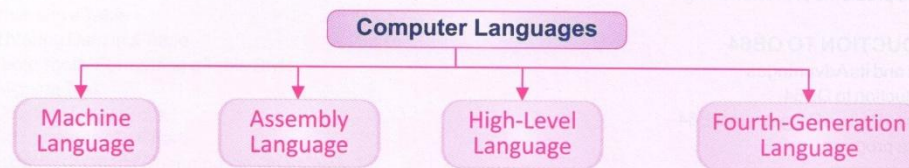


LEARNING IN THIS CHAPTER

- Program and Programming Concepts
- Machine Language
- Assembly Language
- High-Level Language
- Concept of Interpreter and Compiler
- Fourth Generation Language

Language is a medium to express our views and feelings. To communicate with a computer, we need a language that a computer understands. For every action, a computer has to be given instructions accordingly.

- ◆ A **Program** is a set of instructions that tells the computer what to do.
- ◆ The process of writing specific instructions in a computer language is called **Programming**. Each programming language has its own specific rules. The development of programming languages has improved considerably with the ease and ability of programmers to write powerful application programs.
- ◆ The development of computer languages has been classified into the following categories:

**➔ MACHINE LANGUAGE (FIRST GENERATION)**

It is the only language that a computer understands. It is expressed in binary form, i.e., '0' and '1' where 0 means 'Off' state and 1 means 'On' state.

Machine Language has the advantage of very high speed and very low memory utilisation.

But understanding and learning machine language is a tough and time consuming process. It is very difficult to write and debug programs written in machine language. It is extremely machine-dependent. A machine language program written on one computer may or may not run on another computer. 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)**.



Figure 1.1: First Generation Computer

➔ ASSEMBLY LANGUAGE (SECOND GENERATION)

This language uses Mnemonic codes or Symbols in place of 0 and 1. For example, if the operation code for add is 0010 in binary language, it can be directly written as "ADD" in assembly language, because Assembly language uses symbolic codes. Hence, it is easy to work with Assembly language than in binary language.

Since a computer can understand only machine language, so assembly language programs have to be converted

into machine language. **Translator programs** known as **Assemblers** were developed to convert the assembly language program into machine language.

A program written in assembly language is called the **Source program**. Whereas, the program converted into machine language by the assembler is called **Object program** or **Object code**.

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)**.



Figure 1.2: Second Generation Computer

➔ HIGH LEVEL LANGUAGE (THIRD GENERATION)

The restrictions in the usage of Machine and Assembly languages prompted people to develop a language with the following features:

- ◆ Simple and user friendly language
- ◆ Language that is machine-independent

Owing to the above mentioned features, it became easy to learn and use the computer languages. A large number of people started writing computer programs using these languages. That is why it is known as **High Level Language (HLL)**. High level language is quite similar to the English language. Basic C, C++, Java, etc., are some of the very popular examples of high level languages.

High level language programs need to be translated into machine language by using the **Translator programs**. There are two types of translator programs that are as follows:

INTERPRETER

This translator program is used to convert a high level language program into machine language. An Interpreter translates line by line, executes the instruction, and then repeats the procedure for the remaining instructions. If any errors are found, they are to be immediately removed. The converted form is not stored anywhere, therefore it has to be generated at the time of execution of a program. Interpreter programs are preferred for beginners, and are slow in execution speed.



Example

Suppose the French President is visiting India on an official tour. In order to understand each other, both the French President and the Indian Prime Minister would require an interpreter to translate the French language into the English language and vice versa.



Figure 1.3: Third Generation Computer



Fact File



Lady Ada Lovelace, a mathematician, is regarded as the first computer programmer. She was the daughter of famous English poet, Lord Byron.



Let's Know More

Syntax are the rules governing the formation of statements in a Programming language.



Fact File



Locator Identifier Separation Protocol (LISP) was the first computer language for writing artificial intelligence programs. It was created by **John McCarthy**.



Fact File



The term **Software** was first used by **John W. Tukey** in 1957.

COMPILER

Compiler is a translator program used to convert a high level language program into machine language. A Compiler translates the whole program at once, i.e., it generates the object code for the program along with the list of errors. The execution is very fast.

