

Computer and its Languages

A computer has become an integral part of our everyday lives. A computer is a programmable electronic device that works according to the instructions given by us. It has the ability to accept data, process it and give useful output. Computers are designed and categorized with respect to their size, speed, storage, capacity and cost.



We will Learn

- Types of Computers
- Computer Languages
- Language Translators

Types of Computers

Let us discuss the different types of computers :

Microcomputers

Microcomputers are small computers that have a microprocessor as their CPU. These computers are also known as Personal Computers (PCs) as they are meant to be used by a single person at a time. These are inexpensive and have a lower storage capacity as compared to other computers.

Some of the microcomputers are :

1. **Desktop Computers** : These are personal computers sufficient to fit on a desk. These computers typically come with several units, such as monitor, CPU, keyboard and mouse, which are connected to each other and work like a single unit.



Desktop



Laptop

2. **Laptop Computers** : These are portable computers that consist of an integrated screen and keyboard. These are generally small in size and expensive than a desktop computer.

3. Palmtop Computers : These are handheld computers with a small screen and compressed keyboard. The device has similar features as that of a computer.

Minicomputers



Minicomputer

Minicomputers are multi-user computer systems and are capable of supporting hundreds of users simultaneously.

Minicomputers have faster operating speed and larger storage capacity than microcomputers. They can support a large number of high-speed input/output devices. These are used widely as data processing machines and in industrial applications.

Examples : PDP-8, HP 2100, MicroVAX 3100.

Mainframe Computers

Mainframe computers are very powerful. They are big in size with a large memory and high speed. They are designed to tackle huge amount of data. More than hundred users can use a mainframe computer simultaneously. These computers are used in networked environment.

Mainframe computers are very expensive and are mainly used for bulk data processing in large business organisations, universities, banks, scientific laboratories, airline and railway ticket reservations, stock exchange markets, etc.

Examples : IBM 2 series, PDP-10 and System 210.

Supercomputers

Supercomputers, as the name suggests, are the most powerful type of computers. A supercomputer uses multiple CPUs to work on a problem using the concept of parallel processing. Parallel processing is the simultaneous use of multiple CPUs to execute a program.

Supercomputers are used in highly calculation intensive tasks such as weather forecasting, climate research and petroleum exploration.

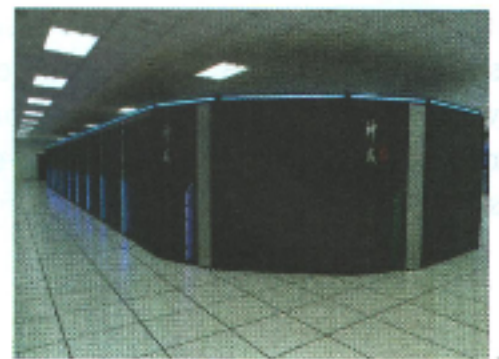
Examples : CRAY-1, PARAM, Tianhe-2.



Palmtop



Mainframe computer



Supercomputer





Sunway TaihuLight is the world's fastest supercomputer. It is developed by China's National Research Center of Parallel Computer Engineering and Technology (NRCPC).

Computer Languages

Language is a medium, through which we interact with each other. For example, if we need to interact with our friend, we need to have a medium, through which we will interact i.e. a language which must be understood by both of us. Similarly, to interact with the computer we need a language. A **computer language** is used to write a set of instructions for the computer, to perform a particular task. Such a set of instructions is called a **program**.

Thousands of programming languages have been created in last 100 years. All these languages can be put into the following categories :

First Generation Languages (Machine Languages)

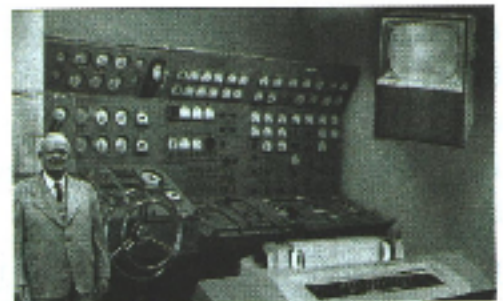
The machine language is the elementary language of a computer that consists of binary digits (0 and 1) only. Computer cannot understand any language other than the machine language. This language has the advantage of very high speed and very low memory utilisation.

However, machine language is hardware dependent, difficult to learn and even more difficult to write programs. Because of this, very few people opt for specialisation in machine language. That is why Machine Language is also regarded as **Low Level Language (LLL)**.

So, with a view to ease the burden on programmers, efforts were made to design languages that were relatively simpler to write programs in. The efforts culminated in the development of the assembly language.

Second Generation Languages (Assembly Language)

Assembly language was developed, where instructions were given in the form of mnemonics (codes). *For example*, to add two numbers, the mnemonic ADD was used and to subtract SUB is used. However, since a computer understands only the machine

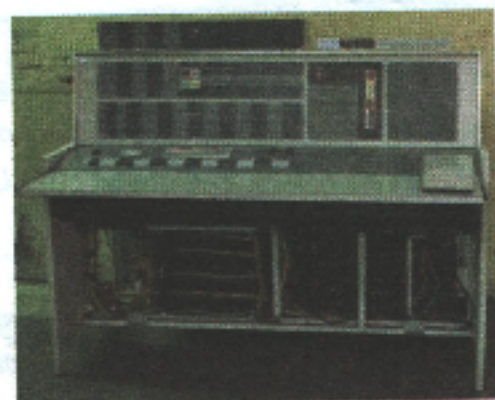


First Generation Computer



Lady Ada Lovelace, a mathematician, is regarded as the first computer programmer.

language, programs written using the assembly language, need to be translated into the machine language using the special software called the **assembler**. The original program written using the assembly language is known as the **source code** or **source program** and the translated machine language equivalent to that is called the **object code** or **object program**.



