Understanding Programming Languages

What is a Programming Language?

Programming languages are used by programmers to communicate with computers. They consist of instructions that tell the computer what tasks to perform.

Main Types of Programming Languages

1. Machine Language

- Made up of 0s and 1s
- Directly understood by the computer
- No translation needed

2. Assembly Language

- Uses short codes (e.g., MOV, ADD)
- Needs an assembler
- Hardware-specific

3. High-Level Language

- Easy to read and write
- Needs a compiler or interpreter
- Examples: Python, Java, C++

Other Classifications of Programming Languages

A. Procedural Language

- Solves problems step-by-step
- Uses functions or procedures
- Examples: C, FORTRAN

B. Functional Language

Understanding Programming Languages

- Uses pure functions
- Avoids changing data
- Examples: Haskell, Python

C. Object-Oriented Language

- Based on objects
- Promotes reuse and modularity
- Example: Java

D. Scripting Language

- Executes one line at a time
- Easy and quick to write
- Examples: Python, JavaScript

E. Statically Typed Language

- Type checking during compilation
- Must declare data types
- Examples: Java, C

F. Dynamically Typed Language

- Type checking at runtime
- No need to declare data types
- Examples: Python, JavaScript

Memory Management in Java

Java automatically manages memory using a system called the Garbage Collector.

Stack vs Heap Memory

- Stack: Stores variables and function calls; fast and small
- Heap: Stores objects and large data; shared across the program