1 EVOLUTION OF COMPUTER

HISTORY OF COMPUTERS

Once upon a time, in a world without computers, people relied on their own intelligence and tools to perform calculations. However, as time passed, the need for faster and more efficient methods of computation grew. Thus, the journey of computers began.

The Evolution of ComputersThe Evolution of Computers

1617
Early Calculating Devices Abacus Napier's Bones Slide Rule

1642-1673
Mechanical Computers Pascaline Leibniz Wheel Difference & Analytical Engine

1941-43
Electromechanical Era Hollerith's Tabulating Machine Zuse Z3 Colossus

1971-81
Integrated Circuit & Microprocessor Integrated Circuits Microprocessors Personal Computers

1945-47
Electronic Era ENIAC Transistors

Present Time
Future Trends Artificial Intelligence Quantum Computing Edge Computing & IoT

1990s
Modern Era Graphical User Interfaces Internet & World Wide Web Mobile Computing

Today computers have become an integral part of modern life, transforming nearly every aspect of society. Their importance is evident in various fields, from education and healthcare to business and entertainment.

EARLY COMPUTING DEVICES:

Abacus

⇨ Abacus was the first calculating device invented in China around 3000 BC.

⇨ Abacus was the first mechanical device for calculations, developed in China.

⇨ It was made up of a wooden frame with rods, each having beads.

⇨ It was used to perform simple calculations like addition, multiplication, subtraction and division.

⇨ It is still used in Asia and Africa.
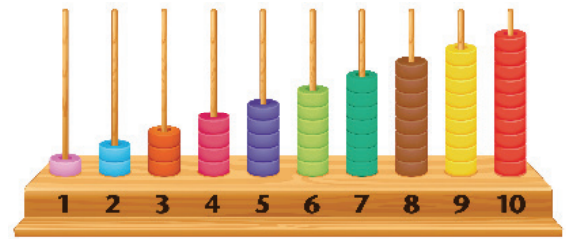
Napier's Bones

⇨ This device was made in 1616 by Sir John Napier.

⇨ It had numbers carved on bones or strips of wood.

⇨ It was used for addition, multiplication, subtraction, division and to find the square root of a number.

Pascaline

⇨ In 1641, Blaise Pascal invented the first mechanical calculator- the Pascaline.

⇨ It consisted of a rectangular box with movable wheels.

⇨ It could be used for those basic arithmetic operations just like a calculator but could be used for 1000 digits.

Emergence of Electronic Computers:

⇨ The first electronic computer, the Electronic Numerical Integrator and Computer (ENIAC), was built in the 1940s. It was enormous in size and used vacuum tubes for computation.

⇨ The invention of transistors in the 1950s led to the development of smaller and more reliable computers. The transistorized computers, known as second-generation computers, were faster and more efficient.

◆ *POPULAR IT INVENTIONS*

First Computer: Difference Engine - 1821

⇨ Charles Babbage (also known as the Father of Computer) started working on the Difference Engine, which is based on the principle of finite differences.

⇨ It uses only arithmetic addition and removes the need for multiplication and division which are more difficult to implement mechanically.

⇨ The project was commissioned by the British government, but due to its high production cost, the funding was stopped in the middle and the machine was never completed.
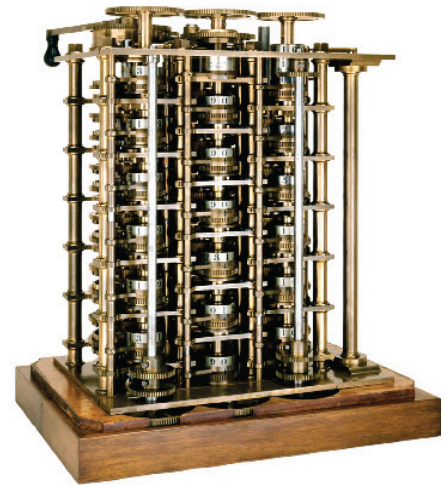
First General-Purpose Computer: Analytical Engine - 1834

⇨ Charles Babbage conceived a more ambitious machine, the first general-purpose programmable computing engine, later called Analytical Engine.

⇨ It has many essential features found in the modern digital computer. The machine was programmable using punched cards, the engine had a "Store" where numbers and intermediate results could be held and a separate "Mill" where the arithmetic operations were performed.

⇨ The engine was also capable to perform direct multiplication and division, parallel processing, microprogramming, iteration, latching, conditional branching, plus-shaping, though Babbage never used these terms. Unfortunately, like Difference Engine, this machine was also not completed.
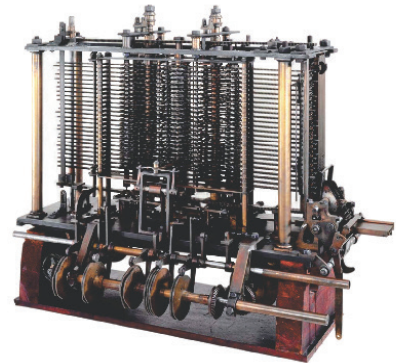
First Computer Program- 1841

⇨ World's first computer programmer Ada Lovelace began translating Luigi Menabrea's (Italian Mathematician) records on Babbage's analytical engine in 1841. She understood how to make it do the things computers do, and she suggested the data input that would program the machine to calculate Bernoulli numbers.

