



BOOKMARK

Computer Science



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Student Learning Outcomes

- ◆ To learn the different stages in the development of the computer, generations of computers, classification of computers.
- ◆ To identify portable computers and uses of the computer.

The word "Computer" is derived from the Latin word "Computare" which means "to calculate". It is an electronic automatic calculating device which processes the data in a prescribed manner and gives the desired results.

How does a computer work?

A computer performs its work with the association of hardware and software, which are the two very essential elements without which the computer cannot work. Hardware means the equipment that forms a computer (including CPU, Monitor and Keyboard) and other devices like Printers. Software means the programs that instruct the computer what to do.

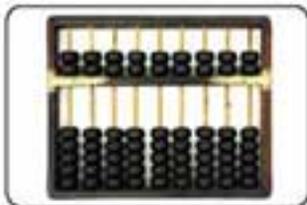
History of Computer

The earliest data processing equipments were all manual mechanical devices. This era is referred to as the dark ages of data processing.

Pre-Historic age

Abacus (3000 B.C)

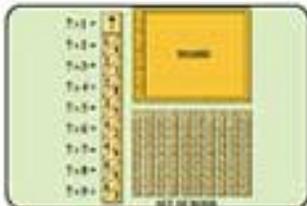
Probably developed in China, the Abacus is a frame with beads strung on wires or rods. Arithmetic calculations are performed by manipulating the beads. The Abacus is still widely used. An adept Abacus operator can calculate faster than a person using a desk calculator.



Middle age

Napier's Bones (1617)

John Napier, a Scottish mathematician, invented it. This device had a set of eleven rods with numbers marked on them. It worked by simply placing the rods side by side and products and quotients of large numbers could be obtained. This device was known as "Bones" or "Napier's Bones." Napier is best known for the invention of logarithms which in turn led to the invention of the slide rule.



Oughtred Slide Rule (1622)

This device was invented by an English mathematician William Oughtred. Basically a slide rule consists of two moveable rulers placed side by side. Each ruler is marked in such a way that the actual distances from the beginning of the ruler are proportional to the logarithms of the numbers printed on the ruler. By sliding the rulers one can quickly multiply and divide.



Pascal's Calculator (1640)

At age 19, Blaise Pascal, the great French mathematician, invented what may be considered as the first adding machine. This device registered numbers by rotating a cogwheel gear by one to ten steps, with a carry over ratchet to operate the next-higher- digit wheel; when the given cogwheel exceeded ten units. The automobile odometer is an example of a device that still uses a series of cogwheels to calculate data. It is also named as "Pascaline".



Leibniz's Calculator (1694)

Pascal's machine was improved in 1694 by the German philosopher and mathematician Leibniz, whose "Wheel" could also perform multiplication and division.



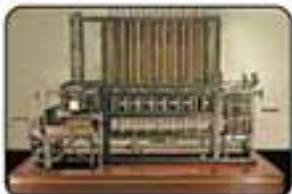
Jacquard's Loom (1801)

Joseph Marie Jacquard, a French weaver, invented the first punched-card machine. The pattern woven by the loom was determined by the placement of holes in a control card.



Charles Babbage's Difference Engine (1812)

Charles Babbage is also known as the "Father of Computer". He proposed a machine that was based on the principle that, for certain formulae, the difference between certain values is constant. A machine of this type was later adopted by insurance companies for computing life tables.



Charles Babbage's Analytical Engine (1833)

Charles Babbage invented another engine with a much deeper and more general conception. This machine though never realized due to the limited technology of the time, would have contained many features of present-day computers, including punched-card input, storage unit, arithmetic unit, printing unit and control by a sequential program.





Modern age

Howard Aiken's Mark 1 (1939-1944)

From 1939 to 1944 Professor Howard Aiken, in collaboration with IBM, developed his first fully functional computer, known as the Harvard Mark I. This machine, like Babbage's, was huge and mostly mechanical. For input and output it used paper-tape readers, card readers, a card punch and typewriters. It took between three and six seconds to add two numbers. Aiken developed three more such machines (Mark II-IV) over the next few years and is credited with developing the first fully automatic large-scale calculator.

Generations of Computers

First Generation (1940-1956)

The first computers used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms. They were very expensive to operate and in addition to using a great deal of electricity, generated a lot of heat, which was often the cause of malfunctions. First generation computers relied on machine language to perform operations. Input was based on punched cards and paper tape, and output was displayed on printouts.

The UNIVAC and ENIAC computers are examples of first-generation computing devices.

Second Generation (1956-1963)

Transistors replaced vacuum tubes and were far superior to them, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors. Though the transistor still generated a great deal of heat, it was a vast improvement over the vacuum tube. Second-generation computers still relied on punched cards for input and printouts for output.