FOURTH GENERATION LANGUAGE (4GL)

Fourth generation languages are closer to human language than any other high level languages.

Fourth generation languages are combination of languages with the following features:

- ◆ Highly user-friendly and independent of any operating system.
- ◆ Very high speed of execution. Designed to reduce level of programming efforts.
- ◆ Minimum efforts from the user to obtain any information.
- ◆ Designed to reduce the overall time it takes to develop software and the cost of software development. In 4GL, the user has to specify only the required output, and the format of the output without bothering about the steps required to obtain that.



Figure 1.4:
Fourth Generation Computer

Know the Fact
The first interactive computer game was **Spacewar**.

Let's Know More
FORTRAN was one of the earliest languages and was designed for scientists and engineers.
COBOL was designed for business users.

Let's Know More
In software development, **beta release** refers to a product or a technology, which is still in development, but is released only for testing and evaluation purpose.

| LANGUAGE | FEATURES |
|-------------------|--|
| MACHINE | <ul style="list-style-type: none"> ◆ Uses binary codes to depict operators and data. ◆ Machine-dependent. ◆ The only language directly understood by a computer. |
| ASSEMBLY | <ul style="list-style-type: none"> ◆ Uses Mnemonic Codes or Symbols instead of binary numbers. ◆ Machine-dependent. ◆ Has to be converted into Machine language by Translator programs (Assemblers). |
| HIGH LEVEL | <ul style="list-style-type: none"> ◆ Uses English words and mathematical operators. ◆ Machine-independent. ◆ Has to be converted into Machine language by Translator programs (Interpreters and Compilers). |
| 4GL | <ul style="list-style-type: none"> ◆ Machine-Independent. Minimal user skills required to obtain results. ◆ Application development tool. |

Recap of the Chapter

- ◆ Programming is the process of writing specific instructions in a computer language.
- ◆ Machine language is the only language that a computer understands.
- ◆ Syntax are the rules governing the formation of statements in a programming language.
- ◆ An Interpreter translates line by line, whereas a Compiler translates the whole program at once.
- ◆ The term software was first used by John W. Tukey in 1957.

Brain DEVELOPER

A. Fill in the blanks:

1. A is a set of instructions, which tells the computer what to do.
2. The development of computer languages can be classified into categories.
3. language consists of binary numbers, i.e., 0 and 1.
4. was the first interactive computer game.
5. language uses simple English words and mathematical operators.
6. language uses mnemonic codes or symbols.
7. was the first computer language for writing artificial intelligence programs.
8. In binary language, 0 means and 1 means state.

HINTS

- Machine
- LISP
- Assembly
- Spacewar
- Four
- Program
- High Level
- On
- Off

B. State True or False:

1. Machine language is the only language, which a computer understands.
2. Assembly language is regarded as the first generation language.
3. Each programming language has its own specific rules.
4. Compiler converts a high level language program into machine language, line by line.
5. High level language program has to be converted into machine language by translator programs.
6. Fortran language was designed for business users.
7. Programming is the process of writing specific instructions in a computer language.
8. Machine language uses mnemonic codes.

C. Application Based Questions:

1. Kapil's aunt was a computer programmer during the third generation of computer language. Which kind of language did she use then?
.....
2. Sumit is trying his hand in Java programming, but he does not know which type of language it is. Help him to solve his query.
.....

D. Multiple Choice Questions:

1. A program written in the assembly language is called
a. Assembler b. Source Program c. Object Program
2. An converts a high level language program into machine language, line by line.
a. Assembler b. Compiler c. Interpreter
3. The program converted into machine language by the translator is called
a. Source Program b. Object Program c. Assembler
4. The term software was first used by
a. John McCarthy b. John W. Tukey c. John von Neumann

E. Answer the following:

1. What do you mean by Machine language?

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.....
.....

2. How is Assembly language different from Machine language?

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.....
.....

3. What are the features of a high level language?

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4. Differentiate between an interpreter and a compiler.

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5. List any three characteristics of the Fourth generation language.

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