Tabulating Machine -1884

After graduation from Columbia University School of Mines in 1879, Herman Hollerith collaborated with his former professor, William Trowbridge, who had received a commission as a special agent for the 1880 census. Over the next 10 years, Hollerith worked on

his idea of a machine punch and count cards. During all this time, he was occupied with the problem of automating the tabulation work of the census. By 1890, he had designed machines to record by electrically reading and sorting punched cards that had been numerically encoded by a perforation position.

First Analog Computer: Differential Analyzer - 1930

Vannevar Bush, an MIT engineer developed the first modern analog computer. It was an analog calculator that could be used to solve some specific set of differential equations, a type of problem common in engineering and physics applications, which are often very tedious to solve. The machine produced approximate, albeit practical solutions.
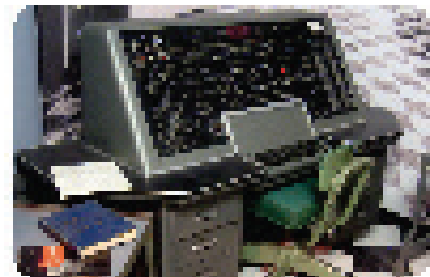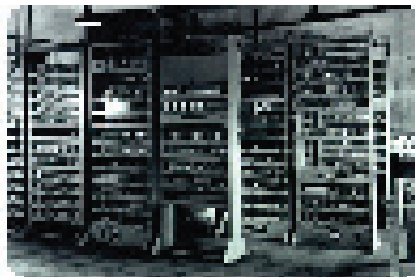

GENERATIONS OF COMPUTERS

As the years passed, computers evolved through various generations, each marked by significant advancements in technology.

First Generation (1940s-1950s):

The first-generation computers used vacuum tubes for processing and magnetic drums for storage. They were large, expensive, and consumed a lot of electricity. Examples include ENIAC and UNIVAC.

Second Generation (1950s-1960s):

Second-generation computers replaced vacuum tubes with transistors, making them smaller, more reliable, and faster. Magnetic core memory was used for storage. Examples include IBM 1401 and CDC 1604.
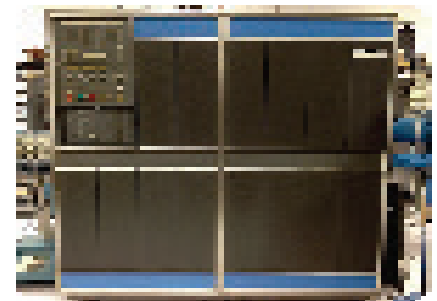
Third Generation (1960s-1970s):

The third-generation computers were characterized by the use of integrated circuits (ICs). ICs allowed for further miniaturization and improved performance. Magnetic disks and tapes were introduced for storage. Examples include IBM System/360 and DEC PDP-11.

Fourth Generation (1970s-1990s):

Fourth-generation computers featured microprocessors, which combined the CPU on a single chip. Personal computers and workstations became more prevalent during this period. Examples include IBM PC, Apple Macintosh, and Sun Microsystems workstations.

Fifth Generation (1990s-Present):

Fifth-generation computers refer to a generation of computers that are currently at the forefront of technological advancements. They are characterized by their potential to use advanced artificial intelligence and parallel processing techniques. While the term "fifth generation" has been used historically to describe different periods of computer development, today, it mainly refers to the future possibilities in computing rather than a specific stage in the development of computers

Examples include IBM Watson and Google's AlphaGo.

COMPARISON OF THE GENERATION OF COMPUTERS

Generation of computers	First Generation	Second Generation	Third Generation	Fourth Generation	Fifth Generation (Speculative)
Time Period	1940s - 1950s	Late 1950s - Early 1960s	Early 1960s - Mid-1970s	Late 1970s - Present	Hypothetical, Future Innovations
Technology	Vacuum Tubes	Transistors	Integrated Circuits (ICs)	Micro-processors	Envisioning Advanced Technologies
Programming	Machine Language	Assembly Language	High-Level Languages	Fourth Generation Languages	Speculative AI, Quantum Computing, etc.

Generation of computers	First Generation	Second Generation	Third Generation	Fourth Generation	Fifth Generation (Speculative)
Abstraction Level	Low-level	Low-level	Higher-level	Higher-level	Advanced AI, Quantum Computing, etc.
Software	Bare metal programming	Closer to hardware	Application-focused	Application-focused	Hypothetical, Problem-Specific Software
Examples	ENIAC, UNIVAC I	IBM 1401, PDP-1	IBM System/360, DEC PDP-11	SQL, C, Python, Java, etc.	Conceptual AI, Quantum Computers, etc.

