Beginners Book: Java Basics

Lesson 1: Introduction to Java

Java Terminology

- **Java Virtual Machine (JVM):** Executes the bytecode produced by compiler.
    - **Phases of Java Program Execution:**
        - The program is written (Java Programmer)
        - The program is compiled (Javac Compiler)
        - The program is ran (JVM)

Bytecode:

The compiled format of Java programs

The javac compiler of JDK compiles the java source code into bytecode so that it can be executed by the JVM. The bytecode is saved in a .class file by the compiler.

Java Development Kit (JDK):

The complete java development kit that includes JRE (Java Runtime Environment), compilers and various tools like JavaDoc, Java debugger etc.

In order to create, compile and run Java program you would need JDK installed on your computer.

Java Runtime Environment(JRE):

JRE is a part of the JDK and includes JVM, browser plugins and applets support.

When you have JRE installed on your system, you can run a java program but you won't be able to compile it. When you only need to run a java program on your computer, you would only need JRE.

Main Features of Java

Java is Platform Independent

The javac compiler converts source code (.java file) to the byte code(.class file) and the JVM executes the bytecode produced by compiler. This byte code can run on any platform such as Windows, Linux, Mac OS etc. which means a program that is compiled on windows can run on Linux and vice-versa. Each operating system has different JVM, however the output they produce after execution of bytecode is same across all operating systems making java a platform independent language.

Java is an Object Oriented Programming (OOP) Language

Object oriented programming is a way of organizing programs as a collection of objects, each of which represents an instance of a class.

Main Concepts of OOP:

- **Abstraction:**
    - A process where you show only “relevant” data and “hide” unnecessary details of an object from the user.
- **Encapsulation:**
    - Hides the implementation details from users.
- **Inheritance:**
    - Inheritance is when a class extends or inherits another class in a Java program.
        - **Single Inheritance:** When a class extends only one other class.
        - **Multiple Inheritance:** When a class extends or inherits more than one base class.
- **Polymorphism:**
    - Allows programmers to perform a single action in different ways.

Java Is Simple

Java is considered as one of simple languages because it does not have complex features like Operator overloading, Multiple inheritance, pointers and Explicit memory allocation.

Java Is A Robust Language

Java programming language is developed in a way that puts a lot of emphasis on early checking for possible errors, that's why java compiler is able to detect errors that are not easy to detect in other programming languages. The main features of Java that makes it robust are garbage collection, Exception Handling and memory allocation.

Java Is Secure

We don't have pointers and we cannot access out of bound arrays (you get ArrayIndexOutOfBoundsException if you try to do so) in Java. This makes several security flaws like stack corruption or buffer overflow is impossible to exploit in Java.

Java is Distributed

Using Java programming language we can create distributed applications. RMI(Remote Method Invocation) and EJB(Enterprise Java Beans) are used for creating distributed applications in Java. In simple words: The java programs can be distributed on more than one systems that are connected to each other using internet connection. Objects on one JVM (Java Virtual Machine) can execute procedures on a remote JVM.

Java Supports Multithreading

Java supports multithreading which is a Java feature that allows concurrent execution of two or more parts of a program for maximum utilisation of CPU.

Java Is Portable

Java code that is written on one machine can run on another machine. The platform independent bytecode can be carried to any platform for execution that makes java code portable.