

Competency 02

Explores the evolution of computing devices, so as to be able to describe and compare the performance of modern computers.

2.1 Elicits the significant changes occurred in the computers from generation to generation with more emphasis on the evolution of processors.

Time: 4 periods

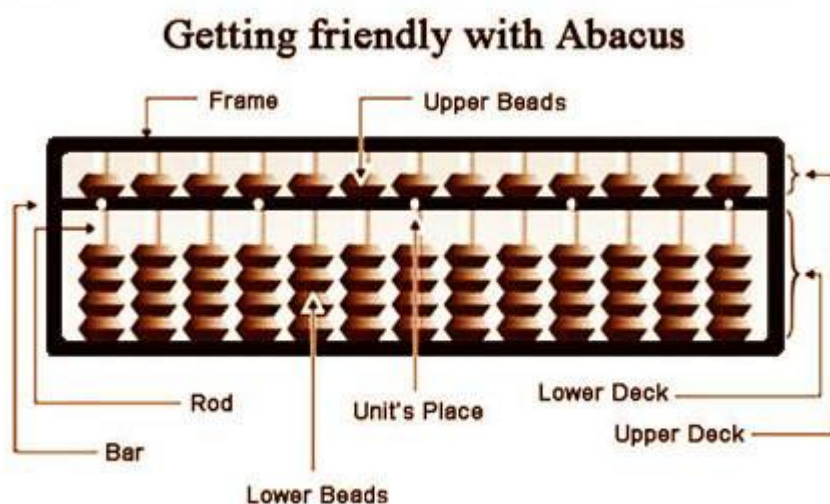
Learning Outcomes

- Categorizes the early calculating aids with examples.
- Describes the generations of computers with their features in a table.
- Categorizes computers in terms of technology, purpose and size with examples.

From the abacus to the modern computer, calculating devices have come a long way.

Calculating aids can be divided into 4 eras for the educational purposes.

- Pre mechanical era – before 1450 Abacus is considered as the first calculating device in the world used by Chinese around 5000 BC.

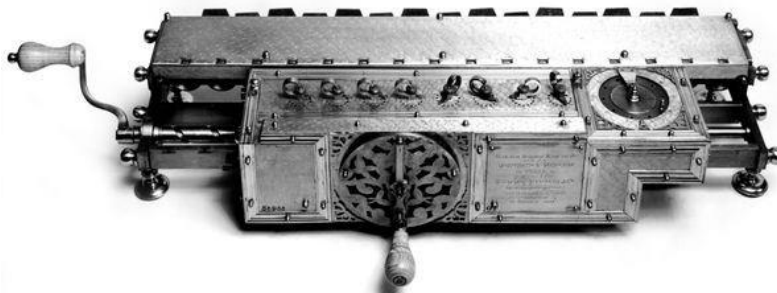


- **Mechanical era – 1450-1840**

The Pascaline was introduced by French mathematician, physicist, inventor, writer Blaise Pascal in 1642. It could add and subtract two numbers.

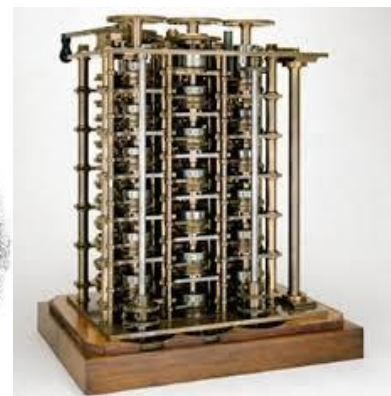
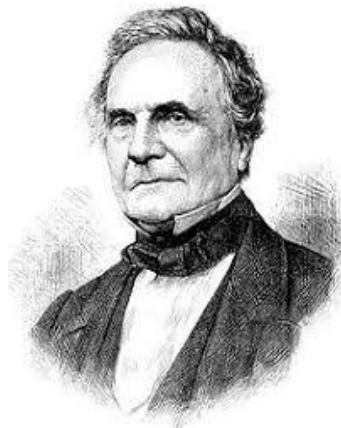


The Stepped Reckoner invented by German scientist Gottfried Wilhelm Leibniz completed in 1694. This device is carried out the operations add, subtract, multiply and divide too.



The difference engine, the first mechanical computer was developed by Charles Babbage in 1880.

