History of Computers

From Ancient Times to Present

The Complete Evolution of Computing Technology

Abacus (2700–2300 BC)

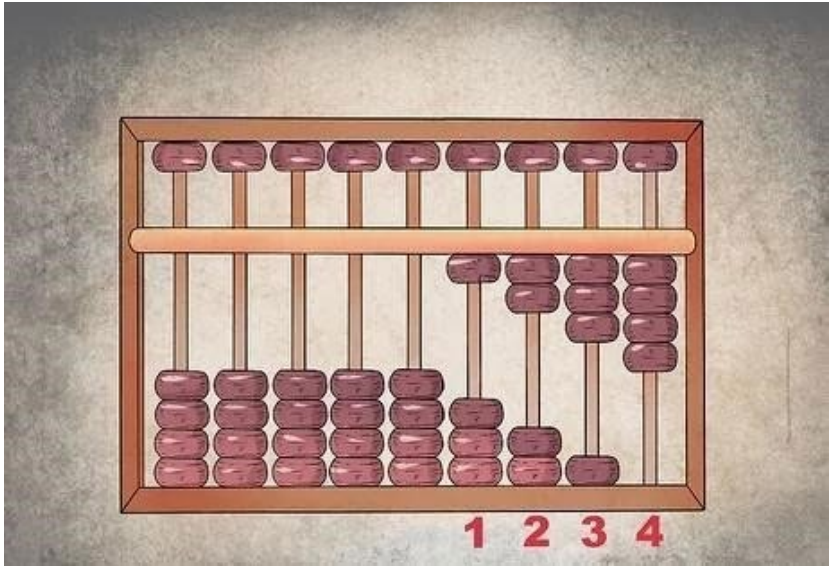
The First Mechanical Calculator

Invented by the Mesopotamians around 3000 BC

Meaning:
The word Abacus comes from the Greek word ἄβαξ (abax), which meant "a calculating table" or "a slab“

Features:

- Consisted of beads on movable rods
- Divided into two parts
- Still used today for teaching basic calculations to children

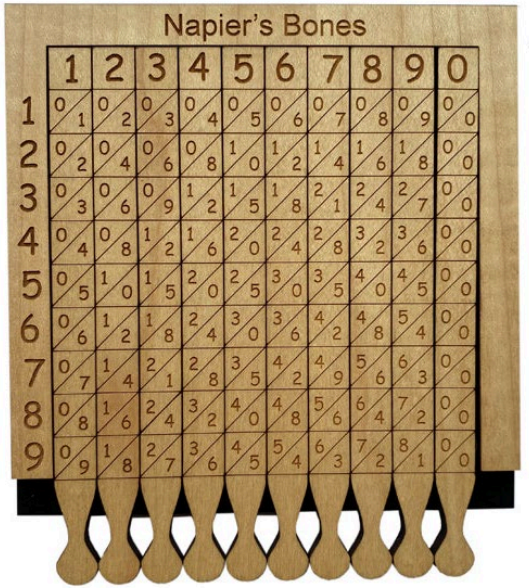


1617-1642: Mathematical Innovations

Napier's Bones (1617)

Inventor: John Napier
Scottish mathematician

- Set of rods or "bones" with multiplication tables
- Performed addition, subtraction, multiplication, and division

