# Java Interview Questions and Answers

**1. What is the difference between JDK, JRE, and JVM?**

JDK: Java Development Kit - includes JRE + tools to develop Java applications.

JRE: Java Runtime Environment - environment to run Java apps (includes JVM).

JVM: Java Virtual Machine - runs Java bytecode, platform-dependent.

**2. What are the main principles of Object-Oriented Programming?**

Encapsulation, Inheritance, Polymorphism, and Abstraction.

**3. What is the difference between == and .equals() method?**

== checks reference equality; .equals() checks content equality (can be overridden).

**4. Why is String immutable in Java?**

For security, thread-safety, performance (String pool), and consistent hashing.

**5. What is the difference between String, StringBuilder, and StringBuffer?**

String: immutable.

StringBuilder: mutable, not thread-safe.

StringBuffer: mutable, thread-safe.

**6. What is method overloading and method overriding?**

Overloading: same method name, different parameters (compile-time).

Overriding: subclass redefines superclass method (run-time).

**7. What is the difference between abstract class and interface?**

Abstract class: can have abstract and concrete methods.

Interface: only abstract methods (Java 8+ allows default/static methods).

**8. What are access modifiers in Java?**

private, default (package-private), protected, and public.

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**9. What is the difference between static and non-static methods?**

Static: belongs to the class, no object needed.

Non-static: belongs to objects.

**10. What is constructor chaining in Java?**

Calling one constructor from another using this() or super() to reuse code.

**11. What is the difference between ArrayList and LinkedList?**

ArrayList: fast access, slow insert/delete.

LinkedList: slow access, fast insert/delete.

**12. What is the difference between HashMap and Hashtable?**

HashMap: not thread-safe, allows one null key.

Hashtable: thread-safe, no null keys.

**13. How does HashMap work internally?**

Uses hashCode() to find bucket index, equals() to resolve collisions (linked list/tree).

**14. What is the difference between HashSet and TreeSet?**

HashSet: unordered, uses HashMap.

TreeSet: sorted, uses Red-Black Tree.

**15. What is the Collections framework in Java?**

Set of interfaces and classes to manipulate groups of objects (List, Set, Map, etc.).

**16. What is the difference between Iterator and ListIterator?**

Iterator: one-way traversal.

ListIterator: two-way traversal and element modification.

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**17. What is the difference between Comparable and Comparator?**

Comparable: natural order using compareTo().

Comparator: custom order using compare().

**18. What happens when you add duplicate elements to a HashSet?**

Duplicates are ignored; HashSet only stores unique elements.

**19. What is the difference between List and Set?**

List: ordered, allows duplicates.

Set: unordered, no duplicates.

**20. What is the difference between Array and ArrayList?**

Array: fixed size, stores primitives or objects.

ArrayList: resizable, object-only.

**21. What is exception handling in Java?**

Managing runtime errors using try-catch-finally to prevent crashes.

**22. What is the difference between checked and unchecked exceptions?**

Checked: compile-time (e.g., IOException).

Unchecked: runtime (e.g., NullPointerException).

**23. What is the difference between throw and throws?**

throw: explicitly throw an exception.

throws: declare exceptions a method can throw.

**24. What is the finally block and when is it executed?**

Always executed after try/catch; used to close resources.

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## 25. Can we have multiple catch blocks for a single try block?

Yes, to handle different types of exceptions.

## 26. What is the difference between final, finally, and finalize?

final: constant/prevents overriding.

finally: always executes.

finalize(): called before GC (deprecated).

## 27. What is multithreading in Java?

Concurrent execution of threads to maximize CPU usage.

## 28. What is the difference between Thread class and Runnable interface?

Thread: extends Thread.

Runnable: implements Runnable, preferred.

## 29. What is synchronization in Java?

Controls access to shared resources to avoid thread conflicts.

## 30. What is the difference between wait() and sleep() methods?

wait(): releases lock, inter-thread communication.

sleep(): pauses thread, keeps lock.

## 31. What is a deadlock and how can you avoid it?

Two threads wait indefinitely for each other's lock. Avoid with lock ordering or timeout.

## 32. What is the volatile keyword in Java?

Ensures visibility of variable changes across threads.

## 33. What is the difference between heap and stack memory?

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Heap: stores objects, shared.

Stack: stores method calls/local vars, thread-specific.

## 34. How does garbage collection work in Java?

Automatically deallocates memory of unreachable objects using algorithms like Mark & Sweep.

## 35. What is the difference between shallow copy and deep copy?

Shallow: copies reference.

Deep: copies actual objects recursively.

## 36. What are wrapper classes in Java?

Convert primitives to objects (e.g., int to Integer).

## 37. What is autoboxing and unboxing?

Autoboxing: primitive to wrapper.

Unboxing: wrapper to primitive.

## 38. What are generics in Java and why are they used?

Enable type safety and code reusability (e.g., List<String>).

## 39. What are lambda expressions in Java 8?

Anonymous functions, used with functional interfaces (e.g., (a, b) -> a + b).