He presented the concept of Input, Process and Output that is used in modern computers, for the first time. Therefore, he is considered as the “Father of the computer”.

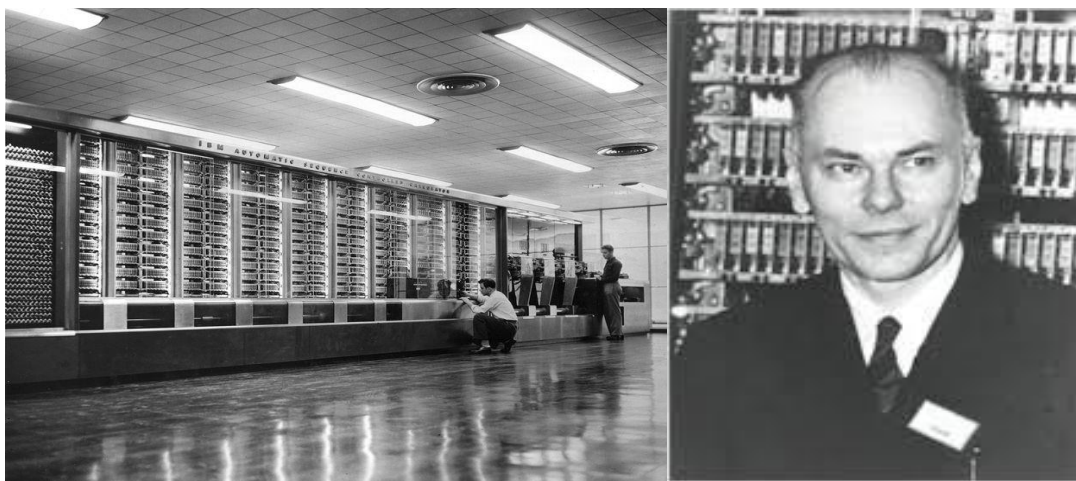


- **Electro mechanical era – 1840 – 1940**

Electronic valve (vacuum tube) invented by American inventor Lee De Forest in 1906.



The automatic sequence controller (Mark 1) was the first automatic computer invented by American physicist and a pioneer in computing Professor Howard Aiken in 1939.



- **Electronic Era**

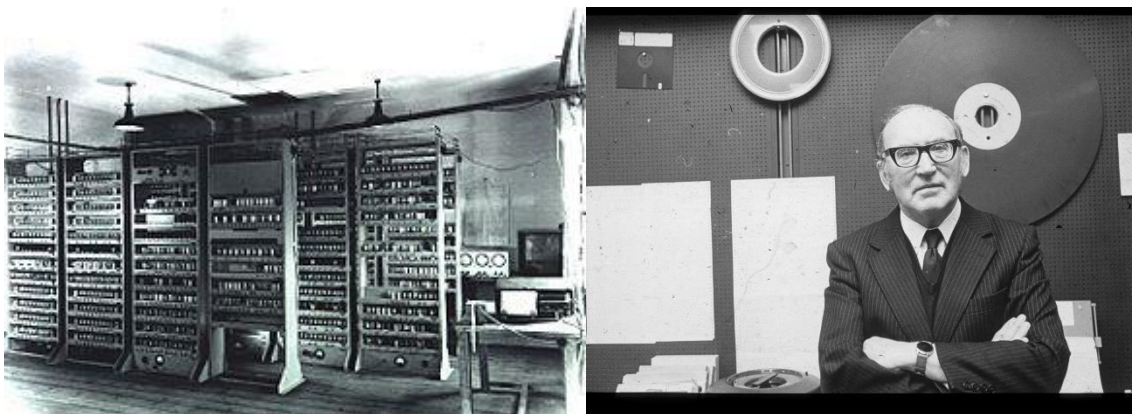
1st Generation Computers (1940-1956)

The computers of first generation used vacuum tubes as the basic component.

