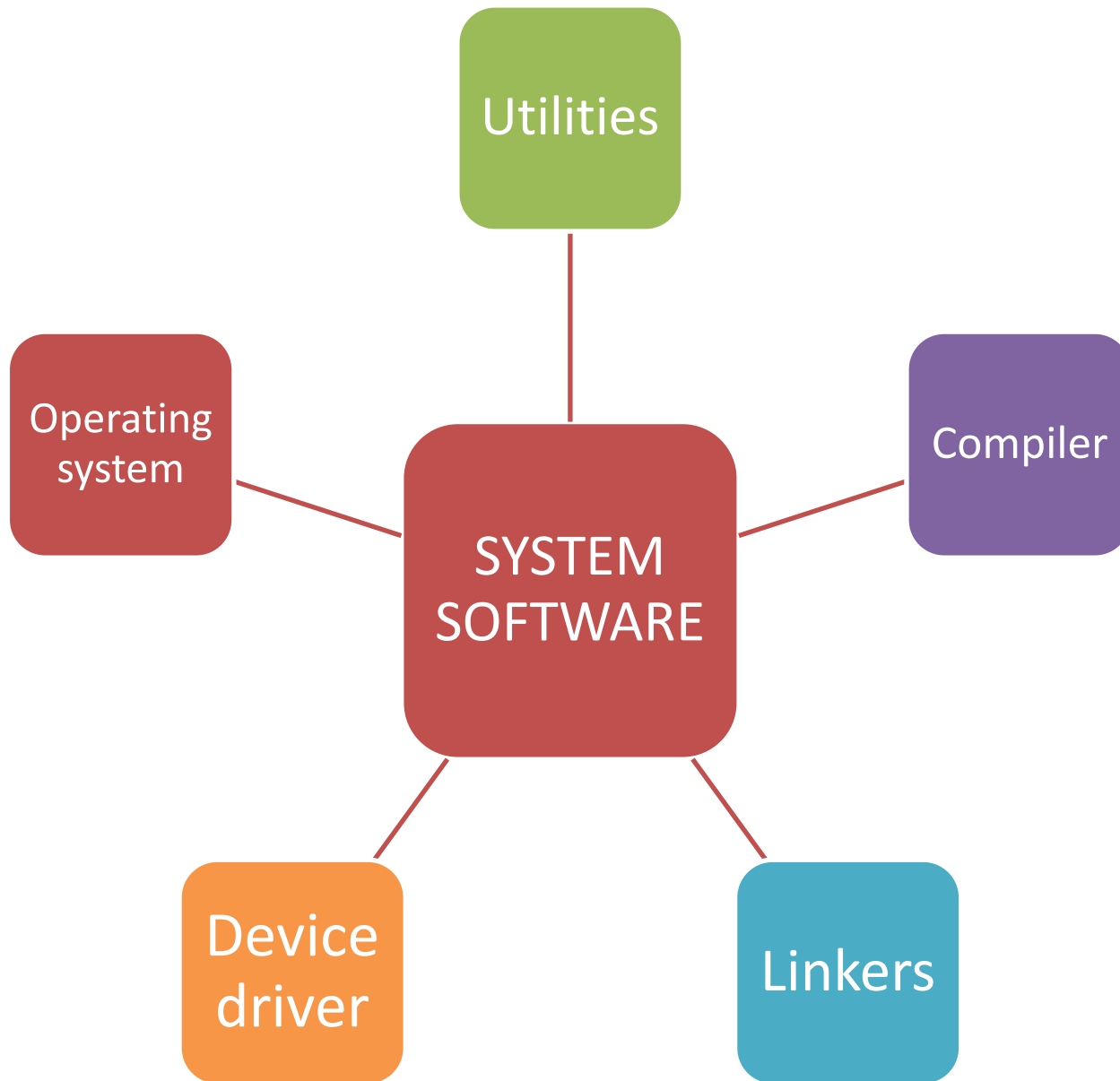
*Vector graphic* editors operate in a different way and don't use pixels. This type of software manipulates lines, curves and text to alter the stored image as required. The type of editing software used depends on the format of the original image. (MS Word- drawing toolbar, CAD Google SketchUp)

# Questions

1. Sort the following into hardware and software:
  - monitor, mouse, web browser, spreadsheet, program, joystick, flight simulator game
2. You have taken some digital photos and you want to edit them on your computer. What free photo editing program could you use?
3. You have been asked to produce a presentation on the social impact of computers on shop workers. What software features would you use to make your presentation interesting?







