**JAVA PROGRAMMING**

**CHAPTER 1: INTRODUCTON TO COMPUTERS, PROGRAMS, AND JAVA**

* 1. **INTRODUCTION**

What is programming?

The term programming means to create (or develop) software, which is also called a program. In basic terms, software contains instructions that tell a computer or a computerized device what to do.

There are many programming languages, some of which are decades old. Each language was invented for a specific purpose to build on the strengths of a previous language or to give the programmer a new and unique set of tools.

* 1. **WHAT IS COMPUTER?**

A computer is an electronic device that stores and processes data.

A computer includes both hardware and software;

Hardware comprises the visible, physical elements of the computer,

and software provides the invisible instructions that control the hardware and make it perform specific tasks.

A computer consists of the following major hardware components:

1. A central processing unit (CPU)
2. Memory (main memory)
3. Storage devices (such as disks and CDs)
4. Input devices (such as the mouse and the keyboard)
5. Output devices (such as monitors and printers)
6. Communication devices (such as modems and network interface cards (NIC)).

**Bits and Bytes**

These 0s and 1s are interpreted as digits in the binary number system and are called bits (binary digits). The minimum storage unit in a computer is a byte. A byte is composed of eight bits.

A computer’s storage capacity is measured in bytes and multiples of the byte, as follows:

* A kilobyte (KB) is about 1,000 bytes.
* A megabyte (MB) is about 1 million bytes.
* A gigabyte (GB) is about 1 billion bytes.
* A terabyte (TB) is about 1 trillion bytes.
  1. **PROGRAMMING LANGUAGES**

Computer programs, known as software, are instructions that tell a computer what to do.

Computers do not understand human languages, so programs must be written in a language a computer can use.

**MACHINE LANGUAGE**

A computer’s native language, which differs among different types of computers,

(a set of built-in primitive instructions).

**HIGH-LEVEL PROGRAMMING LANGUAGES:**

* Ada, BASIC, C, C++, C#, COBOL, FORTRAN, Java, JavaScript, Pascal, Python, Visual Basic

A program written in a high-level language is called a source code. Because a computer cannot execute a source code, a source code must be translated into machine code for execution. The translation can be done using another programming tool called an interpreter or a compiler.

An interpreter reads one statement from the source code, translates it to the machine code or virtual machine code then executes it right away.

**OPERATING SYSTEMS**

The operating system (OS) is the most important program that runs on a computer. The OS manages and controls a computer’s activities.

The popular operating systems for general purpose computers are Microsoft Windows, Mac OS, and Linux. Application programs, such as a web browser or a word processor, cannot run unless an operating system is installed and running on the computer.

The major tasks of an operating system are as follows:

* Controlling and monitoring system activities
* Allocating and assigning system resources
* Scheduling operations.
  1. **JAVA, THE WORLD WIDE WEB, AND BRYOND**

Java is a powerful and versatile programming language for developing software running on mobile devices, desktop computers, and servers.

* 1. **THE JAVA LANGUAGE SPECIFICATION, API, JDK, JRE, AND IDE**

Java syntax is defined in the Java language specification, and the Java library is defined in the Java application program interface (API).

The JDK is the software for compiling and running Java programs.

IDE is an integrated development environment for rapidly developing programs.

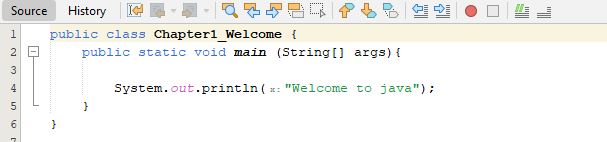
* 1. **A SIMPLE JAVA PROGRAM**

A Java program is executed from the main method in the **class**.

Let’s begin with a simple Java program that displays the message **Welcome to Java!**

1. public class Welcome {
2. public static void main(String[] args) {
3. // Display message Welcome to Java! on the console
4. System.out.println("Welcome to Java!");
5. }
6. }

**FIGURE 1.6. :** A SIMPLE JAVA PROGRAM THAT DISPLAYS THE MESSAGE Welcome to java!



**NOTE:** Java source programs are case sensitive. It would be wrong, for example, to replace **main** in the program with **Main.**

**SPECIAL CHARACTERS**

1. {} Opening and closing braces: Denote a block to enclose statements.
2. () Opening and closing parentheses : Used with methods.
3. [] Opening and closing brackets: Denote an array.
4. // Double slashes : Precede a comment line.
5. "" Opening and closing quotation marks: Enclose a string (i.e., sequence of characters).
6. ; Semicolon : Mark the end of a statement.
   1. **CREATING, COMPILING, AND EXECUTING A JAVA PROGRAM**

You save a Java program in a .java file and compile it into a .class file. The .class file is executed by the Java Virtual Machine (JVM).

You have to create your program and compile it before it can be executed.

* 1. **PROGRAMMING ERRORS**

Programming errors can be categorized into three types: syntax errors, runtime errors, and logic errors.

1. **SYNTAX ERRORS**

Errors that are detected by the compiler are called syntax errors or compile errors.

Syntax errors result from errors in code construction, such as mistyping a keyword or using an opening brace without a corresponding closing brace.

1. **RUNTIME ERRORS**

Runtime errors are errors that cause a program to terminate abnormally.

They occur while a program is running if the environment detects an operation that is impossible to carry out.

For example, if the program expects to read in a number, but instead the user enters a word, this causes runtime errors to occur in the program.

1. **LOGIC ERRORS**

Logic errors occur when a program does not perform the way it was intended to.

1. **COMMON ERRORS**

Missing a closing brace, missing a semicolon, missing quotation marks for strings, and misspelling names are common errors for new programmers.