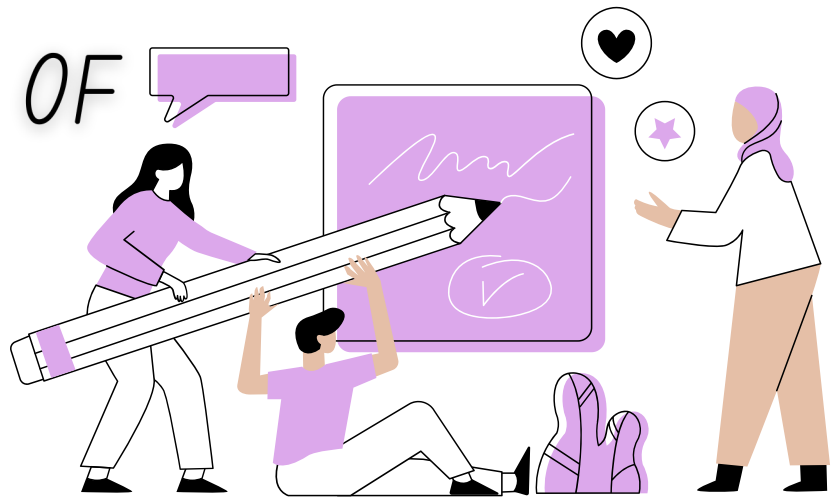


FUNDAMENTALS OF COMPUTER

Computer is an automatic electronic machine that can store, recall and process data. Computers are electronic machines that perform tasks or complex calculations according to a set of instructions or programs.



Characteristics of Computers

I **SPEED:** *The ability to get answers fast enough so that one has time to take action*

II **MEMORY** *the primary memory RAM is used to store the data temporarily.*

III **STORAGE** *After processing, the data and information must be stored in the secondary storage device, so that the data or information can be used later. The data and information can be stored permanently in secondary storage devices.*

NOTE

The computer memory is measured using BITS and Bytes.

IV **ACCURACY** *The computer generated results are exact and without any mistakes with high rate of consistency*

V **VERSATILITY** *Computers seem capable of performing almost any task, provided that the task can be reduced to series of logical steps.*

VI **AUTOMATION** *A computer is much more than an adding machine, calculator or check-in/out system, all of which require human operators to press the necessary keys for the operations to be performed. Once a program is in the computer's memory, the individual instructions are then transferred, one after the other, to the control unit for execution. The processor/CPU follows these instructions until it meets a last instruction which says stop program execution.*

VII **DILIGENCE** *Being a machine, a computer does not suffer from the human traits of tiredness and lack of concentration. For example, if 3 million calculations have to be performed, it will perform the 3 millionth with exactly the same accuracy and speed as the first*

Data and Information

The term data and information are common terminology in the field of computers. Computers process data into information.



DATA is collection of unprocessed items, which can include text, numbers, images, audio and video. We can also define data as collection of raw facts, figures, statistics which requires to be processed.

For example, "PARAM" 16. The computer processed data is called the information, which conveys meaning and is useful to people to take future decisions on the information.

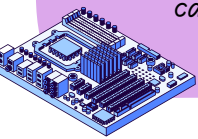
For example, Name = "PARAM" AGE=16.

- **COMPUTERS WORK THROUGH AN INTERACTION BETWEEN HARDWARE AND SOFTWARE.**
- **THE MACHINE PARTS (PHYSICAL PARTS) OF THE COMPUTER IS CALLED AS HARDWARE.**
- **THE PROGRAMS THAT TELL COMPUTER WHAT TO DO, HOW TO DO ETC. IS CALLED AS SOFTWARE.**



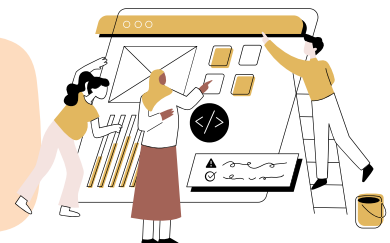
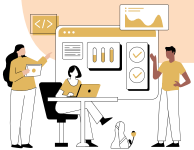
HARDWARE

Hardware refers to the parts of a computer that you can see and touch (physical components) including the case and everything inside it. This part translates instructions and performs calculations. Hardware items such as monitor, keyboard, mouse, printer, and other items are often called hardware devices, or devices.