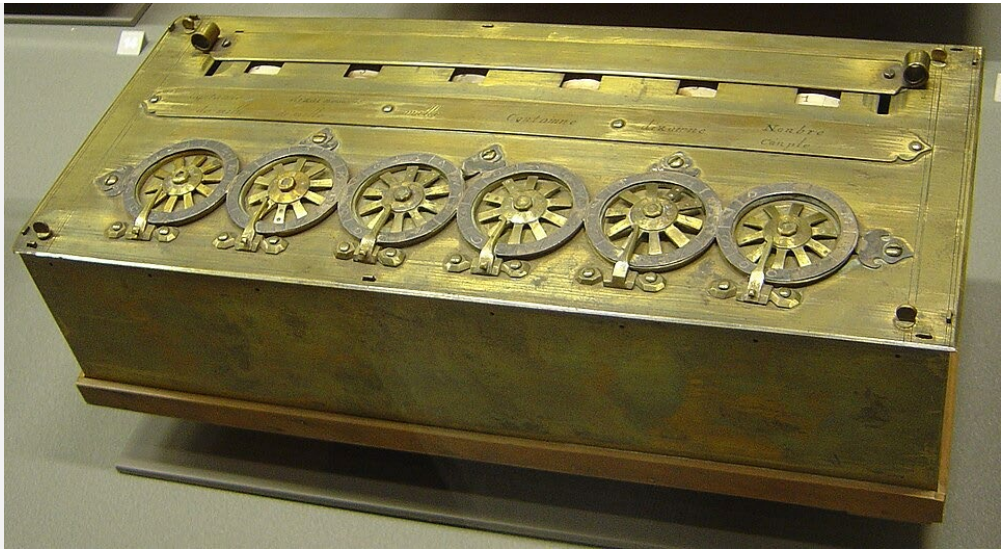


1617-1642: Mathematical Innovations

Pascaline (1642)

Inventor: Blaise Pascal
French mathematician

- One of the earliest mechanical calculators.
- Made of gears and wheels
- Worked on the ratchet mechanism
- Performed addition and subtraction faster than an abacus

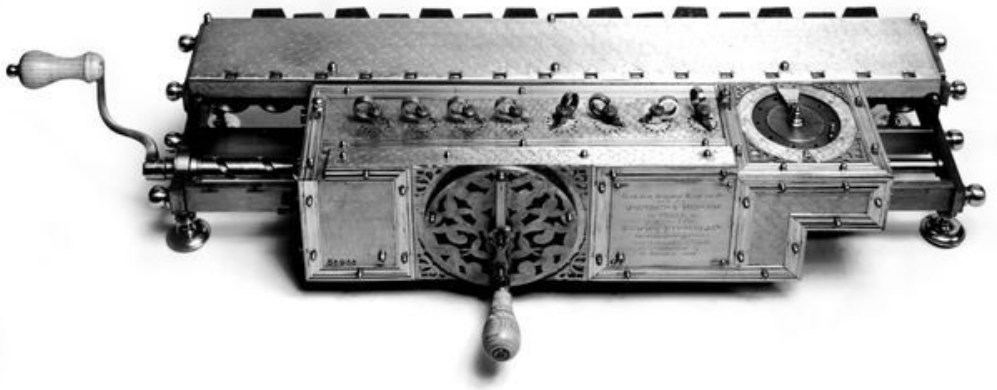


1673-1804: Automation Advances

Leibniz Wheel (1673)

Inventor: Gottfried Wilhelm Leibniz
German mathematician

- Extended Pascal's calculator
- Automatic multiplication and division
- Had cylinder or stepped drum with teeth of incrementing lengths
- Coupled to a counting wheel



1673-1804: Automation Advances

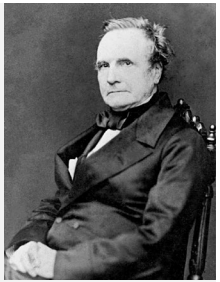
Jacquard Loom (1804)

Inventor: Joseph Jacquard

- Made the cotton weaving process automatic
- Controlled by punched cards laced together in continuous sequence
- **First use of punched cards for programming**

