

## Introduction to Java

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### • What is Java ?

Java is a high-level, object oriented programming language. Initially developed by Sun Microsystems. (Now owned by Oracle Corporation). It was designed to be platform-independent, means java programs can run on any device or operating system that has a Java Virtual Machine (JVM) installed. This platform independence is achieved through a "write once, run anywhere" approach, where code written in java can be compiled into bytecode, that is then executed on any system with a compatible JVM.

### • Features of Java :

#### FEATURES OF JAVA

- Simple
- Object-oriented
- Distributed
- Robust
- Secure
- System independence
- Portability
- Interpreted
- High Performance
- Multithreading
- Dynamic

- 1) Simple : Java is one of the simple languages as it does not have complex features like pointers, operator overloading, multiple inheritances, and Explicit memory allocation.
- 2) Object - Oriented : Java organizing the program in the terms of a collection of objects is a way of object-oriented programming, each of which represents an instance of the class.  
The four main concepts of Object - Oriented programming are :
  - i) Abstraction
  - ii) Encapsulation
  - iii) Inheritance
  - iv) Polymorphism
- 3) Distributed : Java is designed for the distributed environment of the internet, means java has libraries for creating distributed application allowing components to communicate over a network.
- 4) Robust : Robust means strong. Java uses strong memory management. There are lack of pointers. That avoid security problems, there are automatic garbage collection in java. There are exception handling and type checking mechanism in Java. All these points make java robust.
- 5) Secure : Java is best known for its security. With java, we can develop virus-free Systems. Java is secured because :

- No explicit pointer.
- Java programs run inside a virtual machine sandbox.

6) System Independence / Platform Independent :

A platform is the hardware or software environment in which a program runs. Java is platform independent because it uses a virtual machine and it can run on any platform like windows, mac, etc.

7) Portability : Java is portable because it carry the java bytecode to any platform. It doesn't require any implementation.

8) Interpreted : Java can be considered both a compiled and an interpreted language because its source code is first compiled into a binary byte-code. This byte-code runs on the Java Virtual Machine (JVM), which is usually a software-based interpreter.

9) High-Performance : With the use Just-In-Time compilers, java enables high performance.

10) Multithreading : With Java's multithreading feature it is possible to write programs that can perform many tasks simultaneously.

11) Dynamic : Java supports dynamic memory allocation and garbage collection, simplifying memory management.

### • Install Java :

- To install java, you need to follow these steps:

- 1) Download the appropriate Java Development kit (JDK) for your operating system from the official Oracle Website or adopt open JDK.
- 2) Run the Java installer, and follow the installation instructions.
- 3) Validate the JAVA HOME setting.
- 4) Confirm the Java PATH variable was set properly.
- 5) Run a JDK command to verify Java install was a success.

### • Simple Java Program :

```
class Welcome {  
    public static void main (String[] args) {  
        System.out.println ("Welcome to Java Programming");  
    }  
}
```

- Internal Details :



- 1) Java Virtual Machine (JVM) :

Java Virtual Machine is an abstract machine. It is a specification that provides runtime environment in which java bytecode can be executed. JVMs are available for many hardware and software platforms (i.e. JVM is platform dependent).

- 2) Java Runtime Environment (JRE) :

JRE is the environment required to run Java applications. It includes the JVM class libraries, and other supporting files. JRE allows users to run the Java applications without needing the development tools.

- 3) Java Development Kit (JDK) :

Java Development Kit is a software development environment that offers a collection of tools and libraries necessary for developing Java applications. You need the JDK to convert your source code into a format that the Java Runtime Environment can execute.

## 2. Constants, Variables and Data Types

### Constants :

In java constant is an entity in computer programming where its value doesn't change. There are a number of different constant types in Java.



#### 1) Integer Constants :

An integer constant is a sequence of digits without a decimal point. e.g:- 10 and -200 are integer constants. There are three types of integer constants. They are as follows :

- i) Decimal Integer
- ii) Octal Integer
- iii) Hexadecimal integer

#### i) Decimal Integer -

Decimal integer is a sequence of digits from 0 to 9. These constants are either positive or negative. For example, 26, -29, 0 and +3425

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### ii) Octal Integers -

An octal integer constant is a sequence of any combination of digits from 0 to 7. Octal integer always starts with 0.

For example, 0, 024.

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### iii) Hexadecimal Integer -

Hexadecimal integer constants consist of digits 0 to 9 and alphabets "a" to "f" or "A" to "F". These constants are preceded by 0x. Letter "A" to "F" represents the numbers 10 to 15.

For example, 0x23, 0x5B, 0x.

## 2) Real Constant:

Real constants consist of a sequence of digits with fractional parts or decimal points. These constants are also called floating-point constants.

examples of real constants are 2.3, 0.0034, -0.75, etc.

## 3) Character Constant:

A single character constant or character constant is a single character enclosed within a pair of single quote.

For example, 's', 'x', ';' ' ' etc.

## 4) String Constant:

A string constant is a sequence of characters within a pair of double-quotes.

For example "Hello Java" "1996" "2+5" "x" "e...!" etc.

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- Applications of Java :

- 1) Mobile Applications :

Java is used for developing Android applications. The most popular android app development IDE Android Studio, also uses Java for developing android applications.

- 2) Desktop GUI Applications:

We can also develop a GUI application using java. Java provides AWT, JavaFX, and Swing for developing the GUI based desktop application.

- 3) Web-based Applications :

Java is commonly used for building web applications using Frameworks, Javasever faces (JSP) and servelets.

- 4) Embedded Systems:

Java's portability makes it suitable for embedded systems and internet of Things (IoT) devices.

- 5) Enterprise Applications :

Java EE (Java platform, Enterprise Edition) is used for building - large scale enterprise application.

- 6) Scientific and Research Applications:

Java's flexibility and libraries makes it useful for Scientific simulations and research projects.