SOFTWARE

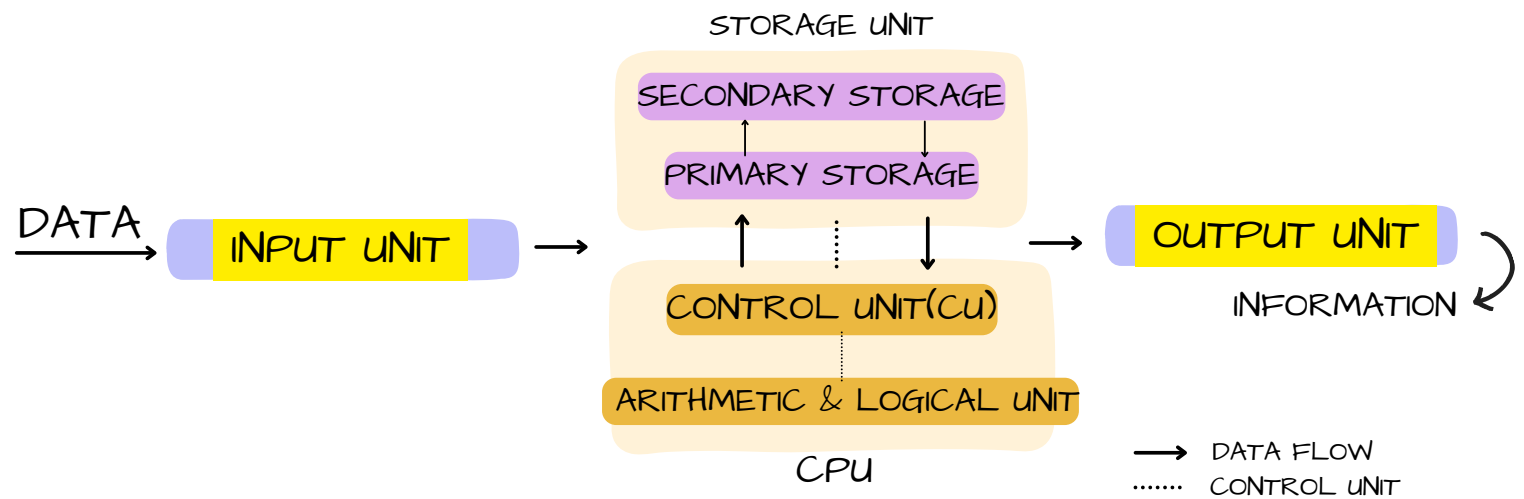
Software refers to the instructions, or programs, that tell the hardware what to do. The two categories of software are system software and application software.



SYSTEM SOFTWARE consists of the programs that control or maintain the operations of the computer and its devices. System software serves as the interface between the user, the application software, and the computer's hardware.

APPLICATION SOFTWARE consists of programs designed to make users more productive and/or assist them with personal tasks.

FUNCTIONAL COMPONENTS OF A COMPUTER (WORKING OF EACH UNIT)



- **ACCEPT THE DATA AND PROGRAM AS INPUT**
- **STORE THE DATA, PROGRAM AND RETRIEVE AS AND WHEN REQUIRED.**
- **PROCESS THE DATA AS PER INSTRUCTIONS GIVEN BY THE PROGRAM AND CONVERT IT INTO USEFUL INFORMATION**
- **COMMUNICATE THE INFORMATION AS OUTPUT**

GENERATIONS OF COMPUTERS

FIRST GENERATION - 1940-1956: Vacuum Tubes

The first-generation computers used vacuum tubes and magnetic drums for memory. They were large, generated a lot of heat, and were expensive to operate. They understood only machine language, had limited problem-solving ability, and used punched cards for input and printouts for output. The Harvard Mark-I and ENIAC machine by John W Mauchly and J Presper Eckert were important early American developments in computing.

