UNIT 1: INTRODUCTION TO JAVA

UNIT STRUCTURE

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1.1 LEARNING OBJECTIVES

After going through this unit, you will be able to:

- learn about the Java programming language
- learn the feature of Java
- describe Java environment
- learn to install Java SDK
- write simple programs in Java

1.2 INTRODUCTION

This is an introductory unit on Java programming language. The unit starts with an introduction to Java programming language. In the next section, basic features of Java and Java environment is described. The unit also describes the process of installation of Java SDK. And at the end, the learners will be able to learn how to write a complete simple program in Java programming language.

1.3 INTRODUCTION TO JAVA

Java is a programming language developed by James Gosling at Sun Microsystems Inc. in the year 1995. But later it is owned by Oracle and more than 3 billion devices are using Java. The class-based object-oriented language makes writing, compiling, and debugging programming easy. It is used for modular programs. Java applications are compiled to byte code that can run on any Java Virtual Machine.

After its development, the first public implementation of Java was released by Sun Microsystems in 1996. In the later stage, 2006, the Sun microsystem released the first Java virtual machine as free and open-source software.

Java is a programming language and a platform. Java is a high-level, robust, object-oriented, and secure programming language. Any hardware or software environment in which a program runs are known as a platform. Currently, Java is used in the following devices/applications.

- Acrobat reader, media player, antivirus, etc.
- Railway ticket booking systems such as irctc.co.in.
- Banking applications.
- Mobile
- Internet programming
- E-business
- Robotics
- Games

1.4 BASIC FEATURES OF JAVA

Java is an object-oriented programming language that has the following features.

- Java is a platform-independent language because it is itself a platform. Any hardware or software environment in which a program runs are known as a platform. Since Java has a runtime environment (JRE) and Application Programming Interface (API), it is called a platform.

- Java is more secure than other basic programming languages.
  - It has no explicit pointer.
  - It runs inside a virtual machine sandbox.
- Java is simpler. It is simpler because
  - It is based on C++.
  - It removes explicit pointers, operator overloading, etc from its features.
  - It adds Automatic Garbage Collection for unreferenced objects.
- Java is architecturally neutral. The Java compiler generates the java bytecodes and it does not have any impact on the system architecture. It can interpret with any machine.
- The Java is robust due to the following reasons
  - It has strong memory management.
  - Automatic garbage collection is possible in Java.
  - To get rid of objects issue, Java runs on JVM (Java virtual machine)
  - It eliminates the error-prone situations by emphasizing only compile time error checking and runtime checking.
- Java is faster than other traditional interpreted programming languages because Java bytecode is "close" to native code.



CHECK YOUR PROGRESS

Q 1: State True(T) or False (F):

a. Java is an OOP.

b. Java is more secure.

Q 2: State two features of Java.

.....

.....

Q 3: What is JVM?

.....

.....

1.5 JAVA ENVIRONMENT

Java environment denotes the Java Runtime Environment (JRE). With the help of the Java environment, the Java program runs correctly. The JRE is one of three interrelated components for developing and running Java programs. The other two components of the java environment are as follows:

- The first component is the Java Development Kit or JDK. It is a set of tools for developing Java applications. Developers may choose Java Enterprise Edition (Java EE), Java Special Edition (Java SE), or Java Mobile Edition (Java ME). Every JDK always includes a compatible JRE, because running a Java program is part of the process of developing a Java program. Every JRE includes a default JRE, but developers are free to choose another that meets the specific resource needs of their applications.
- The Java Virtual Machine, or JVM, executes the live Java applications. Every JRE includes a default JRE, but developers are free to choose another that meets the specific resources needs of their applications.

1.6 INSTALLING THE JAVA SDK

In this section, you will learn how to install Java SDK. The following are the steps for the installation process.

- **Verify for Java:** Initially, you have to verify whether Java is installed or not in your system. To perform the verification, type javac in the cmd of your system. If the command is not recognized, then you need to install the Java SDK.
- **Download JDK:** In this step, you can download the Java from https://www.oracle.com/java/technologies/downloads/