# Operating systems (OS)

The operating system (OS) is essentially software running in the background of a computer system. It manages many of the basic functions.

Operating systems allow:

- complete its own loading into RAM when the computer is started up
- users to communicate with the computer (for example, *windows*)
- managing of security (for example, user accounts, log on passwords).

# Utilities

Utility programs are software that has been designed to carry out specific tasks on a computer. Essentially, they are programs that help to manage, maintain and control computer resources. Examples include:

- antivirus
- backup of files
- disk repair
- file management
- security
- disk defragmenter.

# Compiler

A compiler is a computer program that translates a program written in a high-level language (HLL) into machine code (code that is understood by the computer) so that it can be directly used by a computer to perform a required task. The original program is called the **source code** and the code after compilation is called the **object code**.

- Examples of high-level languages include Java, Python, Visual Basic, Fortran and C++

# Linkers

A linker (or link editor) is a computer program that takes one or more object files produced by a compiler and combines them into a single program that can be run on a computer.

For example, many programming languages allow programmers to write different pieces of code, called modules.

# Device driver

A device driver is the name given to software that enables one or more hardware devices to communicate with the computer's operating system. All hardware devices connected to a computer have associated drivers.

Examples of drivers include printers, memory sticks,  
Mouse and CD drivers

# Question

1. Give three features of a typical operating system?
2. Which of these are true and which are false?

|  | True | False |
|--|------|-------|
| Hardware consists of computer programs                       |      |       |
| A linker is an example of applications software              |      |       |
| A device driver is part of the hardware of a computer system |      |       |

3. Define operating system (OS):

4.

| Software for ... | Application/System | What does it do?           |
|------------------|--------------------|----------------------------|
| Word processing  | Application        | Produce of letters/posters |
| Spreadsheet      |                    |                            |
| Windows          |                    |                            |
| Database         |                    |                            |
| Presentation     |                    |                            |



# Answer

Any three features from:

- file management/delete/copy/save/load files
- memory management
- I/O control
- user interface
- security issues
- accounting/user account management

# Data and Information

## What is Data?

In terms of **ICT**, data is simply any **numbers**, **letters** or **symbols** that can be entered into a computer system.

Here are some items of data:

**A, 20, DOG, 3.1415927, ABC123, +++**

# Data and Information

## What is Information?

Information describes the outcomes from a process. In the sum  $2+3=5$ , 2 and 3 are the data, and 5 is the information.

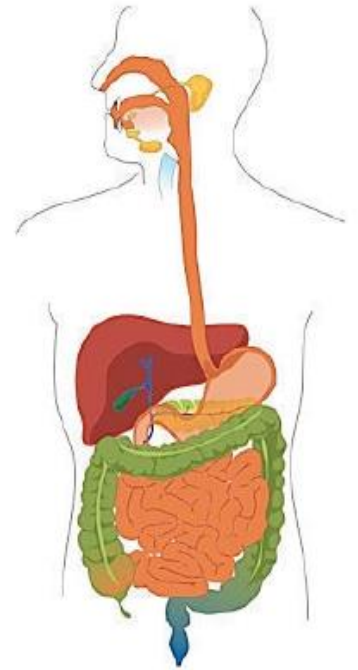
# What is a System?

A system has **three stages...**



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

We are surrounded by all sorts of systems. In fact we actually have quite a few systems inside our bodies, e.g. our digestive system...



# Main hardware components of computer system

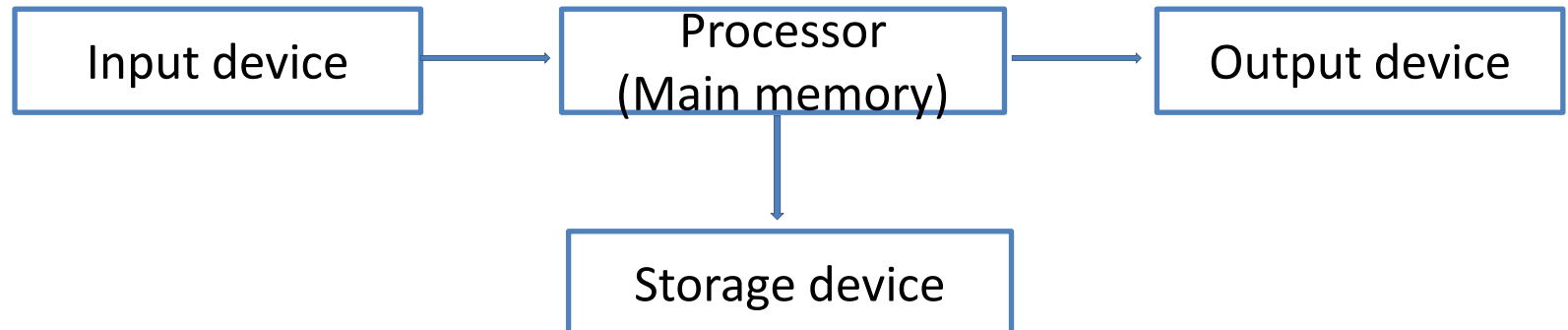
A computer is device, or a group of devices, designed to do something, such as process information or control a system.