ENIAC(Electrical Numerical Integrator and Computer) was a pioneering computer using 10-digit decimal words and over 2,000 vacuum tubes with extensive wiring, taking up 167 square meters. Despite this, it featured punched-card input and output, and its arithmetic components included a multiplier, divider-square rooter, and 20 adders using decimal "ring counters" for quick-access memory.

EDVAC (Electronic Discrete Variable Automatic Computer) aimed to improve on ENIAC by storing its program internally using more memory. It utilized mercury delay lines for memory, allowing electronic pulses to store binary data. This design was facilitated by using binary numbers, simplifying the construction of its arithmetic units. UNIVAC(universal Automatic Computer) , the first US commercial computer, was also significant in computing history.

During the second generation of computers, transistors replaced vacuum tubes, leading to smaller, faster, energy-efficient, and more reliable machines. Although transistors generated heat, they were a significant improvement. Punched cards were used for input, and printouts for output. Assembly languages replaced machine language, allowing instructions in words, and high-level programming languages like COBOL and FORTRAN emerged. Memory transitioned from magnetic drums to magnetic core technology.

Third Generation - 1964-1971: Integrated Circuits

The third computer generation saw the advent of integrated circuits (ICs). Transistors became smaller and were placed on silicon chips, greatly enhancing speed and efficiency. Keyboards and monitors replaced punched cards and printouts. Operating systems allowed multitasking. Some LSIcs and VLSICs were utilized.

Fourth Generation - 1971-Present: Microprocessors

The microprocessor brought forth the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. As these small computers became more powerful, they could be linked together to form networks, which eventually led to the development of the Internet.

Fifth Generation - Present and Beyond: Artificial Intelligence (ROBOTICS)

Fifth generation computing devices, based on artificial intelligence, are still in their developmental stage. Fifth generation computers will come close to bridge the gap between computing and thinking.

CLASSIFICATIONS OF COMPUTERS

Construction & Working	Usage	Number of Micro-Processors	Number of users	Area of Application	Word Length	Size & Capability
-Analog -Digital -Hybrid	-Special Purpose -General Purpose	-Single -Multi -Sequential -Parallel	-Single -multiple network	-Business Scientific	-8 bit -16 bit	-Micro -Mini -Mainframe -Super

CLASSIFICATION BASED ON PRINCIPLES OF OPERATION

Computers are classified as analog, digital, or hybrid based on data handling principles.

Analog Computers work with a continuous range of values, offering approximations due to continuous variation. They require two quantities to represent an analog graph.

Digital Computers process information in digital form, using 0s and 1s. They deliver accurate results quickly.

Hybrid Computers combine analog measurement with digital counting. They use analog components for computation and digital memories for storage.

ANALOG COMPUTERS

Analog computers measure and translate physical magnitudes into data. Calculations happen simultaneously, making them faster. They use electrical parameters to represent quantities, not dealing directly with numbers. Common variables include voltage, pressure, temperature, and speed.

DIGITAL COMPUTERS

Digital computers operate with data represented in a digital form, processing it into 0s and 1s. They offer accurate and fast results. These computers handle digital data like numbers, using the binary system with 0 and 1. Each unit is a bit, and data is in sequences of 0s and 1s. They are not time-dependent. Digital computers serve both general and special purposes. General-purpose ones can run various programs, while special-purpose computers are tailored for specific tasks. Most computers today are digital.

HYBRID COMPUTER (ANALOG + DIGITAL)

Hybrid computers accept both digital and analog signals. They're cost-effective for complex simulations. Combining analog and digital features, they automate intricate physical processes. Modern converters transform data for both types of computation. In a hospital's ICU, analog readings like temperature and blood pressure are converted into digital data for monitoring. Hybrid computers excel in specialized tasks.