Second Generation Computer

Like Machine language, Assembly language is also machine dependent and programming in this language is quite time consuming. Thus, it is also regarded as a **Low Level Language (LLL)**.

Because of the aforementioned difficulties, efforts were made to design programmer-friendly languages, that could work on computers with varying architectures. And the result was the development of high level languages.

Third Generation Languages (High Level Languages)

As the speed, power and capacity of the computer increased, a need was felt to develop programs that could make use of computers in diverse fields and which could be developed by people who were not experts in computer architecture and hardware. So, High Level Languages came into existence. These high level languages are much closer to the human language.



Third Generation Computer

High Level Languages (HLLs) are programming languages designed for users to write instructions in English-like statements (like $c = a + b$) rather than in the machine language or using Mnemonics.

Fortran, C++ and Java are a few examples of high level languages. We need language translators – Compilers and Interpreters to change the HLL code into the machine code so that it can be understood and executed by the computer.

Fourth Generation Languages (4GLs)

Fourth Generation Languages (4GLs) are also high level languages. But they differ from third generation languages as they do not attach much importance to the procedure used to accomplish a task. Instead, they concern themselves only with the end result and output. Oracle, SQL, Server, Sybase, etc are examples of 4GLs.




Fourth Generation Computer



Characteristics of 4GLS

- 4GLs are more user-friendly than earlier generation of languages. Since they use words and phrases very similar to English, they are easier to use and code.
- They allow efficient use of databases and data processing.
- They allow a user to add specific system logic to existing code.

More To Know

FORTRAN was one of the earliest languages designed for scientists and engineers. COBOL was designed for business users.

Language Translators

To follow and execute any program, a computer has to convert the program into a code that it can follow. A program written in a high-level language cannot be executed directly. It needs to be translated first, and then executed.

There are three kinds of language translators :

Assembler : An assembler converts the assembly language program into machine language.

Compiler : A compiler is used to convert a high level language into machine language. It translates the whole program at once. The execution is very fast.

Interpreter : An interpreter is also used to convert a high level language into machine language. But it translates one line at a time and executes it before moving to the next line and is, therefore, slower than a compiler.



Looking Back

- A computer is a programmable electronic device that works according to the instructions given by us.
- There are four main types of computers – Microcomputers, Minicomputers, Mainframe computers and Supercomputers.
- A computer language is used to write a set of instructions for the computer, to perform a particular task.
- Programming languages are of four main types — Machine languages, Assembly languages, High Level languages and 4GLs.
- Machine language programs are directly understood by the computer. Programs written in the Assembly and High Level languages need to be first converted into the Machine language.
- There are three kinds of language translators — Assembler, Compiler and Interpreter.



EVALUATE

A. Multiple Choice Questions.

- Which is the fastest and most powerful computer?
(a) Minicomputer (b) Supercomputer (c) Microcomputer
- _____ are handheld computers.
(a) Desktops (b) Laptops (c) Palmtops
- A program written in the assembly language is called :
(a) source code (b) object code (c) assembler
- Which of these converts an assembly language program into the machine language?
(a) Compiler (b) Assembler (c) Interpreter
- Which of these is not a high level language?
(a) COBOL (b) FORTRAN (c) ASSEMBLY

B. Fill in the blanks.

- Micro Computer are small computers that have a microprocessor as their CPU.
- More than Hundreds users can use a mainframe computer simultaneously.
- Language is a medium, through which we interact with each other.
- machine language uses mnemonic codes.
- Interpreter converts a High Level language into Machine language line by line.

C. State True or False.

- Mainframe computers are more powerful than minicomputers. True
- A set of instructions to perform a particular task is called a program. True
- A computer understands only machine language. True
- Fortran language was designed for business users. false
- Assembly language is regarded as the first generation language. false

D. Write one word for the following.

- A set of instructions given to a computer. Program
- A language which a computer understands. machine
- A language which uses mnemonics. machine
- A translator used to convert Assembly language into Machine language. Assembler

ANSWER THE FOLLOWING QUESTIONS.

(a) what are microcomputers? Name the types of microcomputers.

Microcomputers are small computers that have a microprocessor as their CPU. It is also known as PC (Personal Computer) that means to be used by a single person at a time.

Some of microcomputers are :-

(a) Desktop Computers.

It normally fit on a desk. It comes with different component such as monitor, CPU keyboard, mouse that are connected to each other.

(b) Laptop Computers.

It is a portable computer that have integrated keyboard and mouse. These are generally small in size and carry anywhere easily.

(c) Palmtop computers.

It is a handheld computers with a small screen and compressed keyboard.

example - Smartphone, Tablet etc.

(2) what do you mean by machine language?

machine language consist only two digit 0 and 1. It is the only language that is understand by computer system.

Advantages of machine language is very high speed and low memory capacity.

(3) How is assembly language different from machine language?

machine language is directly understood by the computer. Programs written in the assembly language need to be first converted into the machine language.

(4) Explain the characteristic feature of the 4th generation language?

characteristic of 4th Generation language :-

- (i) user friendly language.
- (ii) easier to use and code.
- (iii) allow to use database and data processing.
- (iv) allow user to add logic to existing code.

(5) How is an interpreter different from a compiler?

Interpreter is used to convert high level language into machine language. It translate one line at a time.

Compiler is used to convert high level language into machine language. It translate whole program at a time.