Charles Babbage: Father of Computers

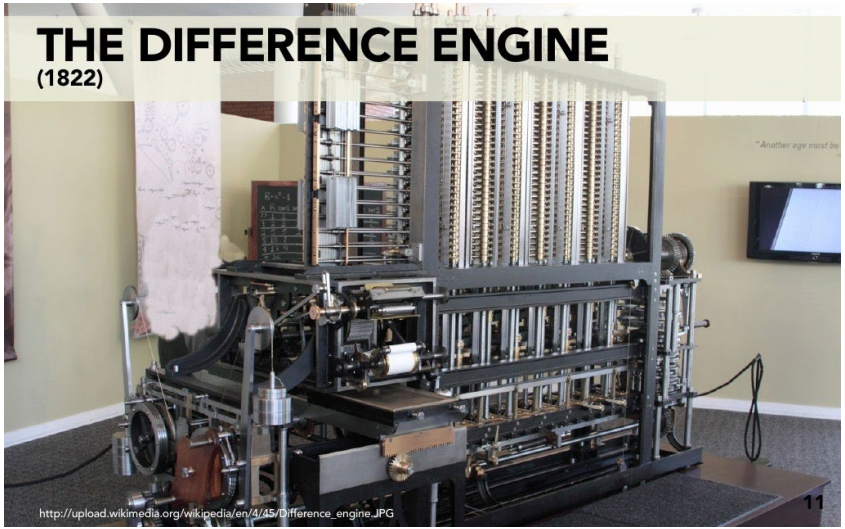
Difference Engine (1822)



Inventor: Charles Babbage
British mathematician
Known as the "Father of Computers"

Features:

- Could solve differential equations
- Powered by steam
- Printed results automatically



Analytical Engine (1833)

The Basis of Modern Computers

Revolutionary Design by Charles Babbage

The machine had five units - the foundation of modern computer architecture:

Input	Output	Store	Mill	Control
Data entry	Results display	Memory	Processing	Coordination

1890-1944: Electromechanical Era

Census Machine (1890)

Inventor: Herman Hollerith
American inventor

Purpose:
Invented to count the population of USA

- Operations controlled by punched cards
- Made census processing much faster

1890-1944: Electromechanical Era

Mark I (1944)

Inventor: Howard Aiken
Collaborated with IBM

- Largest electromechanical computer
- First operating machine executing long computations automatically
- **Considered the real beginning of the modern computer era**
- Huge computer occupying an entire room
- Offered immediate solutions
- Believed to have significantly shortened WWII

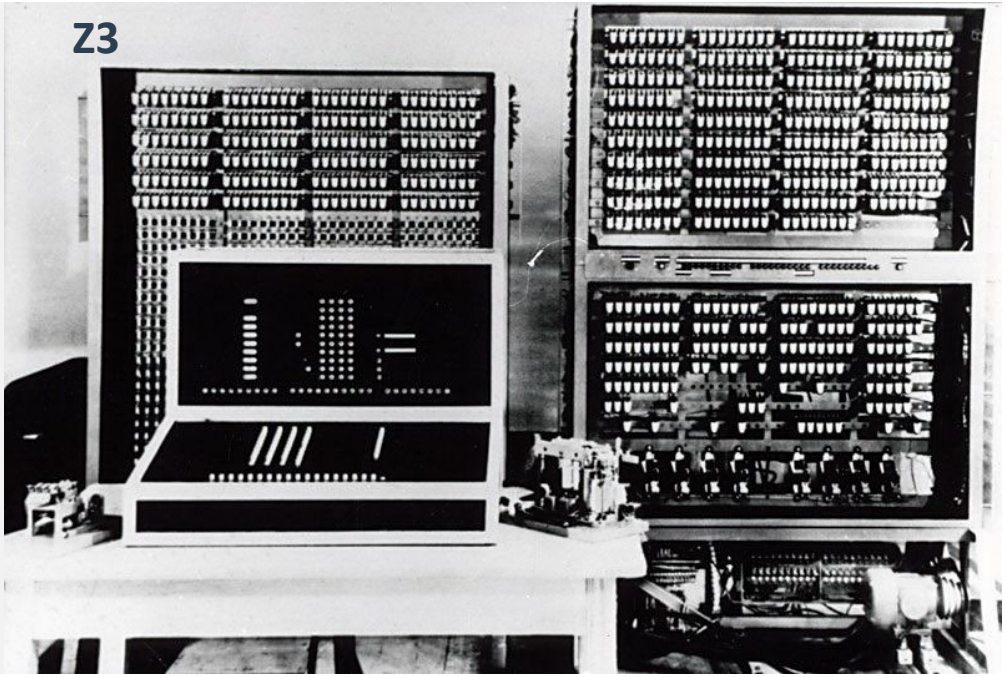
1930s-1940s: Birth of Modern Computing

Konrad Zuse's Computers

1930s: Z1
First programmable computer; performed additions and subtractions. It was programmable via punched tape

1941: Z3
The first working, fully automatic, program-controlled, and freely programmable computer using binary floating-point arithmetic.