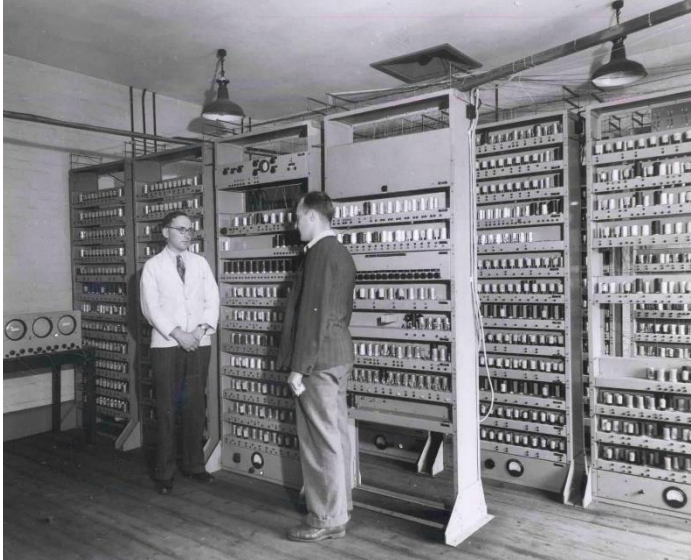
- ENIAC (Electronic Numerical Integrator and Calculator) was the first electronic digital computer designed by physicist John Mauchly and J. Presper Eckert in 1946.



- EDSAC (Electronic Delay Storage Automatic Calculator) was the first full size stored program computer developed by Maurice Wilkes in 1947. EDSAC was built according to the von Neumann machine principles.



- EDVAC (Electronic Discrete Variable Automatic Computer) is considered as the first digital computer that could store program was built in 1948. Unlike its predecessor the ENIAC, it was binary rather than decimal, and was designed to be a stored-program computer. The EDVAC is the successor of the ENIAC. Made by the same designers: Mauchly and Eckert.

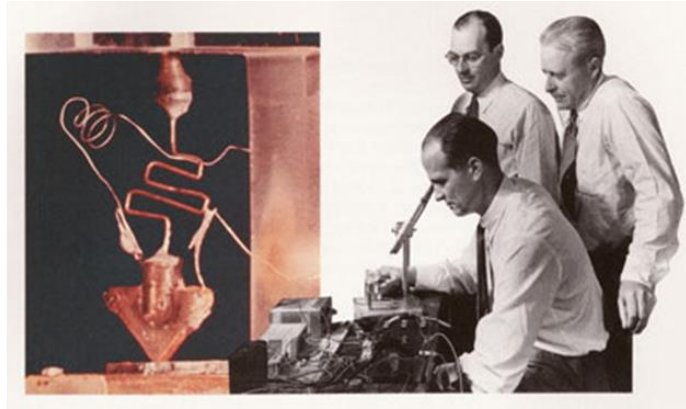
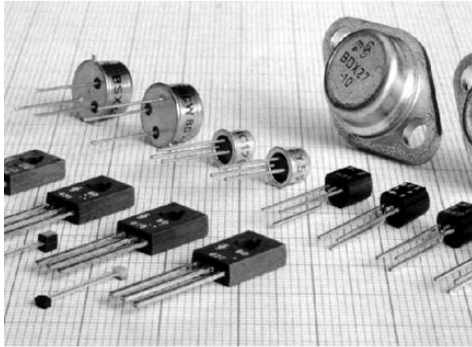


- UNIVAC (Universal Automatic Computer) was an electrical computer containing thousands of vacuum tubes that utilized punch cards and switches to input data and punch cards to output and store data.



2nd Generation Computers (1956 – 1963)

In this generation, transistors were used as the fundamental building block. First Transistor was invented by William Shockley, John Bardeen and Walter Brattain In 1947 at Bell University.



IBM 1620, IBM 7094, CDC 1604, CDC 3600, UNIVAC 1108 were some computers developed in this generation.



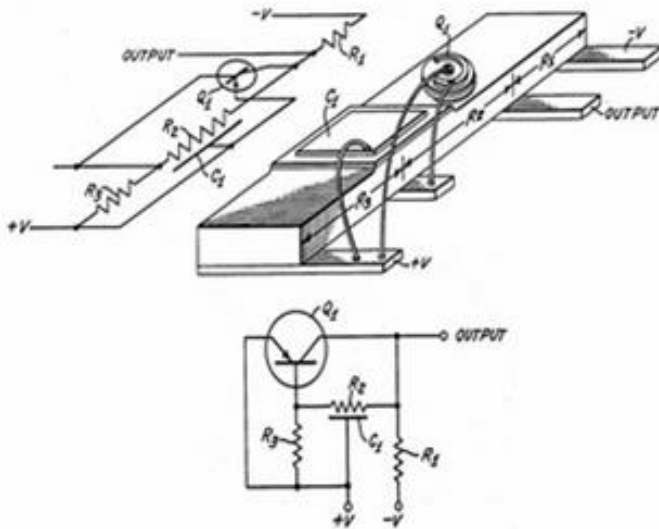
IBM 7090



IBM 1401

3rd Generation Computers (1964 – 1975)

