



Orange Itech

**Java Programming & Logic
Building**

(Unit - 1)

1. What is Java?

Java is a **general-purpose, high-level, object-oriented, and platform-independent** programming language. It is widely used in software development, web applications, mobile applications, and enterprise-level solutions.

Key Aspects of Java:

- **Developed by:** James Gosling at **Sun Microsystems** in 1995.
- **Current Owner:** Oracle Corporation.
- **Primary Goal:** To develop a simple, robust, and platform-independent language.
- **Follows the "Write Once, Run Anywhere" (WORA) principle** using JVM.
- **Java is used in:**
 - Web Development (Spring, JSP, Servlets)
 - Mobile Development (Android)
 - Enterprise Applications (Banking, Healthcare, E-commerce)
 - Game Development (Minecraft)
 - Cloud Computing and IoT

2. Features of Java (Detailed Explanation)

Feature	Description	Why is it Important?
Platform Independent	Java programs run on any OS that has a JVM.	Eliminates the need for separate compilation for different platforms.
Object-Oriented	Supports OOP principles (Encapsulation, Inheritance, Polymorphism, Abstraction).	Helps in writing modular and reusable code.
Secure	No explicit memory management, no pointers, and supports secure communication.	Prevents unauthorized access and vulnerabilities.
Robust	Strong type-checking, exception handling, and garbage collection.	Ensures application reliability and stability.
Multithreading	Supports multiple threads to execute tasks in parallel.	Improves performance and efficiency.
High Performance	Uses JIT (Just-In-Time) compiler for optimized execution.	Increases program execution speed.
Distributed Computing	Supports networking and Remote Method Invocation (RMI).	Useful in enterprise applications and cloud computing.

3. Java Development Environment

To run Java programs, you need the following components:

A. Java Development Kit (JDK)

- JDK is required to **write, compile, and execute Java programs.**
- It includes:
 - **Java Compiler (javac)** - Converts Java code into bytecode.
 - **Java Runtime Environment (JRE)** - Required to run Java applications.
 - **Debugger (jdb)** - Helps in debugging Java programs.

B. Java Runtime Environment (JRE)

- JRE is used **only for running Java programs** (no compilation).
- It contains the **JVM (Java Virtual Machine) and Java libraries.**

C. Java Virtual Machine (JVM)

- **JVM is responsible for executing Java bytecode.**
- It provides:
 - **Class Loader** (Loads compiled .class files into memory).
 - **Memory Management** (Handles stack, heap, method area).
 - **Garbage Collection** (Automatically removes unused objects).

4. Installing Java (JDK) Step-by-Step

A. Windows Installation

1. **Download JDK from [Oracle's website.](#)**
2. **Install JDK** by running the installer.
3. **Set Environment Variables:**
 - Open **System Properties** → **Advanced** → **Environment Variables**
 - Add C:\Program Files\Java\jdk-XX\bin to Path.
 - Set JAVA_HOME to C:\Program Files\Java\jdk-XX.

4. **Verify Installation:**

```
java -version
```

```
javac -version
```

B. Linux/Mac Installation

1. Open terminal and type:

```
sudo apt update
```

```
sudo apt install openjdk-17-jdk
```

2. Verify installation:

```
java -version
```

5. Writing Your First Java Program (Hello World)

A. Java Program Structure

A Java program consists of:

- **Class Declaration** - Defines a class.
- **Main Method (main())** - The entry point of execution.
- **Statements** - Logic inside methods.

B. Example Code

```
// Class Declaration
public class HelloWorld {

    // Main method - Entry point
    public static void main(String[] args) {
        // Print output to console
        System.out.println("Hello, Java!");
    }
}
```

C. Explanation

Code Component	Description
public class HelloWorld	Declares a class named HelloWorld.
public static void main(String[] args)	The main method where execution starts.
System.out.println("Hello, Java!");	Prints text to the console.

6. Compilation & Execution Process

A. Compilation Steps

1. **Write the Java Program** in a text editor (e.g., Notepad, VS Code, IntelliJ).
2. **Save it as HelloWorld.java.**
3. **Compile the program** using the command:

```
javac HelloWorld.java
```

This generates a **bytecode file (HelloWorld.class)**.

