0417 ICT

IGCSE

Section 1:
Types and Components of Computer Systems

This section is broken down into 4 parts. (click links below to visit each part)

Part 1:
Hardware/Software and Types of Computers

Part 2:
Main Components of a Computer System

Part 3:
Operating Systems

Part 4:
Recent Developments

Section Objectives
Section Starter Task 1

Section Objectives
Section Starter Task 2

Section Objectives
Section Starter Task 3
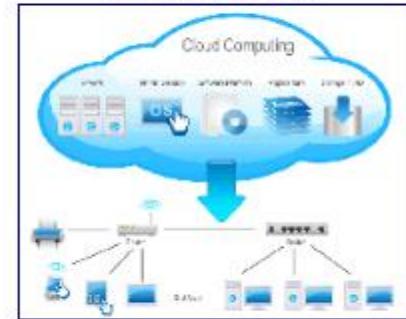
Section Objectives
Section Starter Task 4

Section 1.1:
Hardware, Software and Computer Types

INTRODUCTION TO THE COMPUTER

The term computer is used for any device that may be employed to compute or to calculate.

Компьютер гэдэг нь тооцоолох эсвэл тооцоолоход ашиглаж болох аливаа төхөөрөмжид

What is a computer

- **A computer is an electronic device** that receives input, stores it for a period of time, operating it according to a set of instructions (Known as a PROGRAM) and gives the user with an output.

- -OR- Computer is an electronic device which converts data into information.

- Компьютер нь өгөгдлийг мэдээлэл болгон хувиргадаг цахим төхөөрөмж юм.

WHAT IS HARDWARE?

- Hardware is the **physical** parts of the computer system – the parts that you can **touch** and **see**.

  A Motherboard, a CPU, a Keyboard and a Monitor are all items of Hardware

Компьютер нь *Hardware* буюу техник хангамж, *Softeware* буюу программ хангамж гэсэн 2 хэсгээс тогтоно

Hardware   *Харилцан уялдаатай сонголт*   *Softeware*

Examples of hardware: (click images to zoom and retrieve more info)

Keyboard

Mouse

Monitor

Scanner

Printer

Other examples of hardware include:

- Graphics Card
- Sound Card
- Network Card
- Computer Case
- Cooling Fan
- Modem
- Router
- CD/DVD Reader
- CD/DVD Burner
- Power Supply
- Cables

CD-ROM

Motherboard

Digital Camera

Speakers

Web Cam

NOTE:
We will look at individual computer hardware components in a later unit.

RAM

Hard Disk

Processor

Microphone

Memory Stick

WHAT IS SOFTWARE?

- Software is a **collection of instructions** that can be 'run' on a computer. These instructions tell the computer what to do.

  Software is **not a physical thing** (but it can of course be stored on a physical medium such as a CD-ROM), it is just a bunch of codes.

  An operating system such as Windows XP or Mac OS X, applications such as Microsoft Word, and the instructions that control a robot are all examples of software.
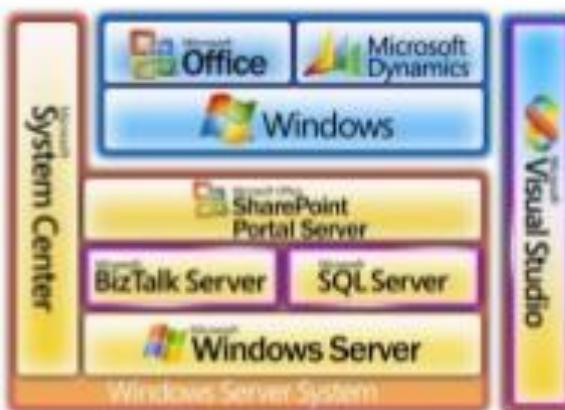
Examples of software:

System software: This type of software includes operating systems and different utilities to allow your system to run smoothly. System software often manages the computer's resources.

Operating Systems

Disk Cleaners

Disk Defragmenter

### Virus Protection
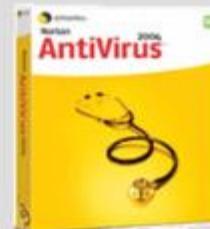
Other examples of system software:

- Graphic Drivers
- Debuggers to identify system errors
- Compression Software
- Encryption Software
- Disk Check

Application software: Everyday programs that you use to produce something useful. Microsoft Word and PowerPoint are good examples.

