**1. How do logical operators differ from bitwise operators in Java?**

**✅ Logical Operators:**

* Used in **conditional statements**.
* Operate on **boolean** values (true or false).
* Examples:
  + && (logical AND)
  + || (logical OR)
  + ! (logical NOT)
* **Short-circuit evaluation**:
  + a && b: If a is false, b is not evaluated.
  + a || b: If a is true, b is not evaluated.

**✅ Bitwise Operators:**

* Work on **integer types** (int, byte, long, etc.).
* Manipulate **individual bits** of a number.
* Examples:
  + & (bitwise AND)
  + | (bitwise OR)
  + ^ (bitwise XOR)
  + ~ (bitwise complement)
  + <<, >>, >>> (bit shifts)
* **No short-circuiting** — both sides are always evaluated.

**🔑 Key Difference:**

* Logical operators deal with **boolean logic**, used in conditions.
* Bitwise operators deal with **bit-level operations**, used for performance, encryption, low-level programming.

**2. What is the ternary operator in Java? Provide its syntax.**

**✅ Ternary Operator:**

* It’s a **shorthand for if-else**.
* Returns one of two values depending on a condition.

**Syntax:**

java

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condition ? expression1 : expression2;

* If condition is true → expression1 is returned.
* If condition is false → expression2 is returned.

**✅ Example:**

java

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int age = 20;

String result = (age >= 18) ? "Adult" : "Minor";

System.out.println(result); // Output: Adult

**Making Decisions Using Conditionals in Java**

Conditionals allow a Java program to **execute different blocks of code based on conditions**.

**✅ 1. if Statement**

java

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if (condition) {

// Code runs if condition is true

}

**✅ 2. if-else Statement**

java

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if (marks >= 40) {

System.out.println("Pass");

} else {

System.out.println("Fail");

}

**✅ 3. if-else if-else Ladder**

java

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if (marks >= 90) {

System.out.println("Grade A");

} else if (marks >= 75) {

System.out.println("Grade B");

} else {

System.out.println("Grade C");

}

**🔹 Conditionals Using Ternary Operator**

A **ternary operator** is a **one-liner conditional** used to simplify if-else.

**✅ Syntax:**

java

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condition ? expression1 : expression2;

**✅ Example:**

java

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int age = 17;

String result = (age >= 18) ? "Adult" : "Minor";

System.out.println(result); // Output: Minor

It’s best used for simple conditional assignments.

**🔹 Switch and Break Statements in Java**

The switch statement is an alternative to **multiple if-else-if** statements when checking a single variable against multiple constant values.

**✅ Syntax:**

java

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int day = 2;

switch (day) {

case 1:

System.out.println("Monday");

break;

case 2:

System.out.println("Tuesday");

break;

case 3:

System.out.println("Wednesday");

break;

default:

System.out.println("Invalid day");

}

**🔸 break Keyword:**

* Stops execution from **falling through** to the next case.
* If break is **not used**, all cases **after a match** will be executed.

**✅ Default Case:**

* Executes when **no case matches**.

**📌 When to Use What?**

| **Use Case** | **Recommended Control** |
| --- | --- |
| Simple true/false check | if, if-else |
| Multiple conditions | if-else-if |
| Choose from fixed set of known values | switch |
| Short conditional assignment | Ternary operator |