

## INTRODUCTION TO JAVA



Java is a high-level programming language originally developed by Sun Microsystems and released in 1995. Java runs on a variety of platforms, such as Windows, Mac OS, and the various versions of UNIX. This tutorial gives a complete understanding of Java. Java is an object-oriented programming language originally developed by Sun Microsystems and released in 1995.

Java programming language was originally developed by Sun Microsystems which was initiated by James Gosling and released in 1995 as core component of Sun Microsystems' Java platform (Java 1.0 [J2SE]).

The latest release of the Java Standard Edition is Java SE 8. With the advancement of Java and its widespread popularity, multiple configurations were built to suit various types of platforms. For example: J2EE for Enterprise Applications, J2ME for Mobile Applications.

Java is –

- Object Oriented – In Java, everything is an Object. Java can be easily extended since it is based on the Object model.
- Platform Independent – Unlike many other programming languages including C and C++, when Java is compiled, it is not compiled into platform specific machine, rather into platform independent byte code. This byte code is distributed over the web and interpreted by the Virtual Machine (JVM) on whichever platform it is being run on.

- Simple – Java is designed to be easy to learn. If you understand the basic concept of OOP Java, it would be easy to master.
- Secure – With Java's secure feature it enables to develop virus-free, tamper-free systems. Authentication techniques are based on public-key encryption.
- Architecture-neutral – Java compiler generates an architecture-neutral object file format, which makes the compiled code executable on many processors, with the presence of Java runtime system.
- Portable – Being architecture-neutral and having no implementation dependent aspects of the specification makes Java portable. Compiler in Java is written in ANSI C with a clean portability boundary, which is a POSIX subset.
- Robust – Java makes an effort to eliminate error prone situations by emphasizing mainly on compile time error checking and runtime checking.
- Multithreaded – With Java's multithreaded feature it is possible to write programs that can perform many tasks simultaneously. This design feature allows the developers to construct interactive applications that can run smoothly.
- Interpreted – Java byte code is translated on the fly to native machine instructions and is not stored anywhere. The development process is more rapid and analytical since the linking is an incremental and light-weight process.
- High Performance – With the use of Just-In-Time compilers, Java enables high performance.
- Distributed – Java is designed for the distributed environment of the internet.
- Dynamic – Java is considered to be more dynamic than C or C++ since it is designed to adapt to an evolving environment. Java programs can carry extensive amount of run-time information that can be used to verify and resolve accesses to objects on run-time.

When we consider a Java program, it can be defined as a collection of objects that communicate via invoking each other's methods. Let us now briefly look into what do class, object, methods, and instance variables mean.

- **Object** – Objects have states and behaviors. Example: A dog has states - color, name, breed as well as behavior such as wagging their tail, barking, eating. An object is an instance of a class.

- **Class** – A class can be defined as a template/blueprint that describes the behavior/state that the object of its type supports.
- **Methods** – A method is basically a behavior. A class can contain many methods. It is in methods where the logics are written, data is manipulated and all the actions are executed.
- **Instance Variables** – Each object has its unique set of instance variables. An object's state is created by the values assigned to these instance variables.

## BASIC SYNTAX

About Java programs, it is very important to keep in mind the following points.

- **Case Sensitivity** – Java is case sensitive, which means identifier **Hello** and **hello** would have different meaning in Java.
- **Class Names** – For all class names the first letter should be in Upper Case. If several words are used to form a name of the class, each inner word's first letter should be in Upper Case.

**Example:** *class MyFirstJavaClass*

- **Method Names** – All method names should start with a Lower Case letter. If several words are used to form the name of the method, then each inner word's first letter should be in Upper Case.

**Example:** *public void myMethodName()*

- **Program File Name** – Name of the program file should exactly match the class name.

When saving the file, you should save it using the class name (Remember Java is case sensitive) and append '.java' to the end of the name (if the file name and the class name do not match, your program will not compile).