Java 18 Java 17

Java SE Development Kit 18.0.2 downloads

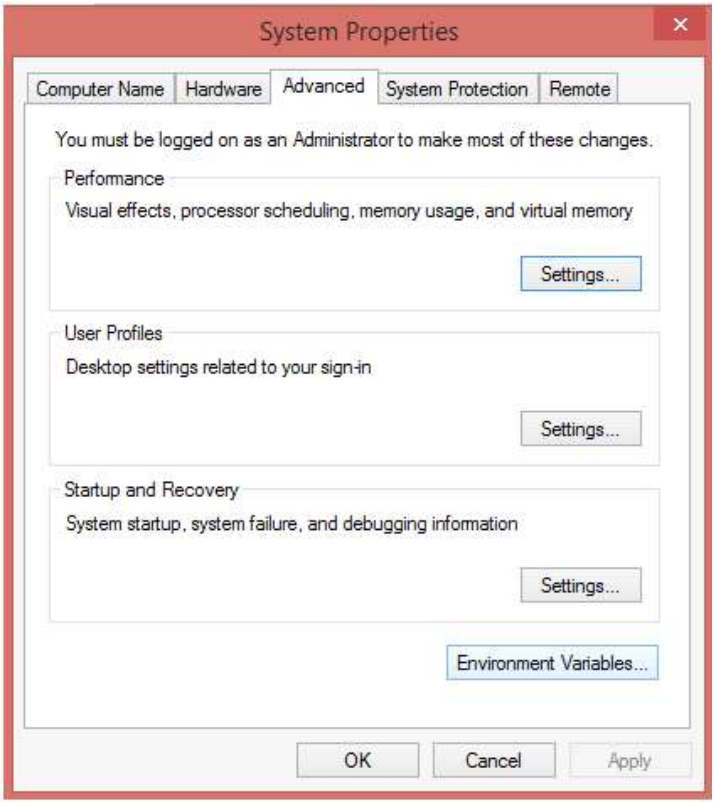
Thank you for downloading this release of the Java™ Platform, Standard Edition Development Kit (JDK™). The JDK is a development environment for building applications and components using the Java programming language.

The JDK includes tools for developing and testing programs written in the Java programming language and running on the Java platform.

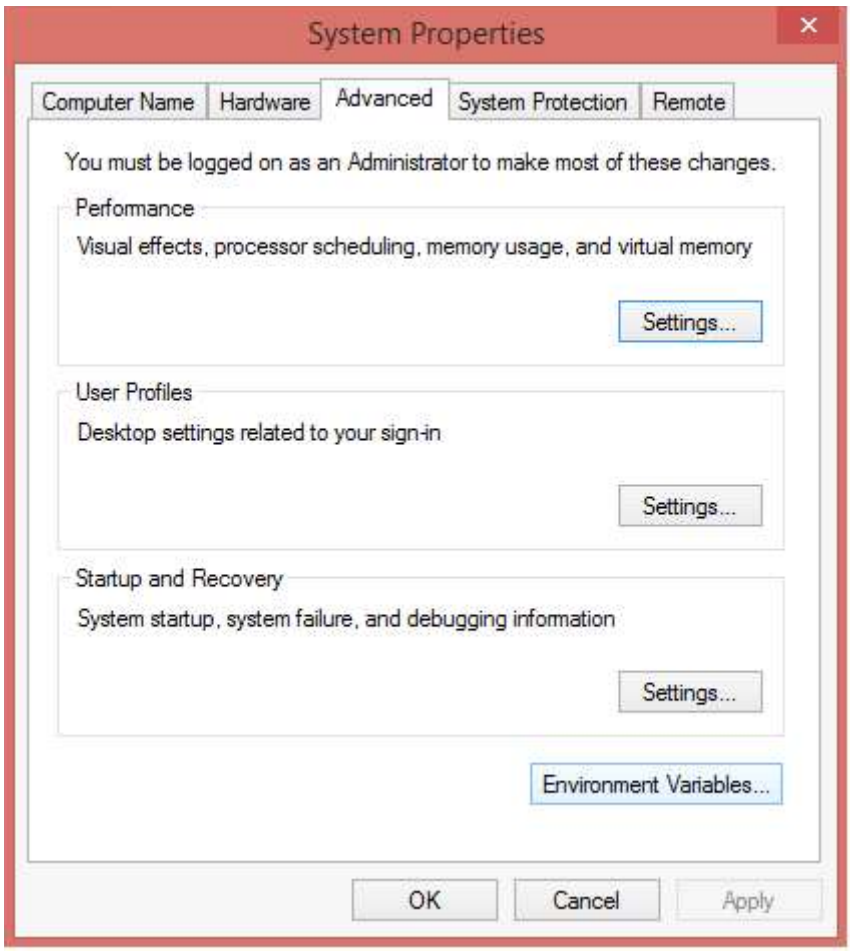
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x64 Compressed Archive	172.79 MB	https://download.oracle.com/java/18/latest/jdk-18_windows-x64_bin.zip (sha256)
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x64 MSI Installer	152.25 MB	https://download.oracle.com/java/18/latest/jdk-18_windows-x64_bin.msi (sha256)

- **Install JDK:** Next you have to open the executable file that you have already downloaded and follow the instructions given during the installation. Once it is installed, then close the installation set up.
- **Set the Permanent Path:** For setting the permanent path, you have to open the executable file already downloaded and follow the instructions:
  - Right-click on **"My Computer"**. Then choose **"Properties"** from the options.
  - The following screen will appear. Click on **"Advanced system settings"** to continue.