The computers of third generation used Integrated Circuits (ICs) in place of transistors. A single IC contains many transistors, resistors, and capacitors along with the associated circuitry. In 1958, invented by Jack Kilby and Robert Noyce separately.



IBM-360 series, PDP (Personal Data Processor), TDC-316 were the computers of 3rd generation.



PDP



IBM System/360

SABRE

4th Generation (1975 – 1989)

In this generation of computers VLSI (Very Large Scale Integrated) circuits were used. VLSI circuits having more transistors and other circuit elements with their associated circuits on a single chip made it possible to have microcomputers.



STAR 1000



PDP 11

Eg: DEC 10, STAR 1000, PDP 11

5th Generation Computers (1989 – present)

The ULSI (Ultra Large Scale Integration) technology is used in this generation resulting in the production of microprocessor chips having millions of transistors and other electronic components.



Eg: Desktop, Laptop, Notebook, Ultrabook



Personal Computer



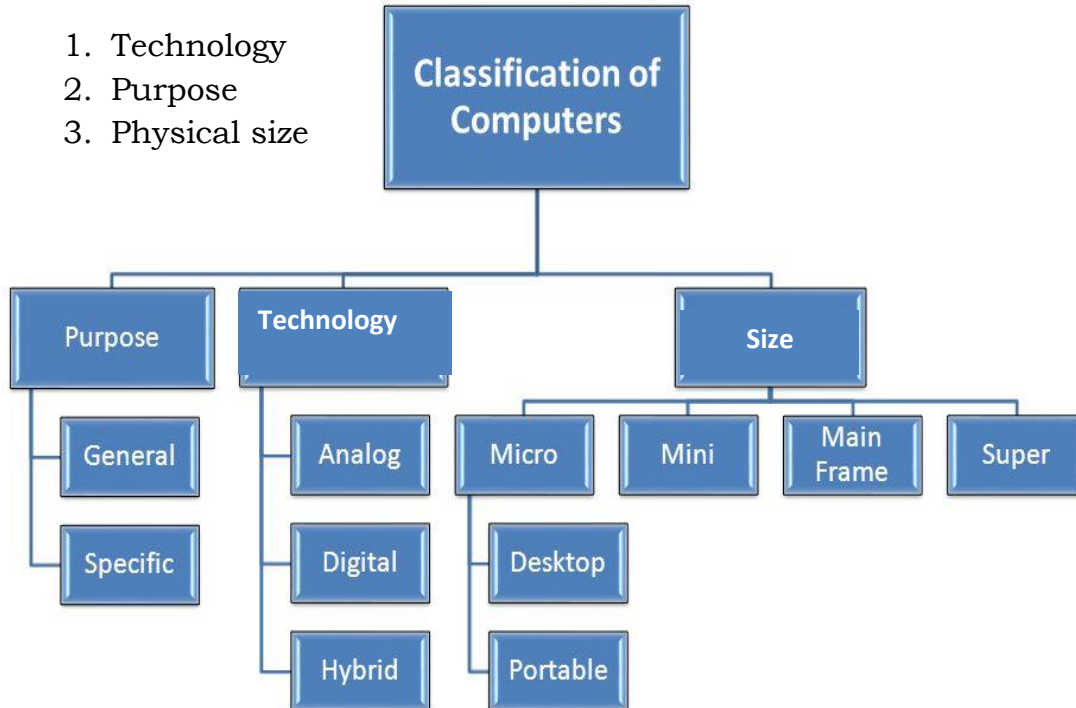
| Generations | Major Hardware Technology | Software Used | Characteristics | Systems invented |
|---|--|---|--|--|
| Generations | Major Hardware Technology | Software Used | Charateristics | Systems invented |
| Third Generation Computers (1964-1975) | <ul style="list-style-type: none"> • Integrated Circuits (IC) • High capacity disks for secondary storage • Keyboard and mouse for data input | <ul style="list-style-type: none"> • birth of Operating Systems (OS) • Well developed Programming languages • high level computer languages for coding | <ul style="list-style-type: none"> • Smaller in size • Less heat Generation • Comparatively faster than the second generation • Expensive • Low power consumption | <ul style="list-style-type: none"> • IBM-360/370 • PDP-8 • PDP-11 • CDC 6600 |
| Fourth Generation Computers (1975-1989) | <ul style="list-style-type: none"> • LSIC (Large Scale Integrated Circuits) and VLSIC (Very Large Scale Integrated Circuits) • Microprocessor • Palm Tops • High Capacity hard disks • Floppy disk • Optical disk • Personal computers (PC) • Faster computer networks | <ul style="list-style-type: none"> • OS with GUI (Graphical User Interface) • UNIX OS | <ul style="list-style-type: none"> • Very small in size • Portable • Upgradable | <ul style="list-style-type: none"> • IBM PC • Apple II |

