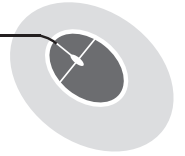# 1 Computer Languages

LEARNING OUTCOMES

After this lesson, students will be able to:

- » Define computer languages.
- » Describe the need for computer languages.
- » List the types of computer languages.
- » Define low level languages.
- » List the advantages and disadvantages of low level languages (LLLs).
- » Define middle level languages.
- » List the advantages and disadvantages of middle level languages.
- » Define high level languages (HLLs).
- » List the advantages and disadvantages of high level languages.
- » Differentiate between LLL and HLL.
- » List the types of HLL.
- » Define assembler, interpreter and compiler.
- » Differentiate between interpreter and compiler.

WARM UP

Recall the answers to the following questions:

1. Define software.

Ans. Software can be defined as a computer program which is a set of instructions that tells a computer what to do.

2. Which language does a computer understand?

Ans. Binary language.

3. What is a program?

Ans. A program is a collection of instructions that can be executed by a computer to perform a specific task.

CHAPTER NOTES

» In order to communicate with computers, a language is required which, when used in a defined way, is able to give instructions to the computer.

» Computer languages allow computers to quickly and efficiently process complex and large amounts of complex information.

» Different kinds of languages have been developed to perform different types of tasks on the computer.

» Languages can be divided into four categories according to how the computer understands them.

» Low-Level Language (Machine Language) consists of strings of 0's and 1's. It is directly understood by the machine (computer) and needs no translation at all.

» Advantages of Low Level Language: Since no translation is required, it executes much faster. There is no need of compilers or interpreters to translate the source code to machine code, so compilation and interpretation time is reduced. It can directly communicate with hardware devices.

» Disadvantages of Low Level Language: It is a machine-dependent language and is different for different CPUs. Programs made on one CPU can't be executed on another. It is difficult to develop, debug and maintain. Low level programs are more error prone. The programmer must have additional knowledge of the computer architecture of that particular machine, for programming in a low level language.

» Assembly languages or middle level languages use a combination of English letters (mnemonics) as a substitute to machine code. A special program called Assembler is required to translate assembly language into machine language.

» Advantages of Middle Level Language: Programs written in machine

language are replaceable by mnemonics, which are easier to remember. Faster execution and efficient programming. Programming is relatively easier due to use of mnemonics and saves lot of time and effort. Debugging is also easier than machine language.

» Disadvantages of Middle Level Language: Long programs written in such languages cannot be executed on small computers. It takes lot of time to code or write the program, as it is more complex in nature. It is difficult to remember the syntax.

» Like machine language, assembly language is also machine dependent. A program written for one computer might not run in other computers with different hardware configurations.

» High level computer languages use formats that are similar to English and are machine independent. The purpose of developing high level languages was to enable people to write programs easily, in their own native language environment (English).

» Advantages of High Level Language: It is user-friendly. Similar to English and uses English vocabulary and well-known symbols. Easy to learn, understand and debug. Problem-oriented rather than 'machine' based.

» Disadvantages of High Level Language: A high level language has to be translated into machine language by a translator, which takes time. The object code generated by a translator might be inefficient compared to an equivalent assembly language program.

» High level programming languages can be categorised into the following types: (a) Procedure-oriented languages (b) Logic-oriented languages and (c) Object-oriented languages.

» Fourth Generation Languages or 4GLs are mainly non-procedural languages which use English-like syntax to design the instructions. Their main use is in the areas of Artificial Intelligence (AI) and databases. Some examples of fourth generation languages are SQL, LISP, etc.

» Advantages of 4GLs: They are much easier to use than other high level languages. Programming effort is greatly reduced as 4GLs are very close to the English language. Even non-programmers can use them easily.
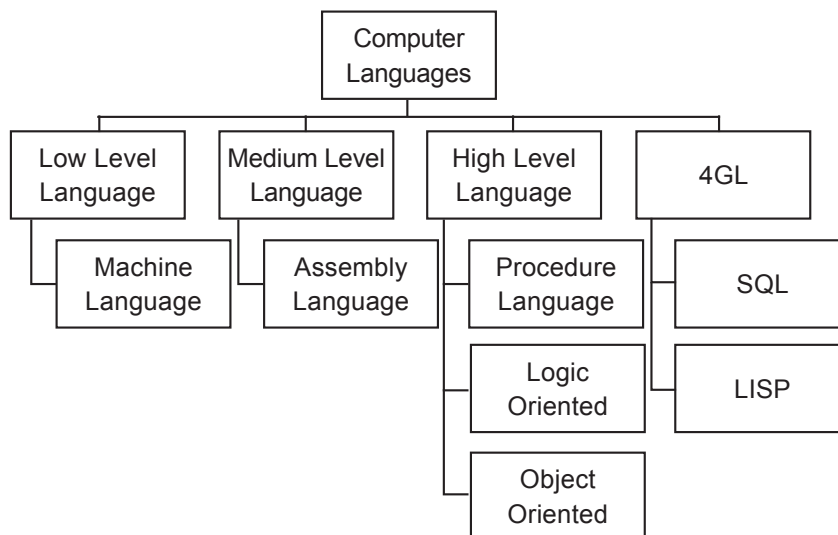
- » Disadvantages of 4GLs: The programs developed in 4GLs are executed at a slower speed by the CPU. Programs developed in these programming languages need more space in the memory of the computer system.
- » A translator is system software that is used to translate a program written in a high level language to machine code. It is called a language processor.
- » In a compiler-based language, the whole source code or program is converted into object code in one go and errors are listed out together. This leads to faster execution as the stored object code is used whenever execution is required for the program.
- » Interpreters convert programs into machine language line by line. Interpreted third generation languages are relatively slow because they are translated whenever there is a need of execution.

DEMONSTRATION

- » Use of compiler- and interpreter-based programs. Python script and interactive modes can be demonstrated.

LAB ACTIVITIES

- » Using Word 2013, create a SmartArt to depict types of computer languages as shown below.

```
                     Computer
                     Languages
        ┌───────────┬──────────┬───────────┐
   Low Level    Medium Level  High Level      4GL
   Language     Language      Language
   └─ Machine   └─ Assembly   └─ Procedure   ├─ SQL
      Language     Language      Language
                                └─ Logic     └─ LISP
                                   Oriented
                                └─ Object
                                   Oriented
```

ASSESSMENT

Teacher can assess the students by taking an oral quiz on the different categories of computer languages and the advantages and disadvantages of each.

SUGGESTED CLASS ACTIVITIES

Answer the following questions.

1. What are low level languages? Explain.
2. What are high level languages? Give two examples.
3. Write a short note on fourth generation languages.
4. Differentiate between a compiler and an interpreter.