

1. Introduction to Programming

- Types of languages
- Static v/s Dynamic Languages
- Stack and Heap memory

2. Introduction to Java

- What is Java?
- What are JDK, JRE & JVM?
- How java code gets executed?
- Platform independence
- First java program
- Taking input from user
- Datatypes and Wrapper Classes
- Comments in Java
- Basic Exercises

4. Functions And Methods

- Why to use methods?
- Syntax of method in Java
- Types of methods
- Parameters & return statement
- Static v/s Non-static methods
- Method Overloading
- Access modifiers
- Variable Arguments (VarArgs)
- Pass by Value
- Constructors
- This Keyword
- Getter and Setter Methods
- Method Overriding
- Final Methods
- Static block
- Exercise

3. Conditionals, Loops & Control Statements

- Conditional Statements
- Loops
- Control Statements
- Ternary operator
- Exercises

5. Development Standards to be followed while writing code.

6. Array and ArrayLists

- What is an Array?
- Accessing array elements.
- New Keyword
- Taking input of array
- Array of Objects
- Function taking array as parameter
- Multi-dimensional array
- ArrayLists
- Exercises

7. Searching in an Array

- Linear Search
- Linear Search on Strings
- Binary Search
- Order-Agnostic Binary Search
- Exercises

8. Sorting an Array

- | | |
|---|---|
| <input type="checkbox"/> Bubble Sort | <input type="checkbox"/> Heap Sort |
| <input type="checkbox"/> Insertion Sort | <input type="checkbox"/> Counting Sort. |
| <input type="checkbox"/> Merge Sort | <input type="checkbox"/> Tim Sort |
| <input type="checkbox"/> Quick Sort | (Java's Arrays.sort()) |

9. Time & Space complexity

- What is Time complexity?
- Why Time complexity?
- Big-O Notation
- Best, Worst & Average cases
- How to find time complexity?
- What is Space complexity?
- Relationship b/w time & space

10. Math and Logic tricks

- Bitwise Operators
- Factors
- Prime numbers
- Modulo operators
- Number theory
- Exercises

11. Recursion

- Introduction
- Sorting
- Flow of program
- String
- Tree building
- Array
- Tail recursion
- Pattern

12. Object Oriented Programming (OOP's)

12.1 OOP Fundamentals

- Classes & Objects
- Properties (Fields) & Methods
- this Keyword
- Access Control
- Constructors

12.2 Core OOP Concepts

- Inheritance
- Polymorphism
- Method Overloading & Overriding
- Encapsulation (Getters & Setters)
- Abstraction (Abstract class & interface)

12.3 Special OOP Topics

- Static & Final Keyword
- Packages
- Enums
- Annotations
- Singleton classes
- Object class methods (toString, equals(), hashCode())

12.4 Advanced Java Features

- Generics
- Collections Framework (List, Set, Map)
- Vector Class
- Exception handling
- Lambda expressions.
- Exercises

13. Stacks & Queues

- Introduction to Stack
- Basic operations on stack
- Push efficient & Pop efficient
- Introduction to Queue
- Queue using stack & Viceversa
- Circular Queue
- Exercises

14. Linked Lists

- Introduction
- Singly Linked Lists (SLL)
- Doubly Linked Lists (DLL)
- Reversal of LL
- Linked List with recursion
- Circular SLL
- Circular DLL
- Exercises

15. Trees

- Introduction
- Binary Search Trees (BST)
- Depth First Search (DFS)
- Breadth First Search (BFS)
- AVL Trees
- Segment trees
- Exercises

16. Hashmaps

17. Heaps

18. Graph theory

19. Dynamic programming.