- Now click on **"Environment Variables"** to continue.



- Enter "path" in the variable name and enter the path to the bin folder inside your JDK in the variable value. Click **OK**.
- Now Java Path has been set up. Open the **command prompt** and type **"javac"** In case you have already opened up the command prompt, I suggest you to close the existing window and reopen it again.

1.7 WRITING JAVA PROGRAMS

In this section, you will learn about the steps of writing a Java program. A Java program is a collection of objects that communicate with each other via java methods.

- **Java Object** - Java Objects are the states and instances of the java class. The object defines the identity of the class. For example, a car is

an object.

- **Java Class** - A class is a frame that defines the behavior/state of the object.
- **Java Methods** - A method is a behavior of an object. A class may have many methods where the data, and logic, are developed.
- **Java Instance Variables** - JAVA object has a unique set of instance variables where values are assigned to these instance variables.

Let us write a Java program. To write a Java program the following steps are required.

- Open **notepad** in your system and start writing your code.
- After writing the code, save the file as **FILENAME.java.** Here, .java is the extension of the java program, and a file name is required to save the file.
- Now, open the command prompt and go to the directory where you have saved your java class.
- Now, in the command prompt type javac **FILENAME.java** and press enter key.
- If there is no error, this will take you to the next line.
- Now type **java FILENAME**
- Then you will be able to see the output of the program.

Let us write a simple Java program.

```
public class FILENAME
{
    public static void main(String [ ]args)
    {
          System.out.println("Hello World");
    }
 }
```

Here, FILENAME is the name of the class and you always save your java program with the same name. The above program will display the word "Hello World". Once you save the file, just follow the following steps to execute the code.

C:\> javac FILENAME.java

C:\> java FILENAME

The output of the program will be: Hello World

To write a Java program, the following points are very important:

- Java is a case-sensitive language.
- For the Class name, the first letter should start with Uppercase.
- All methods' names should start with lower case letters.
- The name of the program file should exactly match the class name.



CHECK YOUR PROGRESS

Q 4: What is the Java environment?

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Q 5: What is a Java object?

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Q 6: What is Java Class?

.....

.....

Q 7: Write a program in Java to print Hello.

.....

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1.8 LET US SUM UP

- Java is a programming language developed by James Gosling at Sun Microsystems Inc in the year 1995. But later it is owned by Oracle and more than 3 billion devices are using Java.
- Java is a programming language and a platform. Java is a high-level, robust, object-oriented, and secure programming language.
- Java is a platform-independent language because it's itself a platform. Any hardware or software environment in which a program runs is known as a platform. Since Java has a runtime environment (JRE) and API, it

is called a platform.

- Java is a more secure programming language.
- It has no explicit pointer.
- It runs inside a virtual machine sandbox
- Java environment denotes the Java Runtime Environment (JRE). With the help of the Java environment, the Java program runs correctly. The JRE is one of three interrelated components for developing and running Java programs.
- Java Objects are the states and instances of the Java class. The object defines the identity of the class. For Example, A car is an object.
- Java Class - A class is a frame that defines the behaviour/state of the object.
- Java Methods - A method is a behaviour of an object. A class may have many methods where the data, and logic, are developed.
- Java Instance Variables - Java object has a unique set of instance variables where values are assigned to these instance variables.



1.9 FURTHER READINGS

1) Schildt, H. (2020). The complete reference Java.



1.10 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: i) True ii) True

Ans to Q No 2: The two features of Java are:

- Java is a platform-independent language because it is itself a platform. Any hardware or software environment in which a program runs is known as a platform. Since Java has a runtime environment (JRE) and API, it is called a platform.
- Java is more secure than other basic programming languages.
- It has no explicit pointer
- It runs inside a virtual machine sandbox

Ans to Q No 3: A Java virtual machine is enables a computer to run Java programs as well as programs written in other languages that are also

compiled to Java bytecode.

Ans to Q No 4: Java environment denotes the Java Runtime Environment (JRE). With the help of the Java environment, the Java program runs correctly. The JRE is one of three interrelated components for developing and running Java programs.

Ans to Q No 5: Java Object - Java Objects are the states and instances of the java class. The object defines the identity of the class. For example, A car is an object.

Ans to Q No 6: A class is a frame that defines the behavior/state of the object.



1.11 MODEL QUESTIONS

Q 1: Explain different features of Java.

Q 2: Write a program in Java to display your name.

Q 3: What are the steps of writing a Java program?

Q 4: How to set up the Java environment.

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