

# Java Relational Operators and Conditional Statements

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## 1. Java Relational Operators and Conditional Statements

### Relational Operators

Relational operators are used to compare two values. They return a boolean value (true or false) based on the comparison.

Operator	Description	Example
==	Equal to	a == b
!=	Not equal to	a != b
>	Greater than	a > b
<	Less than	a < b
>=	Greater than or equal to	a >= b
<=	Less than or equal to	a <= b

### Conditional Statements

Conditional statements allow your program to execute certain sections of code based on whether a condition is true or false. These include:

- if Statement
- if-else Statement
- if-else if-else Ladder
- switch Statement

## 2. Comprehensive Problem Incorporating All Relational Operators and Conditional Statements

### Problem Statement

**\*\*Student Grade Evaluation System\*\***

Create a Java program that evaluates a student's performance based on their scores in three subjects: Mathematics, Science, and English. The program should perform the following

tasks:

1. Input: Prompt the user to enter the student's name and scores for Mathematics, Science, and English (each out of 100).
2. Validation: Ensure that all scores are between 0 and 100.
3. Calculations: Calculate the total marks and average score.
4. Grade Determination: Assign grades A, B, C, D, or F based on specific criteria.
5. Additional Conditions: Handle perfect scores and consistent performance.
6. Output: Display student details, total marks, average score, grade, and additional messages.

### 3. Step-by-Step Solution with Detailed Explanation

#### Step 1: Setting Up the Program

First, set up the necessary imports and the main method in Java. Use Scanner for input.

#### Step 2: Taking User Input

Prompt the user to enter the student's name and scores for Mathematics, Science, and English.

#### Step 3: Validating Scores

Use if statements with relational operators to ensure the scores are between 0 and 100.

#### Step 4: Calculations

Calculate the total and average scores using arithmetic operators.

#### Step 5: Grade Determination

Use an if-else if-else ladder to determine the grade based on average and individual scores.

#### Step 6: Additional Conditions

Check for perfect scores and consistent performance with relational operators and additional if statements.

#### Step 7: Displaying the Results

Display the student's name, total marks, average, grade, and additional messages.

#### Complete Java Program

Here is the complete code for the problem:

```
import java.util.Scanner;

public class GradeEvaluationSystem {
    public static void main(String[] args) {
```

```

Scanner scanner = new Scanner(System.in);

// Input Section
System.out.print("Enter Student's Name: ");
String name = scanner.nextLine();

System.out.print("Enter Mathematics score (0-100): ");
int math = scanner.nextInt();

System.out.print("Enter Science score (0-100): ");
int science = scanner.nextInt();

System.out.print("Enter English score (0-100): ");
int english = scanner.nextInt();

// Validation
if (math < 0 || math > 100 || science < 0 || science > 100 || english < 0 || english > 100) {
    System.out.println("Error: Invalid input! Scores must be between 0 and 100.");
    scanner.close();
    System.exit(0);
}

// Calculations
int total = math + science + english;
double average = total / 3.0;

// Grade Determination
char grade;

if (average >= 90 && math >= 85 && science >= 85 && english >= 85) {
    grade = 'A';
} else if (average >= 80 && average < 90 && math >= 75 && science >= 75 && english >=
75) {
    grade = 'B';
} else if (average >= 70 && average < 80 && math >= 65 && science >= 65 && english >=
65) {
    grade = 'C';
} else if (average >= 60 && average < 70 && math >= 50 && science >= 50 && english >=
50) {
    grade = 'D';
} else {
    grade = 'F';
}

```

```

// Additional Conditions
// Perfect Scores
if (math == 100) {
    System.out.println("Perfect Score in Mathematics!");
}
if (science == 100) {
    System.out.println("Perfect Score in Science!");
}
if (english == 100) {
    System.out.println("Perfect Score in English!");
}

// Consistent Performance
if (math == science && science == english) {
    System.out.println("Consistent Performance across all subjects.");
}

// Output Section
System.out.println("\n--- Student Report ---");
System.out.println("Name: " + name);
System.out.println("Mathematics: " + math);
System.out.println("Science: " + science);
System.out.println("English: " + english);
System.out.println("Total Marks: " + total);
System.out.printf("Average Score: %.2f\n", average);
System.out.println("Grade: " + grade);

scanner.close();
}
}

```