CLASSIFICATION OF COMPUTERS BASED ON CONFIGURATION

Based on performance, size, cost and capacity, the digital computers are classified into four different types: Microprocessor, Minicomputer, Mainframe computer and Super computers

MICRO COMPUTERS

A microcomputer, also known as a personal computer, emerged in 1970. It typically holds one or two processors along with input, output, storage, memory, and a processor. Designed for one user, examples include PC and Apple Macintosh. Main types are desktop and portable computers.

DESKTOP COMPUTERS

Desktop computers, named for their fit on a table, come in two models. In the Desktop model, the system unit sits on the table, with the monitor atop it. In the Tower model, both monitor and system unit rest on the table.

PORTABLE COMPUTERS

Portables are easily carried PCs. Examples are notebooks and handhelds (smartphones). Notebooks, or laptops, are compact and can rest on laps.

HAND HELD COMPUTER

Handheld Computers (like smart phone) are also portable. Handheld computer is also known as palmtop computer. It easily fits in the hand of the user.

USES OF MICRO COMPUTER

The PC is the most common type of computer used in the office. It is now widely used in many homes. These are also used for business and engineering application

MINI COMPUTERS

Introduced in the 1960s, minicomputers are larger and more powerful than personal computers. They can execute five million instructions per second and often have multiple processors. They can accommodate up to 4000 connected users, usually accessed via personal computers or terminals. Terminals lack processing power and depend on the minicomputer. Examples include VAX-8800 and AS 400.

USES OF MINI COMPUTER

Mini computers are often used by small and medium-sized companies to provide centralized store of information.

MAINFRAME COMPUTERS

Introduced in 1975, mainframe computers are huge and more powerful than minicomputers. With multiple processors, they handle many tasks and users simultaneously—up to 50,000. Accessible via terminals or personal computers, a mainframe can execute 16 million instructions per second. Examples include NEC610 and DEC 10.

USES OF MAINFRAME COMPUTERS

Mainframe computers, crucial in large organizations like airlines, aid ticket systems. IBM's z-series mainframe serves this purpose. Despite server dominance leading to challenges in cost and security, mainframes are sought for dynamic environments. In India, RBI, HDFC, TCS, HCL, Wipro, and NSDL utilize mainframes. Rising energy, cooling costs, space constraints, and manpower issues are faced by clients. NADRA in Pakistan employs mainframes for population information management.

SUPER COMPUTERS

Introduced in the 1980s, supercomputers are the fastest and largest machines, exceeding others in cost. Tata's Eka in Pune's Computational Research Laboratories is India's fastest, hitting 132.8 teraflops, though its rank slipped from 18 to 26 due to evolving high-performance computing. The government's Param Yuva, based in Pune's Centre for Development of Advanced Computing, rates at 137 with 38.1 teraflops. Supercomputers are advanced, complex, with vast storage and processing capabilities, used for intense calculations in specialized applications. Created by Seymour Cray at Control Data Corporation, they're costly and designed for immense mathematical tasks.

Uses of Super Computers include:

1. Weather forecasting
2. Animated graphics like in Hollywood movies
3. Fluid dynamic calculations
4. Nuclear energy research
5. Space science
6. Weapon and missile design
7. Petroleum exploration etc.

Today, supercomputers are made by companies like Cray, IBM, and Hewlett-Packard, often gaining expertise from 1980s acquisitions. China's Tianhe-1A has held the fastest title since October 2010. Supercomputers focus on running one program quickly, unlike mainframes that multitask. They include thousands of microprocessors and use high-speed tools like satellites. Examples include CRAY-XP, ETA-10, Deep Blue, and China's Tianhe-1A. Aircraft companies simulate and test performance with supercomputers. Computers differ in processing abilities and are classified by purpose, data handling, and functionality.

APPLICATIONS OF COMPUTERS

The uses of computers can be classified into the area of usage.

SCHOOLS AND COLLEGES: Computers facilitate tasks like creating student IDs, marks cards, attendance, and interactive learning with audio and video. They handle fees collection and administrative work.

BANKS: Computers manage account creation, transactions, fund transfers, alerts, and ATM banking. Online banking and global access via ATM cards are common.