4. **Run the compiled program** using:

```
java HelloWorld
```

Output:

Hello, Java!

B. What Happens Internally?

1. **The compiler (javac)** converts .java source code into **bytecode (.class file)**.
2. **JVM executes the bytecode**, converting it into **machine code** specific to the OS.
3. The **output** is displayed on the console.

7. Java Syntax & Rules

Syntax Rule	Example
Every Java program must have a class .	public class HelloWorld { }
The file name must match the class name.	HelloWorld.java for HelloWorld class.
The main method must be defined.	public static void main(String[] args)
Semicolon (;) is required after statements.	System.out.println("Hello, Java!");
Curly braces ({{}}) define blocks of code.	{ System.out.println("Hello"); }
Java is case-sensitive.	HelloWorld ≠ helloworld

8. Java Comments

Type	Syntax	Purpose
Single-line comment	// This is a comment	Used for brief explanations.
Multi-line comment	/* This is a multi-line comment */	Used for block explanations.
Javadoc comment	/** This is documentation */	Used to generate API documentation.

9. Variables in Java

A. What is a Variable?

A **variable** is a named memory location used to store **data** in Java. The value of a variable can change during program execution.

B. Declaration and Initialization

```
// Declaration
```

```
int age;
```

```
// Initialization
```

```
age = 25;
```

```
// Declaration with Initialization
```

```
int number = 10;
```

C. Rules for Naming Variables

Rule	Example	Valid/Invalid
Can contain letters, digits, _, and \$	myVariable, _count, \$price	Valid
Cannot start with a digit	1value	Invalid
Cannot use Java keywords	int, class, public	Invalid
Java is case-sensitive	Value ≠ value	Valid
Use camelCase notation	studentName instead of student_name	Recommended

10. Types of Variables in Java

Variable Type	Scope	Example
Local Variable	Declared inside a method, only accessible within that method.	void display() { int x = 10; }
Instance Variable	Declared inside a class but outside a method, belongs to an object.	class Car { String model; }
Static Variable	Declared using static, shared among all objects of a class.	static int count = 0;

11. Data Types in Java

Java has two main types of data:

1. **Primitive Data Types** (store simple values)
2. **Non-Primitive Data Types** (store objects)

A. Primitive Data Types

Data Type	Size	Default Value	Example
byte	1 byte	0	byte b = 100;
short	2 bytes	0	short s = 32000;
int	4 bytes	0	int num = 100000;
long	8 bytes	0L	long bigNumber = 10000000000L;
float	4 bytes	0.0f	float pi = 3.14f;
double	8 bytes	0.0d	double value = 99.99;
char	2 bytes	'\u0000' = null	char letter = 'A';
boolean	1 bit	false	boolean isJavaFun = true;

B. Non-Primitive Data Types

Type	Example	Purpose
String	String name = "Java";	Stores sequences of characters.
Array	int[] numbers = {1, 2, 3};	Stores multiple values of the same type.
Class	class Car {}	Blueprint for objects.
Interface	interface Vehicle {}	Defines behavior that classes must implement.

12. Type Casting in Java

A. Implicit Type Casting (Widening)

- Automatically converts smaller types to larger types.
- Example:

```
int num = 100;

double newNum = num; // Automatic conversion from int to double
System.out.println(newNum); // Output: 100.0
```

13. Explicit Type Casting (Narrowing)

- Manually converts larger types to smaller types.
- Example:

```
double price = 99.99;
int newPrice = (int) price; // Explicit conversion from double
                           to int
System.out.println(newPrice); // Output: 99
```