| Generation | Major Hardware Technology | Software Used | Charateristics | Systems invented |
|---|---|--|--|--|
| Fifth Generation Computers (1989 to present) | <ul style="list-style-type: none"> • ULSI (Ultra Large Scale Integration) • Very High Capacity Hard disks and optical disks • Internet | <ul style="list-style-type: none"> • Operating Systems with GUI (Graphical user Interface) • Internet and multi-media applications • Voice recognition based on AI (Artificial Intelligence) • Character recognition • Hand-writing recognition systems | <ul style="list-style-type: none"> • Portable • Less Expensive • Smaller in size • Easy operation • High reliability • High efficiency | <ul style="list-style-type: none"> • IBM notebooks • Pentium PCs • SUN workstations |

Classification of Computers

We can categorized computers based on,

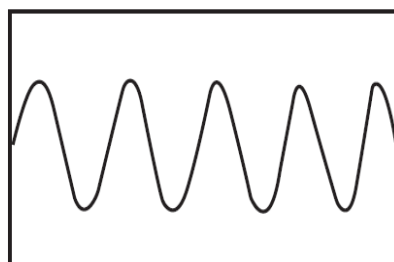
1. Technology
2. Purpose
3. Physical size



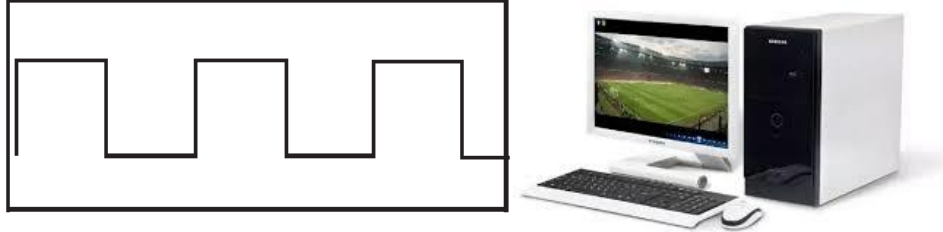
Based on the Technology

Computers can be classified according to the technology used. These are,

- (i) **Analog Computer** - An analog computer is a form of computer that handles continuous values such as electrical, mechanical, or hydraulic quantities and environmental parameters (speed, pressure, and temperature). Speedometers, road lamps with sensors and meteorological machines can be given as examples.



- (ii) **Digital Computer** - The computers used by us in day-to-day life are called digital computers. These computers use digital signals. That performs calculations and logical operations with quantities represented as digits, usually in the binary number system.



- (iii) **Hybrid Computers** - This is a combination of analog and digital computers. Hybrid computers basically collect the data as analog inputs, process them in digital methods and give out put via a digital terminal attached to them. In practical, all analog computers otherwise give their output to some digital computers for analysis or diagnosis. Therefore, it is very difficult to find a standalone analog computer.

The ECG machine used in hospitals to check the function of the heart is an example for hybrid computers. This machine identifies the function of the heart beat which is an analog signal. Then it is converted to a digital signal and these converted signals are printed by this machine.



Based on the Purpose

- (i) **Special purpose computer** - Computers are designed to handle a specific problem or to perform a specific task. The program or instructions set is permanently stored in such a machine. It does its single task very quickly and it cannot be used for any other purpose.