The hardware of most computers can be divided into several types of device:

- An input devices is used to put data into the computer
- A processor does something with the data given by the input device

# Main hardware components of computer system

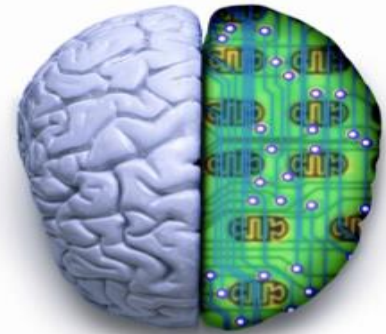
- An output device is used to tell someone or something the results that the processor came up with.
- A storage device keeps all this data.



# Central Processing Unit (CPU)

The CPU is the “brain” of the computer. It is the device that carries out software instructions.

People often use the word ‘processor’ to refer to the central processing unit (CPU) of a computer. A microprocessor is a single integrated circuit (chip) that performs the functions of a CPU. Microprocessors are used control devices such as washing machines, video players and burglar alarms.



*The speed of a CPU is measured in **Hertz** (Hz).*

- 1 **Megahertz** (MHz) is 1,000,000 (1 million) Hertz*
- 1 **Gigahertz** (GHz) is 1,000,000,000 (1 billion) Hertz*

# Random Access Memory (RAM)

- Random Access Memory (RAM) is the part of the computer that **temporarily stores** the **instructions** that the computer is running, and the **data** it is processing.

RAM is a **volatile** storage device. This means that if the computer's power is turned off the contents of RAM disappear and are **lost**.

When a computer is in use, its RAM will contain...

- The **operating system** software
- The **application software** currently being used
- Any **data** that is being processed



# Random Access Memory (RAM)

*The storage capacity of memory is measured in **Bytes**.*

*Usually RAM can hold millions of bytes of data, so you will see capacities measured in:*

## Measuring Memory

| Unit     | Abbreviation | Size                               |
|----------|--------------|------------------------------------|
| Bit      | -            | [Smallest Unit]                    |
| Byte     | -            | 8 Bits                             |
| Kilobyte | KB           | 1, 024 bytes                       |
| Megabyte | MB           | 1, 048, 576 bytes                  |
| Gigabyte | GB           | 1, 073,741,824 bytes/<br>1, 024 MB |

# Read Only Memory (ROM)

Read-Only Memory (ROM) is used in most computers to hold a small, special piece of software: the '**boot up**' program.

This software runs when the computer is switched on or 'boots up'. The software checks the computer's hardware and then loads the operating system.

ROM is **non-volatile** storage. This means that the data it contains is **never lost**, even if the power is switched off.

# Questions

1. Complete the following sentences by using the correct words from this list: memory, megabytes, eighth, gigabytes.
  - a. A school computer has 510 ..... of memory.
  - b. A byte is a unit of computer ..... and it consists of ..... bits.
2. Put the following in order of size, smallest first:  
1 terabyte, 2048 KB, 1,2GB, 16 bits, 1,5MB
3. What does ROM stand for and what does it do?
4. What does RAM stand for and what does it do?

# Operating system

To enable computer systems to function and to allow users to communicate with computer system, special software known as operating system. The general tasks for a typical operating system include:

- Control the operation of the input, output and backing storage devices
- Supervise loading, running and storage of applications programs
- Deal with error that occur in application program
- Maintain security of the whole computer system
- Maintain a computer log (which details computer usage)
- Allow communication between the user and the computer system (user interface)

# User interfaces

- Command line interface

Command line interface (CLI) requires a user to type in instructions to choose options from menus, open software and so on. There are often a number of commands that need to be typed in, for example, to save or load file.