OFFICES: Computers handle documentation, financial transactions, payroll, and other daily events. Both letters and specific software manage tasks like employee payroll and auditing.

BUSINESS STOCK CONTROL: Computers track stock movements, transactions, shipping, pricing, and quality of items in shops and businesses. They ensure efficient inventory management.

STOCK EXCHANGE: Computers enable global stock market monitoring and facilitate buying and selling transactions. Online trading is widespread and allows transactions from anywhere.

RESEARCH & DEVELOPMENT: Computers aid in designing and implementing new inventions. They simulate models with mathematical equations, saving time and resources for real-world implementation.

ENTERTAINMENT & NEWS: Computers play a significant role in entertainment and media. They edit audio and video content, and computers are central to live news broadcasting.

GOVERNMENT OFFICES: Computers handle government transactions, law, and information dissemination through government websites.

In each sector, computers enhance efficiency and effectiveness by automating and streamlining tasks.

SATELLITE COMMUNICATIONS: Satellite technology has enabled global communication, fostering information and technological growth. It's standardized across countries, enhancing ease of communication. Activities like browsing, chatting, emailing, messaging, and online gaming benefit from satellite communications.

PUBLISHING: Publishing involves sharing books, magazines, music, and more. Software aids graphic design, music composition, film editing, and video modification. Many publishers offer content online, allowing users to copy works to devices like computers, smartphones, and tablets.

TRAVEL: Modern travel involves interaction with technology. Onboard navigation systems in vehicles and mobile devices help navigate. Web services allow reservations for cars, hotels, and flights, and online maps provide directions.

COMPUTER-AIDED MANUFACTURING (CAM): CAM utilizes computers in manufacturing processes like fabrication and assembly. It reduces costs, speeds up product development, and utilizes robots. Industries like oil, power, food, and automobiles use CAM for efficient production. Robots in car manufacturing assemble vehicles, and computers track labor, material, and machine data for inventory and accounting updates.

HOSPITALS: Hospitals employ computers for various tasks, including maintaining patient ID cards, details, diagnoses (using technologies like MICR, CEG, Scanning), medication, and medical history. Computers play a vital role in gathering and organizing data, contributing to improved healthcare services.

AREA OF USAGE AND SPECIFICATIONS OF HARDWARE AND SOFTWARE

AREA OF USAGE	HARDWARE	SOFTWARE
HOME	Desktop or notebook computer Smart phone or other mobile device Game consoles	Business (e.g., word processing) Personal information manager Personal finance, online banking, tax preparation Web browser E-mail, blogging, instant messaging, chat rooms, and online social networking Internet telephone calls Photo and video editing Reference (e.g., encyclopedias, medical dictionaries, road atlas) Entertainment (e.g., games, music composition, greeting cards) Education (e.g., tutorials, children's math and reading software)
Small Office/ Home Office	Desktop or notebook computer Smart phone or other mobile device Shared network printer	Business (e.g., word processing, spreadsheet, database) Personal information manager Company specific (e.g., accounting, legal reference) Network management Web browser E-mail Internet telephone calls
Enterprise	Server or mainframe Desktop or notebook computer Industry specific handheld computer Smart phone or other mobile device	Business (e.g., word processing, spreadsheet, database) Personal information manager Accounting Network management, Web browser E-mail, Blogging, Specific database

AREA OF USAGE	HARDWARE	SOFTWARE
SCHOOLS & COLLEGES	Desktop or notebook computer Smart phone or other mobile device Shared network printer	Business (e.g., word processing, spreadsheet, database) Personal information manager Accounting Network management Web browser, E-mail, Blogging
Hospitals	Desktop or notebook computer Smart phone or other mobile device Shared network printer	Business (e.g., word processing, spreadsheet, database) Personal information manager Company specific (e.g., accounting, legal reference) Network management Web browser E-mail Internet telephone calls
Traffic Network	Desktop or notebook computer Smart phone or other mobile device Shared network printer	Business (e.g., word processing, spreadsheet, database) Personal information manager Accounting Network management Web browser E-mail Blogging Specific database - fine details

QUESTIONS



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