

Main Eras of Evolution of Computers



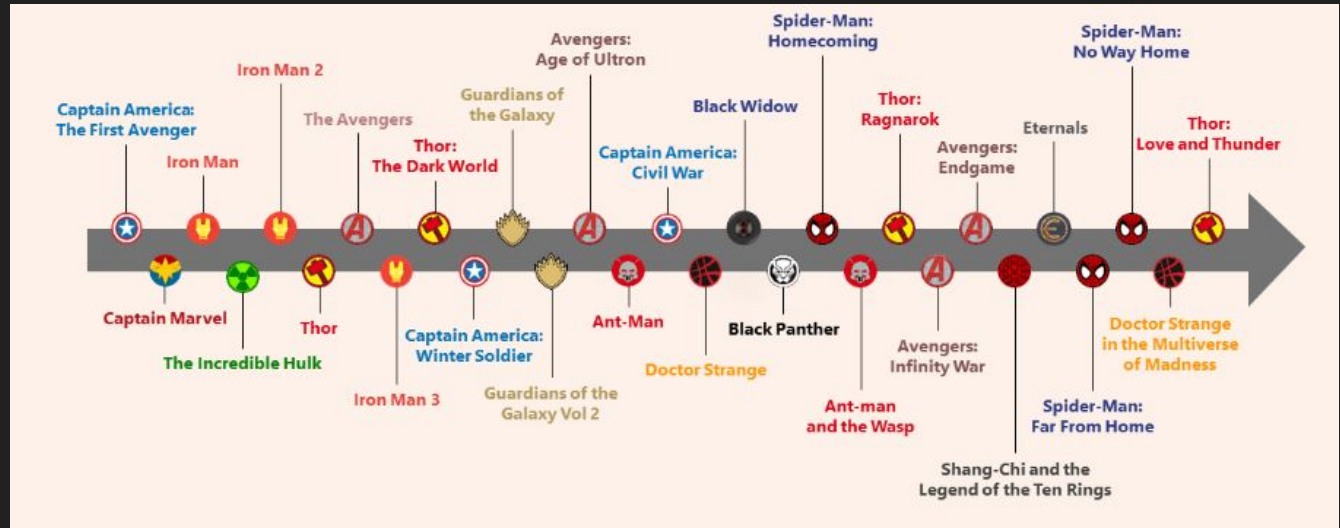
Day 1: Historical Developments

- Objective: **Understand the historical developments of microprocessors and computers.**
- Assessment: Research and present a timeline of major milestones in the development of microprocessors and computers.
- Key Points:
 - The invention of the microprocessor and its impact on computing.
 - Key advancements in computer technology throughout history.
- Standard Addressed: CCSS.ELA-LITERACY.RST.11-12.9 - Synthesize information from a range of sources to deepen understanding.

Task :

Create a timeline for Evolution of Computers based on the discussion

Eg:



Pre-Mechanical Era (3000 BCE - 1450 CE)

During the pre-mechanical era, which spanned from 3000 BCE to 1450 CE, early civilizations developed various calculation devices and mechanical tools to aid in their daily activities.



Pre-Mechanical Inventions

Device	Description
Abacus	An early counting device consisting of rods or wires with beads used for arithmetic calculations.
Counting Boards	Wooden or stone boards with grooves or lines used for mathematical calculations and record-keeping.
Astrolabe	A device used for measuring angles and determining the positions of celestial objects, commonly used in navigation and astronomy.
Slide Rule	A mechanical analog computer used for multiplication, division, and other mathematical calculations.
Early Writing Systems	The development of various writing systems, such as cuneiform in Mesopotamia and hieroglyphics in Egypt, allowed for the recording and preservation of information.
Record-Keeping Systems	Early forms of record-keeping, such as clay tablets and papyrus scrolls, were used to document transactions, inventories, and historical events.

Mechanical Era (1450 - 1840)

Invention of the Mechanical Calculator

The mechanical era began with the invention of the mechanical calculator by Blaise Pascal. This device was capable of performing basic arithmetic calculations and laid the foundation for future computational machines.

The Analytical Engine

Charles Babbage introduced the concept of the Analytical Engine, a mechanical computer designed to perform complex calculations. Although never fully built, this machine was a precursor to modern computers and featured many advanced features.

Contributions of Ada Lovelace

Ada Lovelace, a mathematician and writer, made significant contributions to early computer programming. She worked closely with Charles Babbage and is credited with writing the first algorithm intended to be processed by a machine, making her the world's first computer programmer.

