

# Logical Operators and Conditional Statements in Java

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Java provides three main logical operators that are used to form complex conditions in if-else statements:

1. AND (&&) - returns true if both operands are true.
2. OR (||) - returns true if either operand is true.
3. NOT (!) - negates the truth value of its operand, returning true if the operand is false and vice versa.

## Logical Operator Examples

### 1. AND (&&):

```
int a = 10, b = 20, c = 30;
if (a < b && b < c) {
    System.out.println("Both conditions are true");
} else {
    System.out.println("At least one condition is false");
}
```

Explanation: This will print 'Both conditions are true' because both `a < b` and `b < c` are true.

### 2. OR (||):

```
int a = 10, b = 20, c = 30;
if (a < b || b > c) {
    System.out.println("At least one condition is true");
} else {
    System.out.println("Both conditions are false");
}
```

Explanation: This will print 'At least one condition is true' because `a < b` is true, even though `b > c` is false.

### 3. NOT (!):

```
boolean isRaining = false;
if (!isRaining) {
```

```
    System.out.println("It is not raining");  
}
```

Explanation: The `!isRaining` negates `false` to `true`, so 'It is not raining' will be printed.

## Problems on Logical Operators

### Problem 1: Combining Logical Operators and Conditions

Problem: Write a Java program that checks if a number is positive, even, and less than 100.

```
import java.util.Scanner;  
  
public class LogicalOperatorExample {  
    public static void main(String[] args) {  
        Scanner sc = new Scanner(System.in);  
  
        System.out.print("Enter a number: ");  
        int num = sc.nextInt();  
  
        if (num > 0 && num % 2 == 0 && num < 100) {  
            System.out.println("The number is positive, even, and less than 100");  
        } else {  
            System.out.println("The number doesn't satisfy all conditions");  
        }  
    }  
}
```

Explanation: The program checks whether the number is positive, even, and less than 100 using the `&&` operator.

### Problem 2: Password Validator

Problem: Write a program to validate a password. The password must be at least 8 characters long and must not contain any spaces.

```
import java.util.Scanner;  
  
public class PasswordValidator {  
    public static void main(String[] args) {  
        Scanner sc = new Scanner(System.in);  
  
        System.out.print("Enter your password: ");  
        String password = sc.nextLine();
```

```

        if (password.length() >= 8 && !password.contains(" ")) {
            System.out.println("Password is valid");
        } else {
            System.out.println("Password is invalid");
        }
    }
}

```

Explanation: The program checks if the password length is at least 8 characters and does not contain spaces using `&&` and `!`.

### Problem 3: Grade Checker

Problem: Write a program to check if a student's grade falls between specific ranges and print the appropriate letter grade.

```

import java.util.Scanner;

public class GradeChecker {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        System.out.print("Enter your grade (0-100): ");
        int grade = sc.nextInt();

        if (grade >= 90 && grade <= 100) {
            System.out.println("A");
        } else if (grade >= 80 && grade < 90) {
            System.out.println("B");
        } else if (grade >= 70 && grade < 80) {
            System.out.println("C");
        } else if (grade >= 60 && grade < 70) {
            System.out.println("D");
        } else if (grade >= 0 && grade < 60) {
            System.out.println("F");
        } else {
            System.out.println("Invalid grade entered");
        }
    }
}

```

Explanation: Logical conditions check different ranges of grades and print the corresponding letter grade.

## Combining Logical Operators and Conditional Statements in One Program

```
import java.util.Scanner;

public class LogicalOperatorsAndConditions {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        // User input
        System.out.print("Enter a number between 1 and 100: ");
        int num = sc.nextInt();

        // Logical operations and conditional statements
        if (num > 0 && num <= 100) {
            System.out.println("Valid number entered.");
            if (num % 2 == 0 && num >= 50) {
                System.out.println("The number is even and greater than or equal to 50.");
            } else if (num % 2 == 1 && num < 50) {
                System.out.println("The number is odd and less than 50.");
            } else {
                System.out.println("The number doesn't fall into specific sub-categories.");
            }
        } else {
            System.out.println("Invalid number entered.");
        }

        // Not operator usage example
        boolean condition = (num > 0 && num <= 100);
        if (!condition) {
            System.out.println("The number is out of range.");
        }
    }
}
```

This program demonstrates how to integrate logical operators ( `&&`, `||`, `!` ) with `if-else` conditional statements in a single Java program.