Word Processors
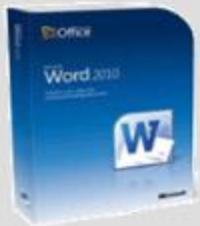
Graphics Editors

Web Design Programs

Spreadsheet Programs

Other examples of application software:

- Presentation Program (PowerPoint)
- Database Program (Access)
- Web Browser (Internet Explorer)
- CAD Design Software
- Media players
- Computer Games

Types of Computers

- PC/Desktop computer

- Laptop computer

- Netbooks

- Personal digital assistans

- Mainframe computer

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Hardware / Software

Computer **hardware** is the **physical components** that make up the computer system. Hardware is useless without software to run on it.

Software is **instructions** that tell computer hardware what to do. Software is useless unless there is hardware to run it on.

For a computer system to be useful it has to consist of both hardware and software.

1 Motherboard

The motherboard is **central** to any computer system.

All components **plug into the motherboard** either directly (straight into the circuit board) or indirectly (via USB ports).

Once connected to the motherboard, the components can **work together** to form the **computer system**.

Components communicate and **send signals** to each other via the **BUS Network**.

Back Panel with connections for peripherals and USB Memory

CPU Slot

RAM (Memory) slots

Connection to Power Supply

Graphics Card Slots

Slots for Hard Disc Drives and DVD-ROMS

PCI Slot (Can connect Sound Cards, Graphics Cards etc)

Motherboard has a Bus Network. This is a collection of wires which allow components to communicate
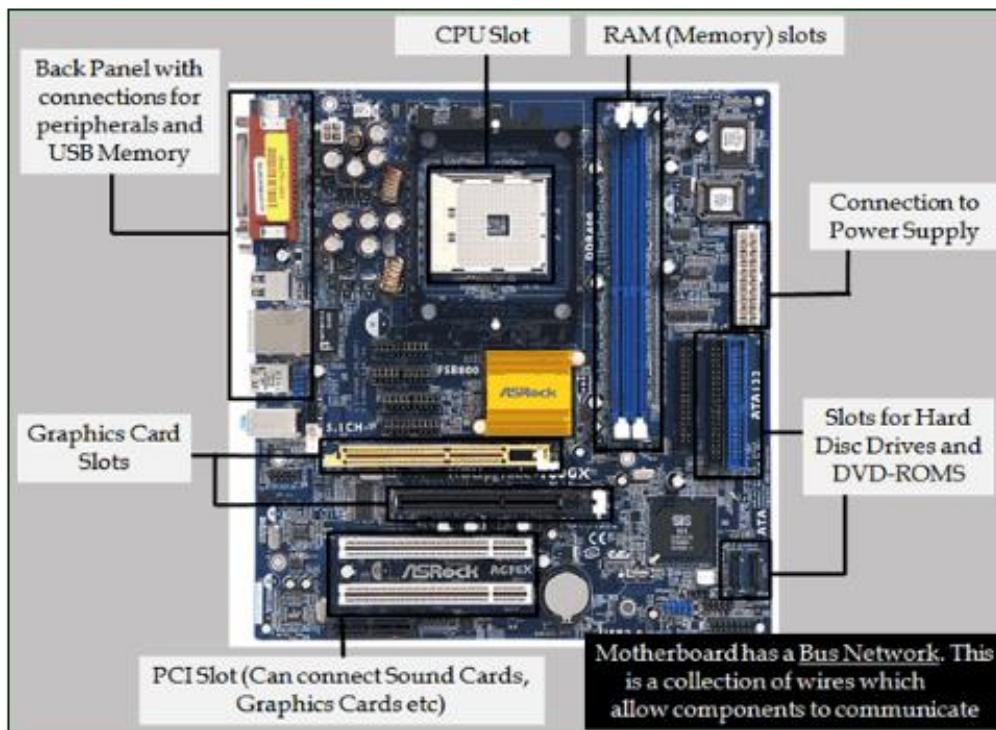
MAIN COMPUTER COMPONENTS

Central Processing Unit (CPU)

- The CPU is the 'brain' of the computer. It is the device that carries out software instructions.