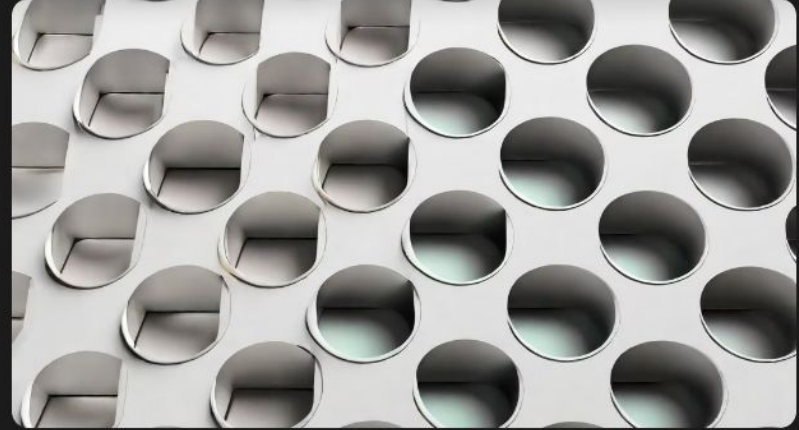


Electro-Mechanical Era (1840 - 1940)



Revolutionizing Communication

The invention of the telegraph during the electro-mechanical era revolutionized communication, allowing for rapid long-distance transmission of messages.



Punched Cards for Data Storage

Punched cards were developed during this era for data storage and processing, enabling the automation of tasks and the manipulation of large amounts of information.

Calculating Machines

Calculating machines like the tabulating machine by Herman Hollerith became popular during the electro-mechanical era, facilitating the processing of data and the automation of numerical calculations.

Electronic Era (1940 - 1956)



Invention of the Vacuum Tube

The electronic era is characterized by the invention of the vacuum tube, which enabled the development of electronic circuitry.



First Electronic Computers

During this era, the first electronic computers like the ENIAC and UNIVAC were developed, paving the way for modern computing.

The First Generation: Vacuum Tubes

- The first generation of computers used vacuum tubes for digital logic elements and memory.
- A number of research and then commercial computers were built using vacuum tubes.
- For our purposes, it will be instructive to examine perhaps the most famous first-generation computer, known as the IAS computer.
- A fundamental design approach first implemented in the IAS computer is known as the **stored-program concept**.
- This idea is usually attributed to the mathematician John von Neumann. Alan Turing developed the idea at about the same time. The first publication of the idea was in a 1945 proposal by von Neumann for a new computer, the EDVAC (Electronic Discrete Variable Computer).
- In 1946, von Neumann and his colleagues began the design of a new stored program computer, referred to as the IAS computer, at the Princeton Institute for Advanced Studies.
- The IAS computer, although not completed until 1952, is the prototype of all subsequent general-purpose computers.

The Second Generation: Transistors

- The first major change in the electronic computer came with the replacement of the vacuum tube by the transistor. The transistor, which is **smaller, cheaper, and generates less heat** than a vacuum tube, can be used in the same way as a vacuum tube to construct computers.
- Unlike the vacuum tube, which requires wires, metal plates, a glass capsule, and a vacuum, the transistor is a **solid-state device**, made from silicon. The transistor was invented at **Bell Labs in 1947** and by the 1950s had launched an electronic revolution. It was not until the late 1950s, however, that fully transistorized computers were commercially available.
- But there are other changes as well. The second generation saw the introduction of more complex arithmetic and logic units and control units, the use of high- level programming languages, and the provision of system software with the computer.
- In broad terms, system software provided the ability to load programs, move data to peripherals, and libraries to perform common computations, similar to what modern operating systems, such as Windows and Linux, do.

Impact of Transistors on Computer Technology

Transistors: A Game Changer

The development of transistors during the Microelectronic Era revolutionized computer technology in several ways.

Replacement of Vacuum Tubes

Transistors replaced vacuum tubes, which were large, fragile, and consumed a lot of power. This led to significant advancements in computer technology, as transistors were smaller, more reliable, and more energy-efficient.

Miniaturization with Integrated Circuits

The development of integrated circuits (ICs) further enhanced the miniaturization of computer components. ICs combined multiple transistors and other electronic components onto a single chip, making computers smaller, faster, and more powerful.

Advancements in Mainframe Computers

The emergence of transistors paved the way for the development of mainframe computers. These large and powerful machines were capable of processing vast amounts of data, enabling advancements in scientific research, business operations, and government applications.

Beginning of Computer Networking

Transistors played a crucial role in the early stages of computer networking. With the miniaturization of computers, it became possible to connect multiple machines together, leading to the development of computer networks and the foundation for the internet as we know it today.