🧩 *LATEST DEVELOPMENTS IN COMPUTING TECHNOLOGY*

1. **Foldable Computers:** Foldable computers are a new category of devices that feature flexible displays and can transform from a smartphone-sized form factor to a larger tablet-sized screen. They offer the portability of a phone and the productivity of a tablet.

2. **Holographic Computers:** Holographic computers incorporate holographic displays and augmented reality (AR) technologies to create interactive 3D holographic images and interfaces. They have potential applications in gaming, design, and education.

3. **Bio Computers:** Bio computers explore the use of biological materials, such as DNA, enzymes, and cells, to perform computing tasks. Research in this area focuses on using biological processes for data storage and computation.

4. **Neuromorphic Computers:** Neuromorphic computers are inspired by the structure and functioning of the human brain. They use specialized hardware to mimic neural networks, enabling efficient and low-power artificial intelligence computations.

5. **Wearable Computers:** Wearable computers are becoming more advanced and integrated into various devices like smartwatches, smart glasses, and fitness trackers. They offer functionalities such as health monitoring, notifications, and voice commands.

6. **Quantum Computers:** Quantum computers continue to advance, with ongoing research in quantum

VIRAL FACTS

The first super-computer of India was PARAM 8000 (year 1991).

KNOW MORE

ANURAG is also an Indian supercomputer. Other supercomputers are CRAY XMP/14, CDC-205, etc. Mr. Seymour Cray was a pioneer person in the field of supercomputer production. He had developed the first supercomputer Cray-1 in 1976.

processors and error correction. They promise to revolutionize computing by solving complex problems exponentially faster than classical computers.

7. **Biometric Computers:** Biometric computers integrate biometric authentication methods, such as fingerprint scanners, facial recognition, and iris scanners, to enhance security and user identification.

8. **AR/VR Integrated Computers:** Some computers are designed specifically for augmented reality (AR) and virtual reality (VR) applications, providing enhanced processing power and graphics capabilities to support immersive experiences.

9. **Cloud-Based Computers:** Cloud-based computers leverage cloud computing services to offload processing and storage requirements from the device, enabling access to data and applications from anywhere with an internet connection.

Chapter QUICK REVIEW

- 🖱 **History of Computers:** From basic tools like the Abacus to advanced electronic computers.

- 🖱 **First Calculating Devices:** Napier's Bones, Pascaline revolutionized simple calculations.

- 🖱 **ENIAC:** The first electronic computer, marking a major shift in technology.

- 🖱 **Popular IT Inventions:** Difference Engine by Charles Babbage; Analytical Engine for programmable computers.

- 🖱 **Ada Lovelace:** The world's first computer programmer who wrote the first algorithm.

- 🖱 **Generations of Computers:** Computers evolved from vacuum tubes to AI-powered systems.

- 🖱 **First Generation:** Large, slow machines using vacuum tubes.

- 🖱 **Second Generation:** Faster computers with transistors.

- 🖱 **Fifth Generation:** Focus on AI, Quantum Computers.

- 🖱 **Latest Developments:** Wearable, Quantum, Bio computers are changing the future.

Interdisciplinary Studies

STEM Basic

Creating an Abacus

Objective: Build a simple abacus and understand basic arithmetic using it.
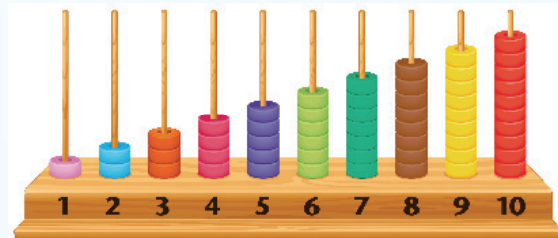
Instructions:

1. Prepare the Base:
- Cut a cardboard/wood base (20 cm x 15 cm).
- Mark and evenly space spots for 5-7 rods.

2. Attach the Rods:
- Cut 5-7 sticks (15 cm each).
- Glue or tape the sticks vertically onto the base.

3. Add Beads:
- Slide 10 beads (5 of each color) onto each rod.
- Leave space at the top or bottom for movement.

4. Label the Rods:
- Label each rod for place values: ones, tens, hundreds, etc.

5. Set Up the Abacus:
- Place all beads at one end to "reset."
- Use beads to represent numbers for addition/subtraction.

Step 6: Practice with Basic Calculations
- Use the abacus for basic addition and subtraction: Start by practicing simple math problems like 5 + 3 or 10 - 4 by moving the beads.
- To add: Move beads from the rightmost (ones) rod toward the center.
- To subtract: Move beads from the center back to the starting position.

Extensions (Optional):

1. Advanced Calculation Practice: Once comfortable with basic arithmetic, try adding larger numbers, or use multiple rods for larger calculations (like 234 + 56).
2. Digital Abacus Project: Introduce the concept of how the abacus can be replicated using digital tools like Micro:Bit or Scratch to create a digital version of the abacus.