1950: Z4
It was the only working computer in mainland Europe for a few years after the war

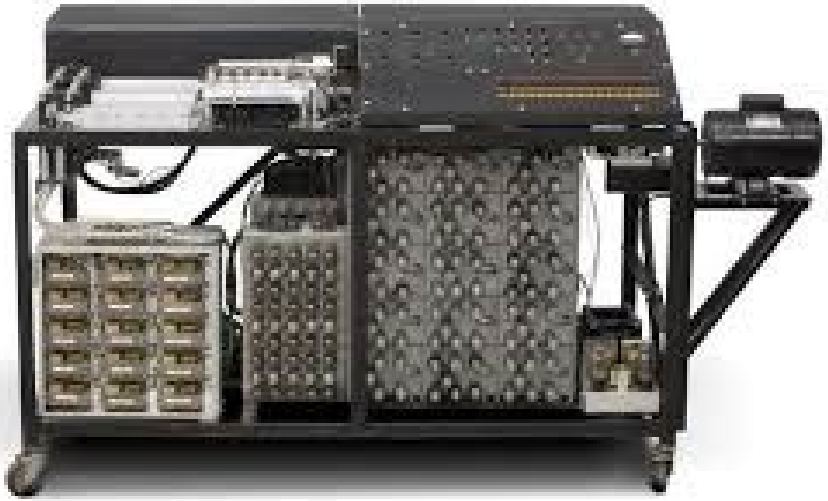


1930s-1940s: Birth of Modern Computing

Atanasoff-Berry Computer

Created in 1941 by J.V. Atanasoff and Clifford Berry

- It was a specific, electromechanical machine built to solve systems of linear equations
- The ABC used regenerative capacitor drums as memory, which was innovative



First Generation Computers (1940-1956)

Major Hardware & Software

Hardware Technology:

- Vacuum Tubes — main switching component
- Punch Cards for input, output and storage
- Magnetic drums for memory

Software Used:

- Machine language (binary 0s and 1s)
- Assembly language
- Stored Program Concept

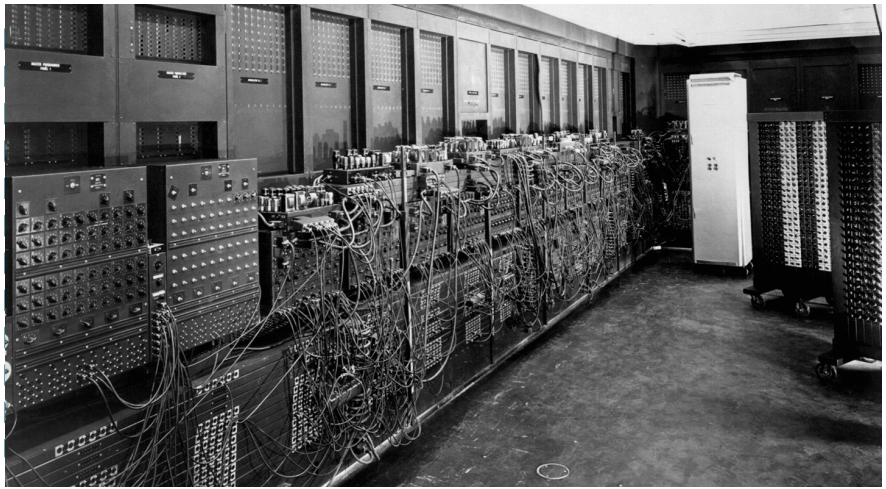
Characteristics & Systems

- High heat generation
- Very slow in processing
- Enormous size — filled entire rooms
- Not portable
- Consumed enormous amounts of electricity
- Extremely expensive to build & operate