**Example:** Assume 'MyFirstJavaProgram' is the class name. Then the file should be saved as '*MyFirstJavaProgram.java*'

- **public static void main(String args[])** – Java program processing starts from the main() method which is a mandatory part of every Java program.

### INHERITANCE

In Java, classes can be derived from classes. Basically, if you need to create a new class and here is already a class that has some of the code you require, then it is possible to derive your new class from the already existing code.

This concept allows you to reuse the fields and methods of the existing class without having to rewrite the code in a new class. In this scenario, the existing class is called the **superclass** and the derived class is called the **subclass**.

### INTERFACES

In Java language, an interface can be defined as a contract between objects on how to communicate with each other. Interfaces play a vital role when it comes to the concept of inheritance.

An interface defines the methods, a deriving class (subclass) should use. But the implementation of the methods is totally up to the subclass.

Java is an Object-Oriented Language. As a language that has the Object-Oriented feature, Java supports the following fundamental concepts –

- Polymorphism
- Inheritance
- Encapsulation
- Abstraction
- Classes
- Objects
- Instance
- Method
- Message Parsing

- **Object** – Objects have states and behaviors. Example: A dog has states - color, name, breed as well as behaviors – wagging the tail, barking, eating. An object is an instance of a class.
- **Class** – A class can be defined as a template/blueprint that describes the behavior/state that the object of its type support.

A class can contain any of the following variable types.

- **Local variables** – Variables defined inside methods, constructors or blocks are called local variables. The variable will be declared and initialized within the method and the variable will be destroyed when the method has completed.
- **Instance variables** – Instance variables are variables within a class but outside any method. These variables are initialized when the class is instantiated. Instance variables can be accessed from inside any method, constructor or blocks of that particular class.
- **Class variables** – Class variables are variables declared within a class, outside any method, with the static keyword.

A class can have any number of methods to access the value of various kinds of methods. In the above example, barking(), hungry() and sleeping() are methods.

Following are some of the important topics that need to be discussed when looking into classes of the Java Language.

### CONSTRUCTORS

When discussing about classes, one of the most important sub topic would be constructors. Every class has a constructor. If we do not explicitly write a constructor for a class, the Java compiler builds a default constructor for that class.

Each time a new object is created, at least one constructor will be invoked. The main rule of constructors is that they should have the same name as the class. A class can have more than one constructor.

Java also supports Singleton Classes where you would be able to create only one instance of a class.

There are three steps when creating an object from a class –

- **Declaration** – A variable declaration with a variable name with an object type.
- **Instantiation** – The 'new' keyword is used to create the object.
- **Initialization** – The 'new' keyword is followed by a call to a constructor. This call initializes the new object.

Classes have several access levels and there are different types of classes; abstract classes, final classes, etc.

### **JAVA PACKAGE**

In simple words, it is a way of categorizing the classes and interfaces. When developing applications in Java, hundreds of classes and interfaces will be written, therefore categorizing these classes is a must as well as makes life much easier.

### **IMPORT STATEMENTS**

In Java if a fully qualified name, which includes the package and the class name is given, then the compiler can easily locate the source code or classes. Import statement is a way of giving the proper location for the compiler to find that particular class.

For example, the following line would ask the compiler to load all the classes available in directory java\_installation/java/io–

```
import java.io.*;
```

## ARRAYS

Java provides a data structure, the array, which stores a fixed-size sequential collection of elements of the same type. An array is used to store a collection of data, but it is often more useful to think of an array as a collection of variables of the same type.

Instead of declaring individual variables, such as number0, number1, ..., and number99, you declare one array variable such as numbers and use numbers[0], numbers[1], and ..., numbers[99] to represent individual variables.

Syntax

```
arrayRefVar = new dataType[arraySize];
```

The above statement does two things –

- It creates an array using new dataType[arraySize].
- It assigns the reference of the newly created array to the variable arrayRefVar.

Declaring an array variable, creating an array, and assigning the reference of the array to the variable can be combined in one statement, as shown below –

```
dataType[] arrayRefVar = new dataType[arraySize];
```