- The Pentium processor made by Intel is an example of a CPU.

CPU is usually plug into a large socket on the main circuit board (the motherboard) of a computer. They get very hot when they are operating so usually have a large fan attached to their top to keep them cool.

MAIN MEMORY

- Any **data** or **instructions** that are to be **processed** by the CPU must be placed into **main memory** (sometimes known as **primary storage**).
- **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**.

  RAM, like the CPU, also plugs in to sockets on the motherboard.
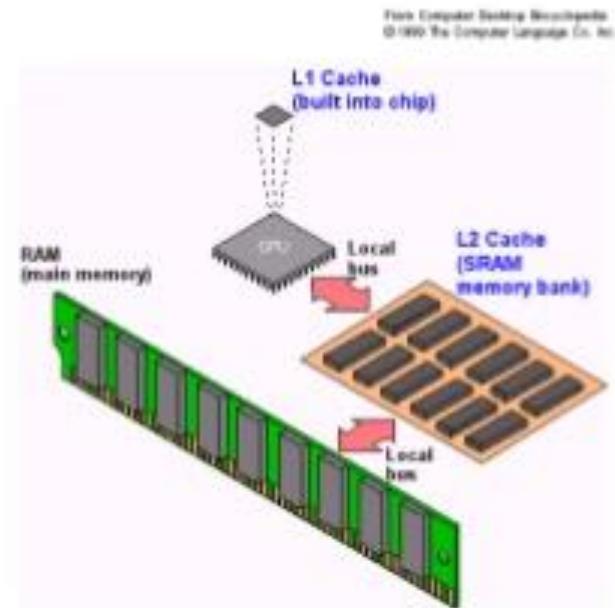
- **Read-Only Memory (ROM)**
- Read-Only Memory (ROM) is used in most computers to hold a small, special piece of software: the **'boot up'** program.

  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.
- *This 'boot up' software is known as the **BIOS** (Basic Input Output System)*
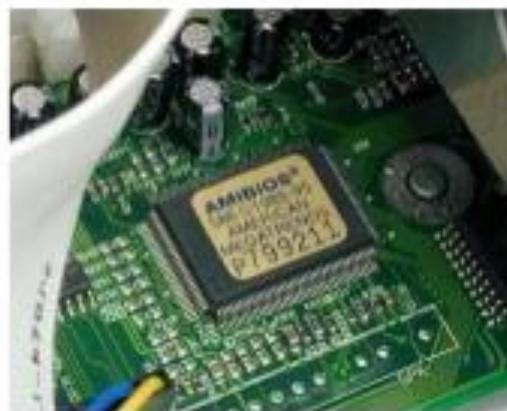
Peripheral Devices

Technically, a computer need only be made up of a CPU and some RAM. But a computer like this would not be much use to anybody – other devices need to be connected to allow data to be passed in and out of the computer.

The general name for these extra devices is **'peripheral devices'**. They are usually categorised into **input** devices, **output** devices and **storage** devices.

Keyboard and mouse

Microphones

USB and FireWire hubs

Web cameras

Memory card readers

VoIP devices

2 Processor (CPU / Central Processing Unit)

\# The Central Processing Unit (CPU) is the **brain of the computer**.

\# The CPU **'controls'** what the computer does and is responsible for performing **calculations** and **data processing**. It also handles the movement of data to and from system memory.

\# CPU's come in a variety of speeds which are known as **'clock rates'**. Clock rates are measured in **'Hertz'**. Generally, the faster the clock rate, the faster the performance of the computer.

\# There are two main brands of CPU currently on the market... AMD and Intel:

INTEL CPU   **AMD CPU**

Connecting Pins

The difference between Intel and AMD CPU's is like comparing Coca Cola and Pepsi.... it is a matter of preference. Intel CPU's do perform better at certain tasks but they cost more to buy than AMD CPU's.

Physically they are slightly different with Intel CPU's tending to have more pins.