Systems Invented:

- ENIAC, EDVAC, EDSAC
- UNIVAC, IBM 701

First Generation Computers (1940-1956)



ENIAC (1940s)

- Electronic-Numerical-Integrator-And-Computer
- Created by **Mauchly & Eckert** for ballistic analysis
- 1,800 square feet
- 30 tons of weight
- 6,000 switches, 18,000 vacuum tubes

UNIVAC (1951)

- Universal Automatic Computer
- Built by **J. Presper Eckert and John Mauchly**
- First commercial computer for business and government applications
- Marked the transition from military to commercial computing

Second Generation Computers (1956–1963)

Major Hardware & Software

Hardware Technology:

- Transistors replaced vacuum tubes
- Magnetic tape and drums for secondary storage

Software Used:

- High-level languages (FORTRAN, COBOL)
- Assembly language is still used
- Batch processing operating systems

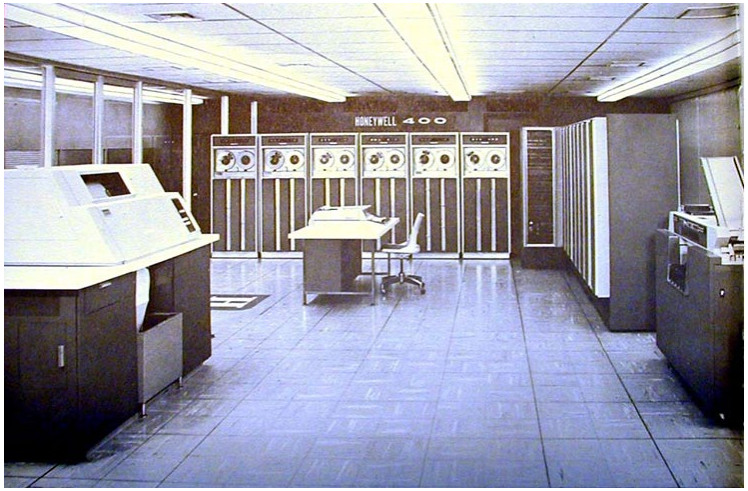
Characteristics & Systems

- Smaller in size than the 1st generation
- Less heat generation
- Lower power consumption
- Comparatively faster than 1st generation
- Still expensive

Systems Invented:

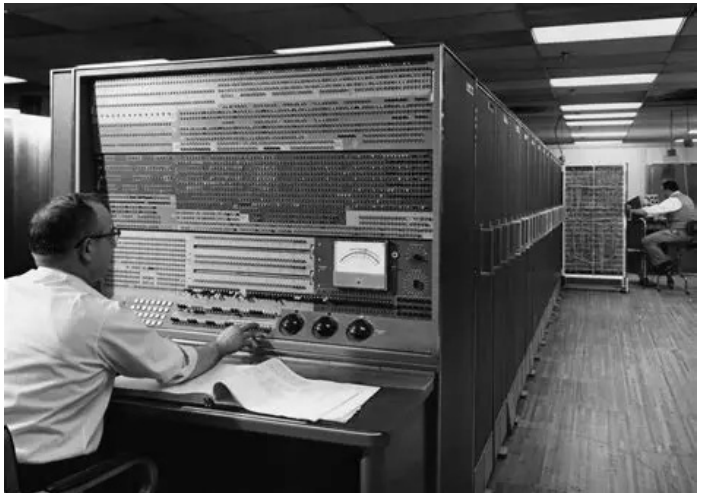
- Honeywell 400, IBM 7030
- CDC 1604, UNIVAC LARC

Second Generation Computers (1956–1963)



Honeywell 400 (1960s)

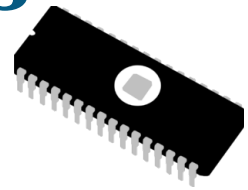
- Built by **Honeywell** after acquiring Datamatic from Raytheon
- Transistorised mainframe with 48-bit word length and magnetic core memory
- Designed for business and government data processing



