# Introduction to Java

Java is a high-level, object-oriented programming language developed by James Gosling at Sun Microsystems (now owned by Oracle) and released in 1995. It follows the Write Once, Run Anywhere (WORA) principle, meaning Java programs can run on any system that has a Java Virtual Machine (JVM).

**Features of Java**

* **Platform-Independent**: Java programs run on any OS with a compatible JVM.
* **Object-Oriented**: Supports principles like encapsulation, inheritance, and polymorphism.
* **Robust and Secure**: Includes strong memory management, exception handling, and security features.
* **Multithreading**: Supports concurrent execution of multiple threads.
* **High Performance**: Uses Just-In-Time (JIT) compilation to improve speed.

## JDK, JRE, and JVM

Java consists of three main components:

### 1. Java Virtual Machine (JVM)

JVM is an abstract machine that provides a runtime environment for Java applications. It converts **bytecode** into machine-specific code. The key tasks of JVM include:

* **Loading** the bytecode
* **Verifying** and **executing** the code
* **Memory management (Garbage Collection)**

### 2. Java Runtime Environment (JRE)

JRE is a part of the **JDK** and includes:

* **JVM**
* **Core libraries**
* **Other supporting files** to run Java applications.

JRE **does not** include development tools like the compiler.

### 3. Java Development Kit (JDK)

JDK is a complete software development package that includes:

* **JRE (JVM + Libraries)**
* **Java Compiler (javac)**
* **Debugger and other development tools**

**JDK = JRE + Development Tools**

### JDK Versions

Java has different versions, such as:

* **JDK SE (Standard Edition)** – For general-purpose programming.
* **JDK EE (Enterprise Edition)** – For large-scale enterprise applications.
* **JDK ME (Micro Edition)** – For mobile and embedded devices.

### Summary Table

| **Component** | **Purpose** |
| --- | --- |
| **JVM** | Converts bytecode to machine code and executes it. |
| **JRE** | Contains JVM and libraries required to run Java programs. |
| **JDK** | Includes JRE + development tools (compiler, debugger, etc.). |