



1. Introduction to Java

- History and Evolution of Java
- Features of Java (Platform Independence, Security, etc.)
- Java Virtual Machine (JVM), JRE, and JDK
- Writing Your First Java Program (Hello World!)
- Compilation and Execution Process
- Java Development Tools (Eclipse, IntelliJ, VS Code)

2. Data Types and Variables

- Primitive Data Types (int, float, char, boolean, etc.)
- Non-Primitive Data Types (Strings, Arrays, Classes, Objects)
- Type Casting (Implicit and Explicit)
- Variable Scope (Local, Instance, and Static Variables)
- Constants and Final Variables (final, static final)

3. Operators in Java

- Arithmetic Operators (+, -, *, /, %)
- Relational (Comparison) Operators (==, !=, <, >, <=, >=)
- Logical Operators (&&, ||, !)
- Bitwise Operators (&, |, ^, ~, <<, >>)
- Assignment Operators (=, +=, -=, etc.)
- Ternary Operator (?:)

4. Object-Oriented Programming (OOP) Concepts

- **Classes and Objects**
- **Encapsulation** (Getters, Setters, Access Modifiers)
- **Inheritance** (Single, Multilevel, Hierarchical, Multiple via Interfaces)
- **Polymorphism** (Method Overloading & Method Overriding)
- **Abstraction** (Abstract Classes & Interfaces)
- **Super and This Keywords**
- **Static and Final Keywords in OOP**

5. Access Modifiers

- **Public** (Accessible everywhere)
- **Private** (Accessible only within the class)
- **Protected** (Accessible within the same package and subclasses)
- **Default (No Modifier)** (Accessible within the package)

6. Exception Handling

- What is an Exception? Checked vs. Unchecked Exceptions
- Try-Catch Block

- Multiple Catch Blocks
- Finally Block
- Throw vs. Throws
- Custom Exceptions (User-defined Exceptions)

7. Java Collections Framework (JCF)

- Introduction to Collections API
- List Interface (ArrayList, LinkedList, Vector, Stack)
- Set Interface (HashSet, LinkedHashSet, TreeSet)
- Map Interface (HashMap, TreeMap, LinkedHashMap, Hashtable)
- Queue Interface (PriorityQueue, Deque)
- Sorting and Searching Collections (Collections.sort(), Comparator, Comparable)

8. Multithreading

- What is a Thread?
- Creating Threads (Thread Class vs. Runnable Interface)
- Thread Lifecycle and Methods (start(), sleep(), join(), yield())
- Synchronization (synchronized keyword)
- Inter-thread Communication (wait(), notify(), notifyAll())
- Thread Pooling (Executor Framework)

9. Serialization

- What is Serialization and Deserialization?
- Serializable Interface

- Object Output Stream and Object Input Stream
- Transient Keyword
- Serial Version UID

10. Lambda Expressions & Stream API

- Functional Interfaces (Runnable, Callable, Consumer, Supplier, Predicate)
- Lambda Expression Syntax
- Method References (:: operator)
- Stream API Basics (filter(), map(), collect(), forEach())
- Parallel Streams
- Collectors and Grouping

11. Cloning

What is Cloning?

- **Shallow Cloning** vs. **Deep Cloning**
- clone() Method in Object Class
- Using Cloneable Interface
- Copy Constructors