14. Operators in Java

A. Types of Operators

Category	Operator
Arithmetic	+ - * / %
Assignment	= += -= *= /= %=
Comparison (Relational)	== != > < >= <=
Logical	&& !
Bitwise	& ^ ~ << >>
Increment/Decrement	++ --
Ternary	: ?

```
public class OperatorsExample {
    public static void main(String[] args) {
        int a = 10, b = 5;
        System.out.println("Addition: " + (a + b)); // 15
        System.out.println("Multiplication: " + (a * b)); // 50
        System.out.println("a > b: " + (a > b)); // true
        System.out.println("(a > 5 && b < 10): " + (a > 5 && b < 10));
// true
        int min = (a < b) ? a : b;
        System.out.println("Minimum: " + min); // 5
    }
}
```

15. Special Operators

A. instanceof Operator

- Used to check if an object is an instance of a specific class.
- Example:

```
String text = "Java";
System.out.println(text instanceof String); // Output: true
```

B. Bitwise Operators

Operator	Meaning	Example (a=5, b=3)	Result
& (AND)	Bitwise AND	5 & 3	1
(OR)	Bitwise OR	12 3	15
^ (XOR)	Bitwise XOR	5 ^ 3	6
~ (NOT)	Bitwise Complement	~5	-6
<< (Left Shift)	Shifts bits left	5 << 1	10
>> (Right Shift)	Shifts bits right	5 >> 1	2



Unit 1: Basic Programs on C Programming

01. write a program to display "welcome to c language".
02. Write a program to multiply and divide two numbers and print them in the form of equation
 $(4*3=12 \ 8/4=2)$?
03. write a program to find he addition of two numbers
04. write a program to find this subtraction of three numbers
05. write a program to find the multiplication of four numbers
06. write a program to find addition of 5 numbers
07. write a program to find the area of circle
09. write the program to find the area of triangle
10. write the program to find area of rectangle
11. Write a program to find the square and cube of a given number?
12. Write a program to find the square root of a given number (use sqrt () function)? `Math.sqrt(a)`
13. Write a program to find the area and perimeter of a square?
14. Write a program to find the area and circumference of a circle?
15. Write a program to find the area of a sphere?
16. Write a program to find the volume of a cylinder?
17. Write a program to find your age in days?
18. Write a program to read your address and print it?
19. Write a program to print the area of triangle if three sides are given?
20. Write a program to read the marks of 5 subjects and display the total, per
21. Write a program to find the simple interest and compound interest?
22. The total mechanical energy of a particle is given by $e = mgh + (1/2) mv^2$?
23. write a program to accept length breathe and height of room and accept length and height of doors and window to calculate total area to be printed (including roof also)
24. write a program to accept basic salary from user and calculate HRA, TA and calculate gross salary
25. write a program to perform swapping of two number using third variable
26. write a program to perform swapping of two number without using third variable
27. write a program to perform swapping of two number with by using bitwise operator

28. write a program to perform conversion of litres to millilitres
29. write a program to perform conversion of kilometres to metres
30. write a program to perform conversion between H:M:S to seconds
31. write a program to perform conversion of Millilitres to litres
32. write a program to perform conversion of metres to kilometres
33. write a program to perform conversion of seconds to H:M:S
34. write a program to find remainder and quotient by accepting divisor and dividend
36. write a program to find the square root given number by using sqrt() function
37. A milk vendor buys milk at the rate of 3.25/- the then adds a litre of water for every four litres of milk and sells the water milk at the rate of 4.15/lt. calculate the gain for milk vendor?
38. The temperature of the city is input through the keyboard in Fahrenheit. Write a program to convert into Celsius?
39. Given the coordinates of two points (x_1, y_1) and (x_2, y_2) . Write a program to find the distance between these two points?
40. Rajesh's basic salary is input through the keyboard. His D.A. is 40% of basic salary, and H.R.A. is 20% of basic salary. Write a program to calculate his gross sal?
41. The distance between two cities in Km. is input through the keyboard. Write a program to convert and print the result in meters and centimetres?
42. Write a program which accepts the amount in dollars and convert into rupees?
43. write a program to find kinetic energy and potential energy
44. write a program to find arithmetic mean and harmonic mean
45. write a program to find the surface area of cylinder
46. write a program to find the area and perimeter of the ring
47. write a program to find the volume and surface area of cuboid
48. write a program to convert the temperature from Celsius to Kelvin unit