Examples:

AMD Fusion
FAMILY OF APUS
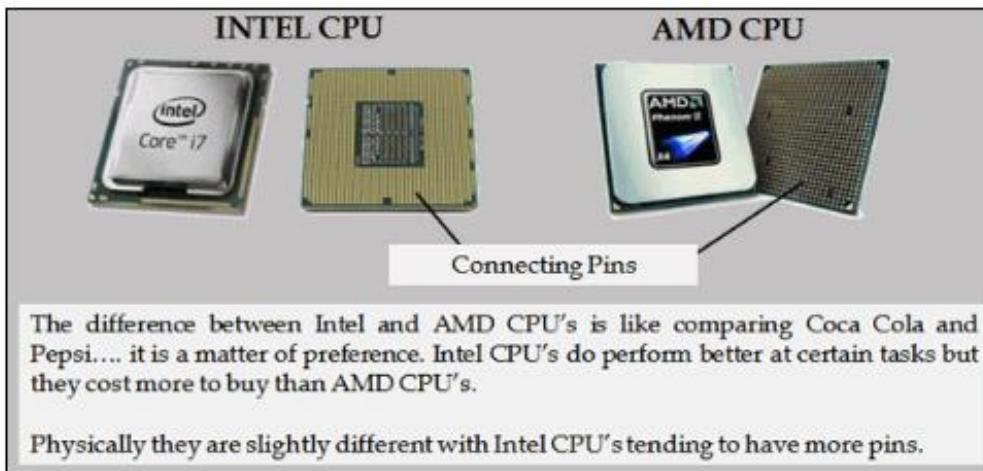
Click image to zoom in and retrieve more information.

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3 Internal Memory (RAM and ROM)

\# There are two types of internal memory - **RAM** and **ROM**.

\# RAM and ROM are used to **store computer data** and this can be directly accessed by the CPU.

\# RAM and ROM are sometimes referred to as **'Primary Storage'**.

RAM (Random Access Memory)

- RAM is used to **temporarily store information** that is **currently in use** by the computer. This can include anything from word documents to videos.

- RAM can be **read from and written to** and so the information stored in RAM can change all the time (it depends what tasks you are using the computer for).

- RAM is a **fast memory**. Data can be written to and read from RAM very quickly. RAM is generally measured in GB (Gigabytes).

- RAM is **Volatile Memory**. This means that information stored in RAM is deleted as soon as the computer is turned off.
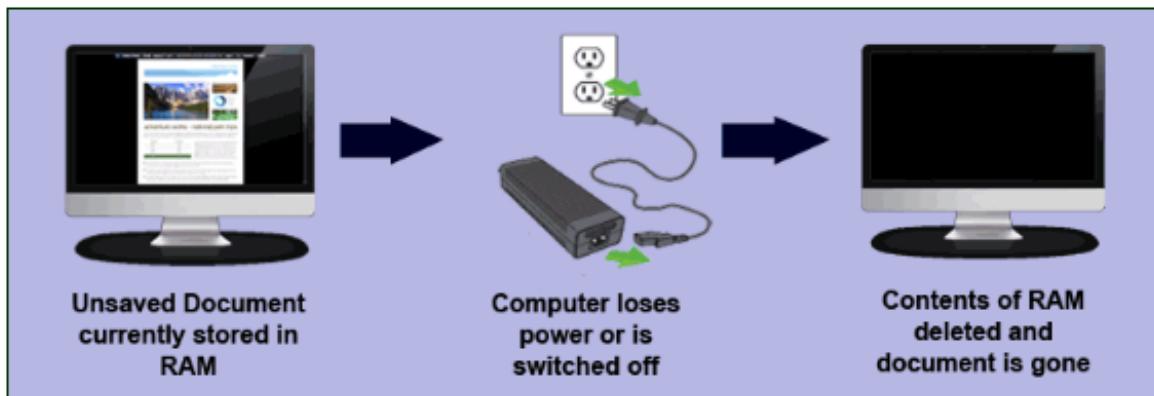
Examples:

Click image to zoom in and retrieve more information.

NOTE:
If you use up all of your RAM by opening too many programs at once you will notice that your computer becomes very slow.

Unsaved Document currently stored in RAM

Computer loses power or is switched off

Contents of RAM deleted and document is gone

ROM (Read Only Memory)

- ROM is used to **permanently store instructions** that tell the computer how to **boot** (start up). It also **loads the operating system** (e.g. Windows).

  These instructions are known as the **BIOS** (Basic input/output system) or the **boot program**.