IBM 7030 (1961)

- Designed by **Gene Amdahl** and **IBM engineers**
- IBM's first transistorised supercomputer, nicknamed Stretch
- Built to meet the demanding requirements of nuclear research labs (Los Alamos, NSA)

Third Generation Computers (1964–1971)



Major Hardware & Software

Hardware Technology:
- Integrated Circuits (IC)
- High-capacity disks for secondary storage
- Keyboard & mouse introduced for input

Software Used:
- Birth of Operating Systems (OS)
- High-level languages (BASIC, Pascal)
- Well-developed programming languages

Characteristics & Systems

- Smaller in size than the 2nd generation
- Less heat generation
- Comparatively faster
- Expensive but more accessible
- Low power consumption

Systems Invented:
- IBM-360/370 series, PDP-8, PDP-11
- CDC 6600

Third Generation Computers (1964–1971)

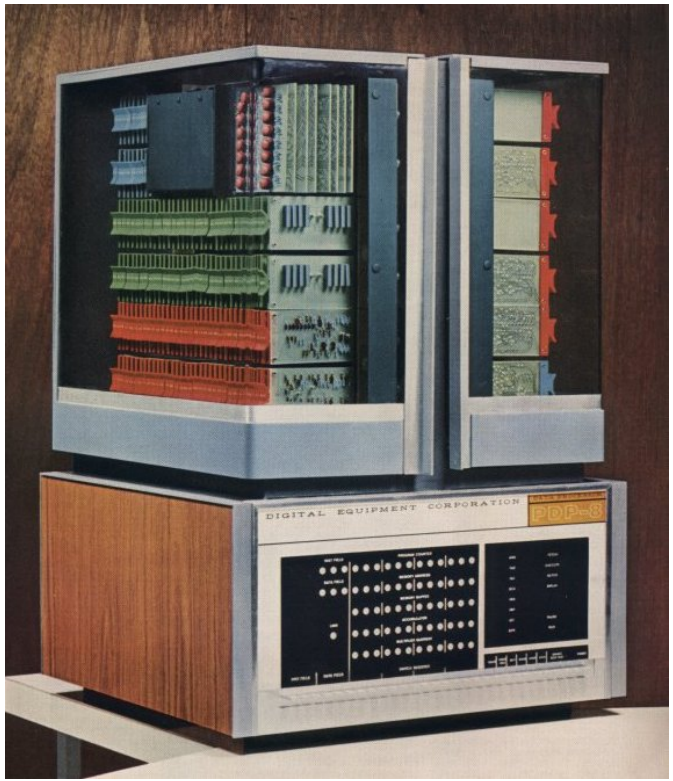
IBM 360 (1964)

- Announced by **Thomas J. Watson Jr.** and **IBM engineers**
- First family of compatible mainframe computers under a unified architecture
- Used integrated circuits and magnetic core memory (8 KB – 9 MB)
- Supported multiple operating systems

CDC 6600 (1964)

- Designed by **Seymour Cray** at Control Data Corporation
- Featured a 60-bit processor at 10 MHz, with up to 982 KB of memory
- Achieved about 3 million instructions per second
- Introduced 10 peripheral processors to handle input/output tasks in parallel with the main CPU
- Sold over 100 units

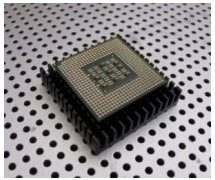
Third Generation Computers (1964–1971)



PDP 8

- introduced by Digital Equipment Corporation (DEC) in 1965
- It is widely recognised as the first commercially successful minicomputer.
- Used discrete transistors and later small-scale integrated circuits.
- Magnetic core memory (starting at 4 KB).
- Front panel switches and lights for manual programming and monitoring

Fourth Generation Computers (1971–Early 1990s)



Major Hardware & Software

Hardware Technology:

- LSIC & VLSIC (Large/Very Large Scale ICs)
- Microprocessor — entire CPU on single chip
- Palm Tops, high-capacity hard disks
- Optical disks, personal computers (PC)
- Faster computer networks