These computers are often used to perform specific function such as controlling a manufacturing process or directing communications.



- (ii) **General purpose computer** – These are designed to perform a range of tasks. These computer can store different programs and can thus be used in countless application. A General Purpose Computer can perform any kind of jobs with equal efficiency simply by changing the application program stored in main memory.



Based on Size

- (i) **Super Computer** - The fastest and most powerful type of computers. Supercomputers are very expensive and are employed for specialized applications that require immense amounts of computing power. (Eg: TIANHE-1) Super computers are used for highly calculation-intensive tasks such as weather forecasting, climate research, molecular modeling, physical simulation, and cryptanalysis and like military and scientific agencies are heavy users.



Cray-1



The Cray-1 supercomputer, c. 1976. It was approximately 6 feet high and 7 feet in diameter (1.8 by 2.1 metres).



Fugisu

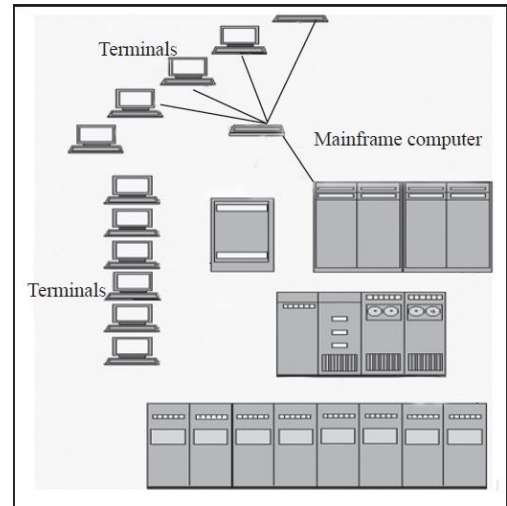


NEC

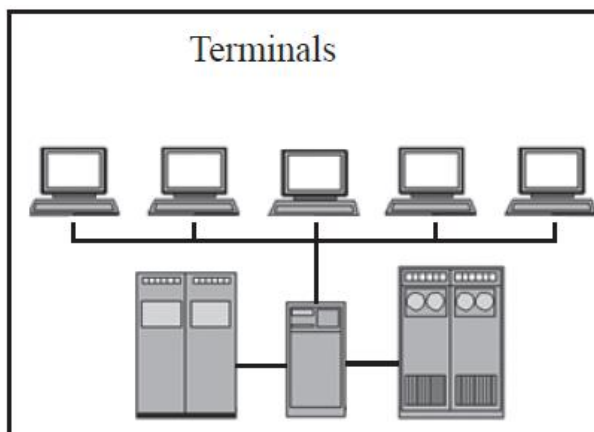
- (ii) **Mainframe Computer** - A very large and expensive computer capable of supporting hundreds, or even thousands, of users simultaneously.

A typical application is the airline system. It has a mainframe computer at their head office where information of all the flights is stored. Small computers are installed at the booking offices are attached to central data bank, so that up to date information of all flights is always available.

Some computers are – Univac 1100/10, Univac 1100/60, Honeywell DSP 88/860, IBM 270/168 etc.



- (iii) **Mini Computer** – Mid size computers mainly used as small or mid-range servers operating business and scientific applications. They are smaller version of the mainframes. Generally they offer the same computing power as bigger counterparts. The most important advantage of a mini computer over the main frame is that it is cheaper in cost smaller in size and reliable. It does not require air conditioning and can be operated in room temperature.



(iv) **Micro Computer –**

Desktop – A personal computer sufficient to fit on a desk



Laptop – A portable computer



Palmtop – A hand size computer



Notebook - A portable computer small and thinner than Laptop.



8th Generation
13-inch Notebook

Smart phone – This is a mobile phone used for mobile communication with an operating system and other advanced facilities.



Tablet - A tablet is a wireless, portable personal computer with a touch screen interface. The tablet is typically smaller than a notebook computer, but larger than a smartphone.



Phablet - A phablet is a small pocket sized mobile device that is a bit larger than the size of an average smartphone and smaller than tablet. (Eg: Apple 6Plus, Galaxy Note, etc)



References

Teachers' Guide 2017

Grade 10 Text Book

<http://www.vidyagyaan.com/computer-knowledge/different-types-of-computer/>