- Information stored in ROM is known as **READ ONLY**. This means that the contents of ROM cannot be altered or added to by the user.

- ROM is **fast memory**. Data stored in ROM can be accessed and read very quickly.

- ROM is **Non-Volatile** memory. This means that stored information is not lost when the computer loses power.

- Other examples of ROM include:
  - **DVD/CD ROMS** bought in stores containing pre-recorded music and movie files. These are played back at home but cannot be altered.
  - **ROM** in printers which is used to store different font types.

Examples:

Click image to zoom in and retrieve more information.

NOTE:
The computer would not start-up without ROM Bios.
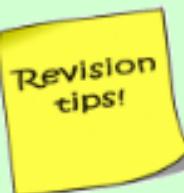
How to remember the difference between RAM and ROM.

		RAM	ROM
1.	Contents are lost when the computer is turned off.	✓	
2.	Contents are not lost when the computer is turned off.		✓
3.	Stores instructions that tell the computer how to start up.		✓
4.	Stores data and programs currently in use.	✓	
5.	Your computer will perform faster with more of this.	✓	
6.	This cannot be written to (altered).. only read.		✓
7.	Stands for Random Access Memory.	✓	
8.	Stands for Read Only Memory.		✓

4 Video Card (aka graphics card)

Graphics cards are hardware devices that plug into the motherboard and enables the computer to **display images on the monitor**.

Graphics cards usually require the **installation of software** alongside the hardware. The software **instructs the computer how to use the graphics card** and also allows you to **alter settings** to change image quality and size.

See below for an example of graphics card software allowing the user to alter various graphical settings:

Examples:

Click image to zoom in and retrieve more information.

Select a Task...
- 3D Settings
  - Adjust image settings with preview
- Display
  - Change resolution
  - Change flat panel scaling
  - Adjust desktop color settings
  - Rotate display
  - Set up multiple displays
- Stereoscopic 3D
  - Set up stereoscopic 3D
  - View compatibility with games
- Video & Television
  - Adjust video color settings
  - Adjust video image settings

Adjust Desktop Color Settings

You can adjust the color settings for your desktop. To change video color s

1. Select the display you would like to change.

Laptop Display

2. Choose how color is set.

○ Other applications control color settings
● Use NVIDIA settings
   Color channel: All channels

☼ Brightness: - ⎕   + 0%
◑ Contrast: - ⎕   + 0%
🎨 Gamma: -   ⎕   + 1.00

5 Sound Card

Sound cards are **internal hardware devices** that plug into the **motherboard**.

A sound card's main function is to allow the computer system to **produce sound** but they also allow users to **connect microphones** in order to **input sounds** into the computer.

Sound cards are also useful in the **conversion of analogue data into digital** and **vice versa**.

This topic is discussed in more detail in later units.

Examples:

Click image to zoom in and retrieve more information.

6 Storage Devices (secondary backing storage)

Secondary storage devices are used to store data that is **not instantly needed** by the computer.

Secondary storage devices **permanently store data and programs** for as long as we need. These devices are also used to **back-up data** in case original copies are lost or damaged.

> **Remember:** **Temporary storage** like **RAM** does not hold data for long periods.
>
> It is used to store only those programs and files that we are **currently working on**.

There are two categories of storage devices:

- **Internal Storage** - Internal Hard Disk Drives
- **External Storage** - External Hard Disk Drive, Memory Stick etc

Example of how a hard disk drive works:

The video to the right shows how data is read/written to the hard disk drive by spinning a platter across a read/write head.

The read/write head is on the end of a movable arm.

Click to enable Adobe Flash Player

Examples:
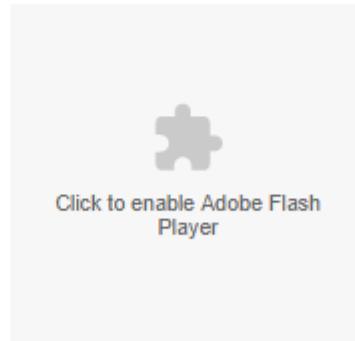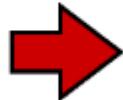
Click image to zoom in and retrieve more information about INTERNAL STORAGE.

Click image to zoom in and retrieve more information about EXTERNAL STORAGE.