Second-generation computers moved from machine language to assembly language, which allowed programmers to specify instructions in words. High-level programming languages were also being developed at this time, such as the early versions of COBOL and FORTRAN. These were also the first computers that stored their instructions in their memory, which moved from a magnetic drum to magnetic core technology.

The computers of this generation were the IBM 1620, IBM 7094, CDC 1604, CDC 3600 and the UNIVAC 1108.

Third Generation (1964-1971)

The development of the integrated circuit was the hallmark of the third generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which tremendously increased the speed and efficiency of the computers.

Instead of punched cards and printouts, users interacted through keyboards and monitors and interfaced with an operating system, which allowed the device to run many different applications at one time. Computers for the first time became accessible to the masses, because they were smaller and cheaper than their predecessors.

The computers of this generation were IBM-360 series, Honeywell-6000 series and the PDP (Personal Data Processor) and TDC-316.

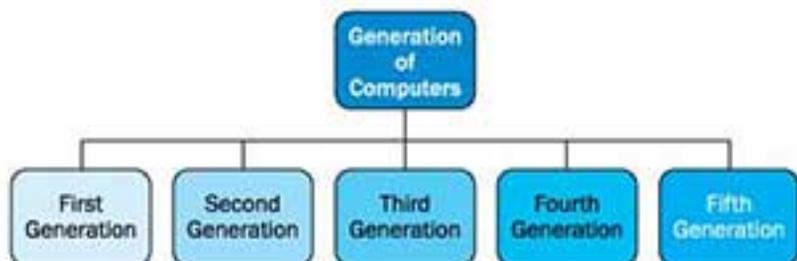
Fourth Generation (1971-Present)

The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room could now fit in the palm of the hand. The Intel 4004 chip, developed in 1971, located all the components of the computer—from the Central Processing Unit (CPU) and memory to input/output controls—on a single chip.

In 1981, IBM introduced its first computer for the home user, and in 1984 Apple introduced the Macintosh. Microprocessors also moved out of the desktop computers into many areas of life as more and more everyday products began to use microprocessors. As these small computers became more powerful, they could be linked together to form networks, which eventually led to the development of the Internet. Fourth generation computers also saw the development of (Graphical User Interface) GUIs, the mouse and handheld devices.

Fifth Generation (Present and Beyond)

Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning on their own.



Types of Computers



There are three types of computers:

1. Digital Computers
2. Analog Computers
3. Hybrid Computers

1. Digital Computer

This computer is based on counting operations. It processes information represented by a combination of discrete or discontinuous data. It is a device for performing a sequence of arithmetic and logical operations, on data as well as on its own program. It is used at home and in businesses. These are general purpose computers.



2. Analog Computer

The analog computer processes information represented by a combination of continuous data such as velocity, temperature and time. This computer is used mainly in refineries and for weather forecasting, etc. These are special purpose computers.



3. Hybrid Computer

This type of computer has the combined features of both the analog and digital computers. Thus, it is able to use the advantages of both machines. These computers are used in robots and scientific fields.

Classification of Computers

The following computers are classified by their speed and capacity.

1. Super Computer

A "Super Computer" is a machine that can process billions of instructions in a second and is used for extremely complex calculations. It is the most expensive of all computers and is used in space exploration, nuclear research and global weather forecasting.



2. Mainframe

A "Mainframe" is a large, high-powered computer that can perform billions of calculations from multiple sources at one time. It has faster processing speed and greater storage capacity. The mainframe can occupy more than one room. Mainframes are used by government and large organizations like automobile industry, banks and universities.



3. Mini Computer

A "Mini Computer" is a large powerful machine. It can support many users at a time. It typically serves a network of simple terminals and is ideal for small companies.



4. Micro Computer

A "Micro Computer" is the smallest general purpose computer and can perform all functions not found in any large computer system. It is based on a microprocessor chip. It is primarily used by one person at a time, that is why it is also called a Personal Computer (PC).

Some Portable Computers

Laptops

The first laptop computer was designed in 1979 by William Moggridge of Grid System Corp. It had 340 kilobytes of bubble memory, a die-cast magnesium case and a folding electroluminescent graphics display screen. Today's laptops are much more advanced, lighter and have faster processing power.



Palmtops

The palmtop computer is a sophisticated microprocessor based computing device with memory for storage and a built-in software for processing data to the limitation of available GUI (Graphical User Interface).



About the Series

Computer Science series for primary and secondary grades is being prepared to familiarize the students with the development of latest technologies and information. Demonstrative illustrations and easy to understand language make the learning experience fun for children. Activities are prepared so appropriately that students' understanding can be evaluated easily. It promotes technical competencies within the children.



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