Software Used:

- OS with GUI (Graphical User Interface)
- UNIX OS widely adopted

Characteristics & Systems

- Very small in size
- Portable and lightweight
- Upgradable hardware
- More affordable than previous generations

Systems Invented:

- IBM PC (1981)
- Apple II

1975-1977: The PC Revolution

Altair 8800 (1975)

- Used BASIC (Gates & Allen)
- Very popular computer
- Invented the term "personal computer“
- Considered the first commercially successful personal computer

Apple I (1976)

- Single-circuit board with ROM
- Required separate keyboard, power and case

Apple II (1977)

- Powered by the MOS Technology 6502 processor running at 1 MHz.
- Came with 4 KB of RAM, expandable up to 48 KB.
- Supported color graphics

1981-1984: The Modern PC Era

IBM PC (1981) - Model 5150

- • 4.77 MHz Intel 8088 microprocessor
- • Microsoft MS-DOS operating system
- • Revolutionized computer development
- • Widely cloned, generating software/peripherals

Apple Lisa (1983)

First PC with graphical user interface (GUI)

- • Drop-down menus and icons
- • Motorola 68000, 1 MB RAM, 12" monitor
- • Dual floppy drives, 5 MB hard drive

Apple Macintosh (1984)

First successful computer with mouse and GUI based on Motorola 68000 microprocessor

1984-1990s: Industry Growth

Michael Dell / PC's Limited (1984)

- First self-designed computer: Turbo PC
- By early 1990s: leading computer developer

IBM Personal System 2 (1987)

- First IBM with Intel 80386 chip
- OS/2: First IBM OS allowing mouse use

Apple iMac G3 (1998)

Clear, customizable case • $1,300 • 4GB hard drive • 32MB RAM • CD-ROM • 15" monitor

Fifth Generation Computers (Present & Beyond)

Major Hardware & Software

Hardware Technology:
- ULSI (Ultra Large Scale Integration)
- Very high capacity hard disks & optical disks
- Internet becomes mainstream

Software Used:
- GUI-based Operating Systems
- Internet & multimedia applications
- AI: Voice, character & handwriting recognition

Characteristics & Systems

- Portable — laptops, tablets, smartphones
- Less expensive, widely affordable
- Smaller form factors
- Easy operation — touchscreens, voice control
- High reliability and efficiency

Systems Invented:
- IBM notebooks, Pentium PCs
- SUN workstations, Smartphones

Future of Modern Computing

Emerging Technologies Shaping Tomorrow

Quantum Computing
Solving complex problems exponentially faster

Advanced AI
AGI (Artificial General Intelligence) development

Neuromorphic Computing
Brain-inspired computer architectures

Biotechnology Integration
Brain-computer interfaces, DNA computing

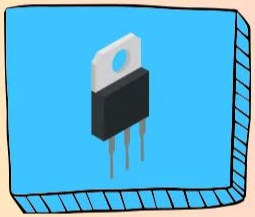
Edge Computing
Processing data closer to source (IoT devices)

Sustainable Computing
Green technology, carbon-neutral data centers

Evolution of COMPUTERS

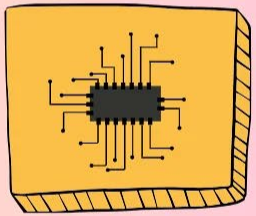
01. Vacuum Tubes

First Generation



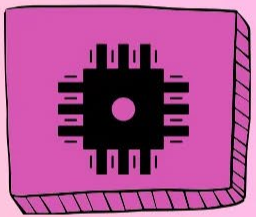
02. Transistors

Second Generation



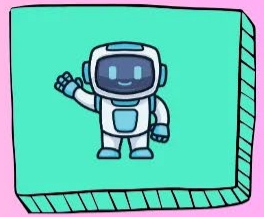
03. Integrated circuits

Third Generation



04. Microprocessor

Fourth Generation



05. AI & ML

Fifth Generation