# User interfaces

- Graphical user interface

Graphical user interface (GUI) allows the user to interact with a computer using pictures or icons rather than having to type in number of commands. GUIs use various technologies and devices to provide the user interface. One of the most common is WIMP (windows icons menu and pointing device), which was developed for use on personal computers (PCs). Here a mouse is used to control a cursor and icons are selected to open/run windows. Each window contains an application, and modern computer system allow several windows to be open at the same time.

# Summary of the main difference between CLI and GUI

| Interface                      | Advantage   | Disadvantage  |
|--------------------------------|---|---|
| Command line interface (CLI)   | <ul style="list-style-type: none"><li>• The user is in direct communication with the computer</li><li>• The user is not restricted to a number of predetermined options</li><li>• It is possible to alter computer configuration settings</li></ul>   | <ul style="list-style-type: none"><li>• the user needs to learn a number of commands to carry out basic operations</li><li>• All commands need to be typed in, which takes time and can be error prone</li><li>• Each command must be typed in using the correct format, spelling, and so on</li><li>• More difficult to edit once commands entered</li></ul> |
| Graphical user interface (GUI) | <ul style="list-style-type: none"><li>• The user doesn't need to learn any commands</li><li>• It is more user- friendly; icon are used to represent applications</li><li>• A pointing device is used to click on an icon to launch application –this is simpler than typing in commands</li></ul> | <ul style="list-style-type: none"><li>• Uses up considerable more computer memory than a CLI interface</li><li>• The user is limited to the icons provided on the screen</li><li>• Needs an operating system, such as windows, to operate, which uses up considerable memory.</li></ul>   |



# Types of computer

| Devices           | Advantages  | Disadvantages   | Main uses  |
|-------------------|---|---|--|
| Tablets           | <ul style="list-style-type: none"> <li>- Quick to turn on</li> <li>- Portable</li> <li>- Easy to use</li> <li>- Lots of apps to choose from</li> <li>- Ability to transfer data</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Can be expensive</li> <li>▪ Not all have expandable memory.</li> <li>▪ Amount of battery life</li> <li>▪ Speed of data transfer and compatibility</li> </ul>                                       | <ul style="list-style-type: none"> <li>• Portable entertainment</li> <li>• Web browsing</li> <li>• Games</li> <li>• Reading</li> <li>• Email</li> <li>• Video calls</li> </ul> |
| Smartphones       | <ul style="list-style-type: none"> <li>- Pocket sized</li> <li>- Can make calls, and send texts and emails 3G/4G connectivity to access the web from most places</li> <li>- Lots of apps available</li> <li>- Ability to transfer data</li> </ul> | <ul style="list-style-type: none"> <li>• Small screens can drain the battery quickly</li> <li>• Typing on a small touch screen may be slow</li> <li>• Amount of battery life</li> <li>• Speed of data transfer and compatibility</li> </ul> | <ul style="list-style-type: none"> <li>• Multifunctional device you can easily keep with you</li> </ul>  |
| Laptops           | <ul style="list-style-type: none"> <li>- Excellent for work functions</li> <li>- Full-size keyboard</li> <li>- Very large storage capacity</li> </ul>   | <ul style="list-style-type: none"> <li>• Larger and heavier than a tablet or smartphone</li> <li>• Slower to start than tablets</li> <li>• Amount of battery life</li> </ul>  | Using applications software of all types   |
| Personal computer | <ul style="list-style-type: none"> <li>- Easy to upgrade</li> <li>- Usually have a larger screen than a laptop</li> </ul>   | <ul style="list-style-type: none"> <li>• Not portable</li> <li>• Take up a lot of space</li> </ul>  | Work and home applications<br>Watching TV and films  |



# Impact of emerging technologies

- Artificial intelligence
- Driverless cars
- Vision enhancement
- Computer-assisted translation
- 3D and holographic imaging
- Robotics
- Biometrics



## RFID / Radio-frequency identification / гэж юу вэ?

RFID / Radio-frequency identification / гэж юу вэ? РД долгионоор шошго хадсан бүтээгдэхүүнийг автоматаар унших технологи, нийлүүлэлтийн гинжин хэлхээг хянах гол төхөөрөмж, үндсэн хэрэглэгдэх төхөөрөмж нь шошго уншигч антенн болон дундын программ хангамж юм.

RFID шошго нь бүтээгдэхүүнийг ялгах ЕРС болон IC чип радио долгионыг мэдрэх антенн юм. Хэрэглэгдэх хүрээнээс ээ шалтгаалаад шошго нь идэвхтэй идэвхгүй 2 янз байдаг.