The Third Generation: Integrated Circuits

- A single, self-contained transistor is called a discrete component. Throughout the 1950s and early 1960s, electronic equipment was composed largely of discrete components—transistors, resistors, capacitors, and so on.
- Early second- generation computers contained about 10,000 transistors. This figure grew to the hundreds of thousands, making the manufacture of newer, more powerful machines increasingly difficult.
- In 1958 came the achievement that revolutionized electronics and started the era of microelectronics: the invention of the integrated circuit. It is the integrated circuit that defines the third generation of computers.
- The two most important members of the third generation, both of which were introduced at the beginning of that era: the IBM System/360 and the DEC PDP-8.

Beyond the third generation

- there is less general agreement on defining generations of computers. There have been a number of later generations, based on advances in integrated circuit technology.
- With the introduction of large scale integration (LSI), more than 1,000 components can be placed on a single integrated circuit chip.
- Very-large-scale integration (VLSI) achieved more than 10,000 components per chip, while current ultra-large-scale integration (ULSI) chips can contain more than one billion components.
- With the rapid pace of technology, the high rate of introduction of new products, and the importance of software and communications as well as hardware, the classification by generation becomes less clear and less meaningful.

Personal Computer Era (1971 - Present)

Key Milestones and Advancements

The invention of the microprocessor by Intel revolutionized the personal computer industry, allowing for the development of smaller, more powerful computers.

The introduction of the Altair 8800 in 1975 marked the first affordable personal computer, sparking the interest of hobbyists and enthusiasts.

The rise of Apple and IBM in the personal computer market in the late 1970s and early 1980s solidified the industry and brought personal computers into homes and businesses worldwide.

Modern Era of Computing

The modern era of computing is characterized by significant advancements in technology and the widespread use of mobile computing, cloud computing, and artificial intelligence.

Mobile Computing and Smartphones

The development of mobile computing and smartphones has revolutionized the way people communicate and access information. Smartphones have become an essential tool in the modern era, providing users with instant access to the internet, social media, and various applications.

Cloud Computing and Internet Services

The growth of cloud computing and internet services has transformed the way businesses and individuals store, manage, and access data. Cloud computing allows for efficient storage and processing of large amounts of data, enabling businesses to scale their operations and provide seamless online services to users.

Advancements in Artificial Intelligence and Machine Learning

Advancements in artificial intelligence and machine learning have opened up new possibilities in various industries, including healthcare, finance, and transportation. AI and machine learning algorithms can analyze large amounts of data, make predictions, and automate processes, leading to improved efficiency and decision-making.

Evolution of Computers

Pre-Mechanical Era

The concept of computing dates back to ancient times, with the development of tools like the abacus and the Antikythera mechanism.

Mechanical Era

The mechanical era of computing began with the invention of devices like the Pascaline and the Analytical Engine by Blaise Pascal and Charles Babbage, respectively.

Electromechanical Era

The electromechanical era saw the development of machines like the Mark I and ENIAC, which used vacuum tubes and relays for computation.

Transistor Era

The invention of the transistor in 1947 revolutionized computing, leading to the development of smaller, faster, and more reliable computers.

Integrated Circuit Era

The integrated circuit, invented in 1958, allowed for the integration of multiple transistors onto a single chip, further miniaturizing computers and increasing their processing power.

Microprocessor Era

The development of the microprocessor in the early 1970s led to the creation of personal computers, making computing accessible to individuals and businesses.

Modern Era

Advancements in technology have led to the development of faster, more powerful computers, with innovations like cloud computing, artificial intelligence, and quantum computing shaping the future of computing.

Impact of Computers on Society

Computers have had a profound impact on society, revolutionizing various aspects of our lives from their early development to modern advancements.

Early Development

In the mid-20th century, computers were primarily used by governments and large organizations for complex calculations and data processing.

The invention of the microprocessor in the 1970s paved the way for personal computers, making computing more accessible to individuals.

Advancements in Communication

The internet, a global network of computers, has revolutionized communication, allowing people to connect and share information across the globe.

Social media platforms have transformed the way we interact and communicate, enabling instant communication and the sharing of ideas.

Impact on Work and Productivity

Computers have greatly increased productivity in various industries, automating tasks and streamlining processes.

The rise of remote work and digital nomadism has been made possible by computers, allowing people to work from anywhere in the world.

Advancements in Healthcare

Computers have revolutionized healthcare, enabling advanced medical imaging, data analysis, and electronic health records.

Artificial intelligence and machine learning algorithms are being used to diagnose diseases and develop personalized treatment plans.