

What is a computer?

Note: This page is not relevant for GCSE.

Until the 1980s, there were very few computers in the workplace. Organisations that had computer systems ran them on giant mainframe computers that were housed in specialist rooms with reinforced floors and industrial cooling systems.

This all changed in 1981 when IBM, a company known previously for its mainframes, launched its first personal computer. As with many new developments, there was much debate as to whether personal computers would be successful. The IBM desktop computer shown below cost around £4,500 when it was launched in 1984. It had a single-core CPU with a maximum speed of 25MHz.



Figure 1: IBM Personal Computer/AT

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Today, computers come in all shapes and sizes. We have sophisticated games consoles, mobile phones, and tablets. Computers are also embedded into a wide range of devices, such as cars, televisions, washing machines, and fridges. The latest Raspberry Pi computer (4 Model B) has a 1.5GHz 64-bit quad-core CPU, 4GB RAM and costs £54 .

Despite the rate of technological advancement, the core definition of a computer has not changed:

A computer is an electronic device that processes data by following a set of instructions.

Hardware refers to the **physical components of a computer system**. The core components of any computer system are:

- Processor
- Main memory
- Input/output controllers

These three components are sometimes referred to as the '**three-box model**'. They are linked by the system bus, which is a high-speed communication channel.

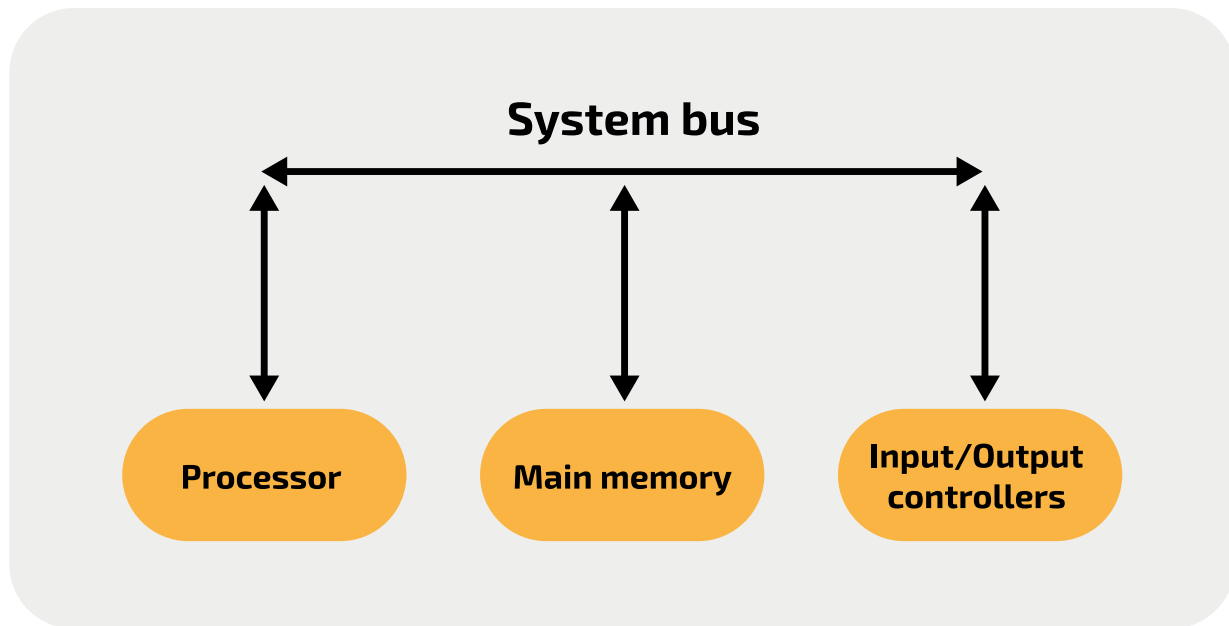


Figure 2: Three-box model

The three-box model describes a **von Neumann machine** (or **von Neumann architecture**). This is the model proposed by John von Neumann and his peers in 1945 for "an electronic digital computer", and remains the fundamental architecture used today for general purpose computers. An alternative architecture — **Harvard architecture** — with two banks of main memory, was proposed at the same time by researchers at Harvard.

Most computers have a wide range of additional hardware. These are called **peripheral devices** and are connected through the input/output controllers. They can be broadly categorised into three groups:

- Secondary storage devices, e.g. a hard disk
- Input devices, e.g. a keyboard or sensor
- Output devices, e.g. a speaker or actuator

Some peripheral devices, such as a touchscreen display, provide both input and output functionality.

Peripheral devices can be internal or external. For example, a hard disk can be installed inside the system case, or it can be attached by connecting a cable from the device to a port (e.g. a USB port).

Some hardware devices, such as keyboards, have a mechanical aspect and contain moving parts, which can be used to control them. Other hardware devices, such as solid-state disks, are solely controlled by electrical signals.



Software comes in the form of **programs**: sets of instructions that allow the computer to carry out a wide range of tasks. Some embedded computers, such as those found inside a washing machine, have limited sets of instructions. General purpose computers are capable of running a wide range of software that can be run at the request of the user.

You can learn about software in detail in the [software topic](#).